O The Network in the Starting Year (2013) in the Phase 2

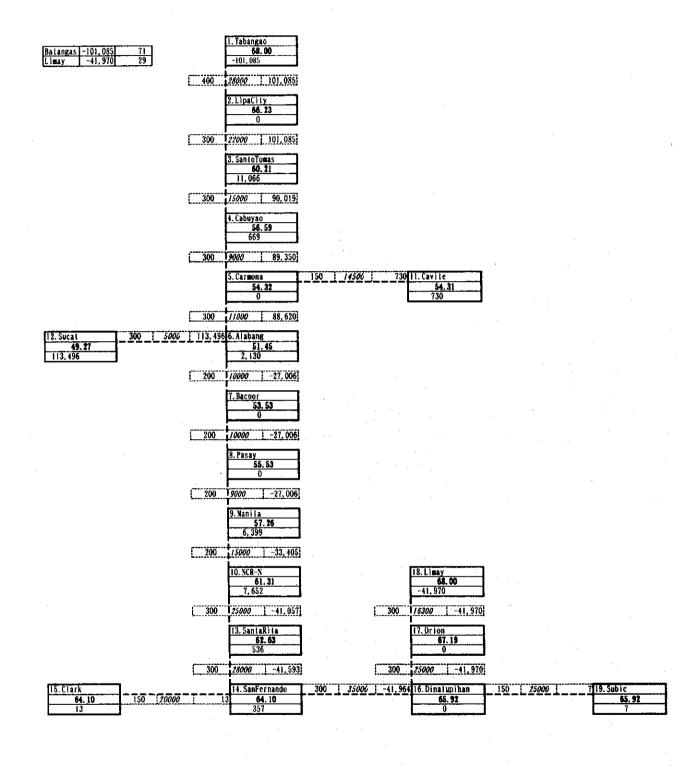


Figure 5-3-7 Pipeline Network (Option 1/ Low Case in 2013)

5 - 24

(3) The Network in the Final Year (2025)

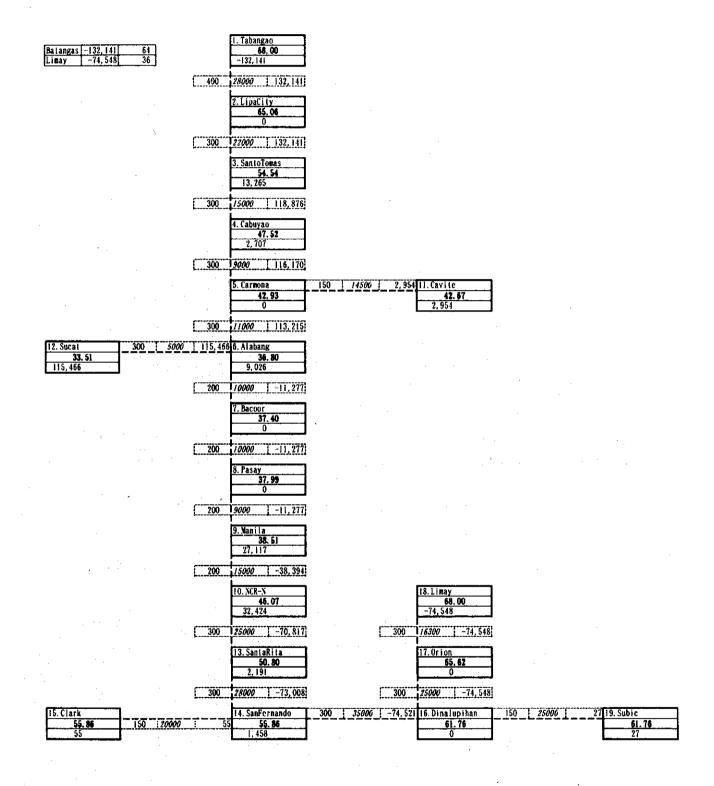


Figure 5-3-8 Pipeline Network (Option 1/ Low Case in 2025)

(2) Area L - Option 2

The LNG terminal constructed in Area L-3 will be connected to the landing terminal for domestic natural gas in Area L-2 through a transmission pipeline across Manila Bay.

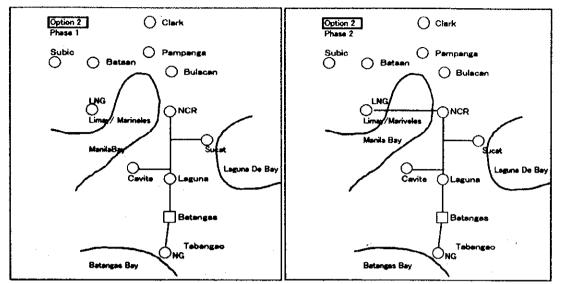
Gas will be supplied to Areas L-1 and L-2 first, and finally to Area L-3.

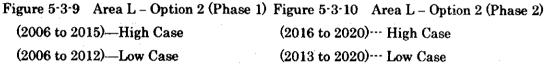
- Phase 1 Priority will be given to Areas L-1 and L-2. Domestic gas will be transported from the landing terminal for domestic gas in the Batangas area.
- Phase 2 By the year when the capacity of the transportation pipeline in the above mentioned section reaches its limit, a new transmission pipeline will be constructed undersea across Manila Bay to connect the LNG terminal in Area L·3 and the Phase 1 transmission pipeline.
- Phase 3 Another new pipeline will be extended from the northern NCR and the LNG terminal, and supply gas to Area L-3.

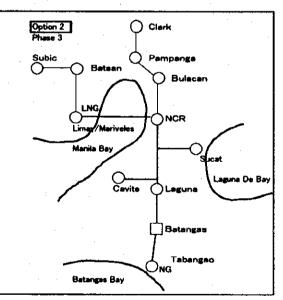
Thereby, a double-source and two-terminal system for domestic and imported natural gas will be established and ensure stable gas supply (Figures 5-3-9 and 5-3-10).

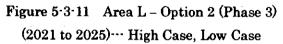
The undersea pipeline to be constructed in the Phase 2 will be able to flexibly respond to the increase of gas demand in Areas L-1 and L-2 by enlarging the diameter of the undersea pipeline. So, it will be important to fix the demand forecast when planning the pipeline.

The pipelines in the Phase 3 can be laid at any year until the target year after the Phase 2. Therefore, the pipelines can flexibly support the increase of gas demand in Area L-3.









5-27

The peak-hourly gas flow rate at each supply point obtained from the two demand forecast cases is shown in Table 5-3-5.

No	Point	Demand Case	2006	2010	2015	2020	202 5
3	Santo Tomas	High	396	7,619	14,213	17,095	20,172
	(Batangas)	Low	277	6,477	11,276	11,994	13,265
4	Cabuyao	High	367	1,483	3,585	6,257	9,108
	(Laguna)	Low	257	425	863	1,529	2,707
с.	Alabang	High	1,104	4,801	11,902	21,022	30,892
6	(NCR·S)	Low	763	1,327	2,776	5,002	9,026
9	Manila	High	3,317	14,423	35,757	63,157	92,811
	(NCR-C)	Low	2,293	3,987	8,339	15,029	27,117
10	NCR-N	High	3,966	17,246	42,755	75,518	110,976
10	(NCR·N)	Low	2,742	4,767	9,971	17,970	32,424
	Cavite	High	401	1,619	3,913	6,830	9,942
11	(Cavite)	Low	280	463	943	1,669	2,954
12	Sucat	High	355	114,284	116,316	118,899	121,655
	(Rizal)	Low	248	410	113,685	114,328	115,466
10	Santa Rita	High					7,334
13	(Bulacan)	Low					2,191
14	San Fernando	High				·	4,880
14	(Pampanga)	Low					1,458
15	Clark	High			•••••		184
15	(Bataan)	Low					55
18	Limay/Mariveles	High	•••••		•••••	1, 066	1,560
	(Bataan)	Low			148	262	466
10	Subic	High					92
19	(Bataan)	Low					27

Table 5-3-5 Peak-hourly Gas Flow Rate in Area L – Option 2 (Nm³/h)

The result of a pipeline network analysis using the two scenarios are shown in Figures 5-3-12 to 5-3-15 (High Case) and in Figures 5-3-16 to 5-3-19 (Low Case).

1) High Case

(1) The Network in the Final Year (2015) in the Phase 1

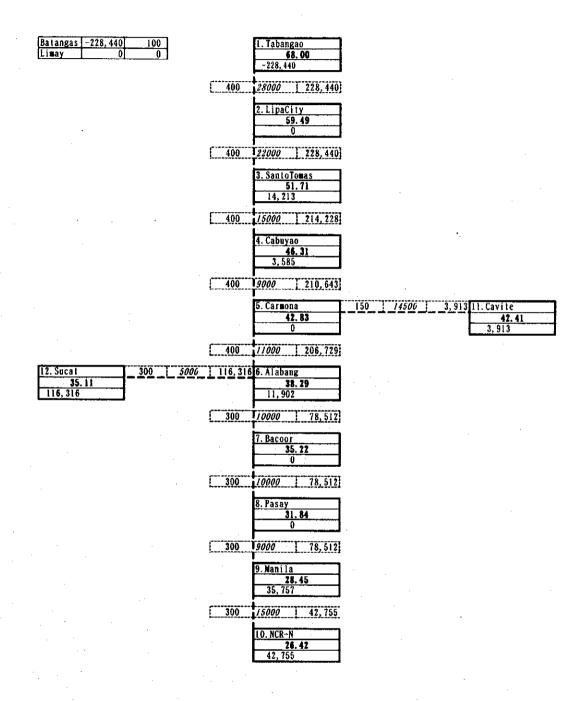


Figure 5-3-12 Pipeline Network (Option 2 / High Case in 2015)

(2) The Network in the Starting Year (2016) in the Phase 2

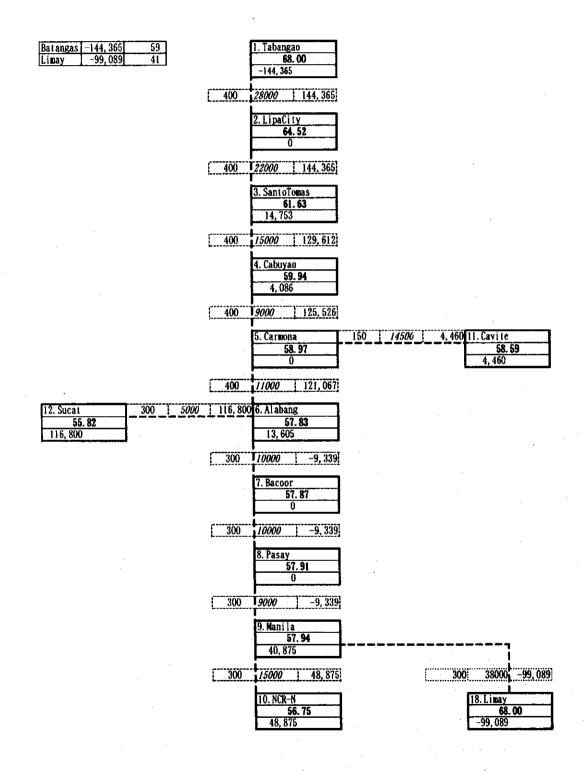


Figure 5-3-13 Pipeline Network (Option 2 / High Case in 2016)

③ The Network in the Starting Year (2021) in the Phase 3

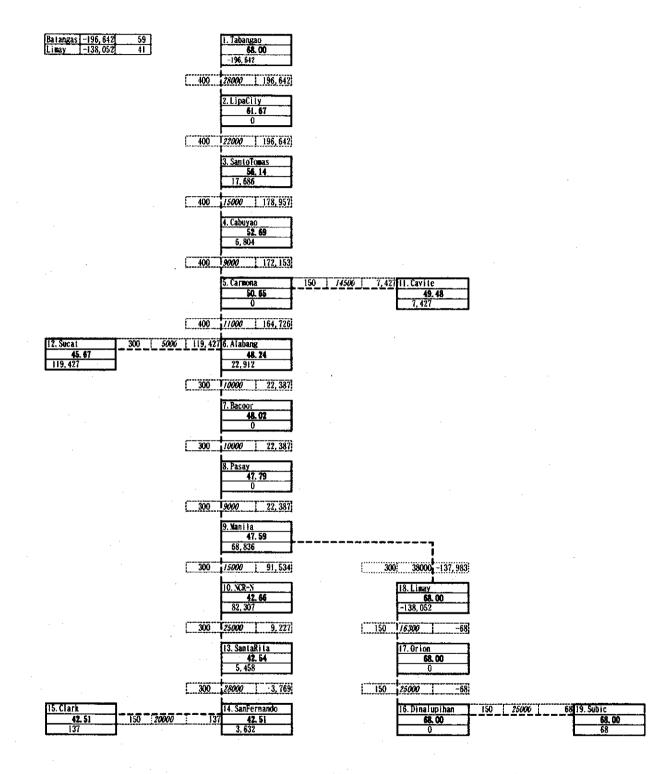


Figure 5-3-14 Pipeline Network (Option 2 / High Case in 2021)

(4) The Network in the Final Year (2025)

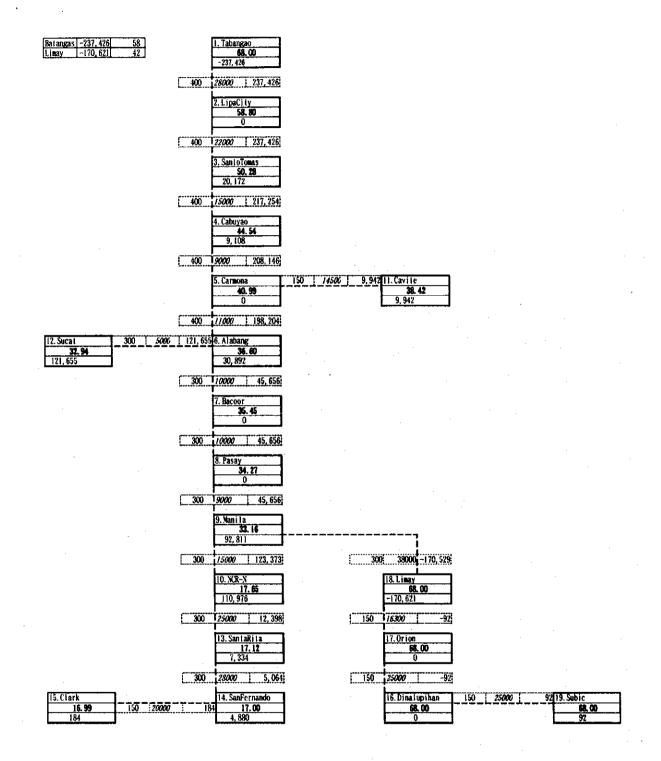


Figure 5-3-15 Pipeline Network (Option 2 / High Case in 2025)

2) Low Case

(DThe Network in the Final Year (2012) in the Phase 1

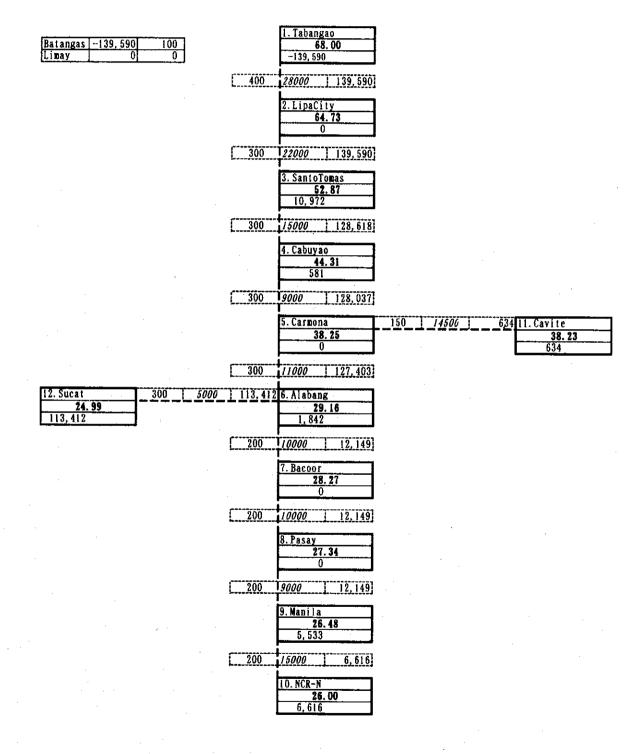


Figure 5-3-16 Pipeline Network (Option 2 / Low Case in 2012)

2 The Network in the Starting Year (2013) in the Phase 2

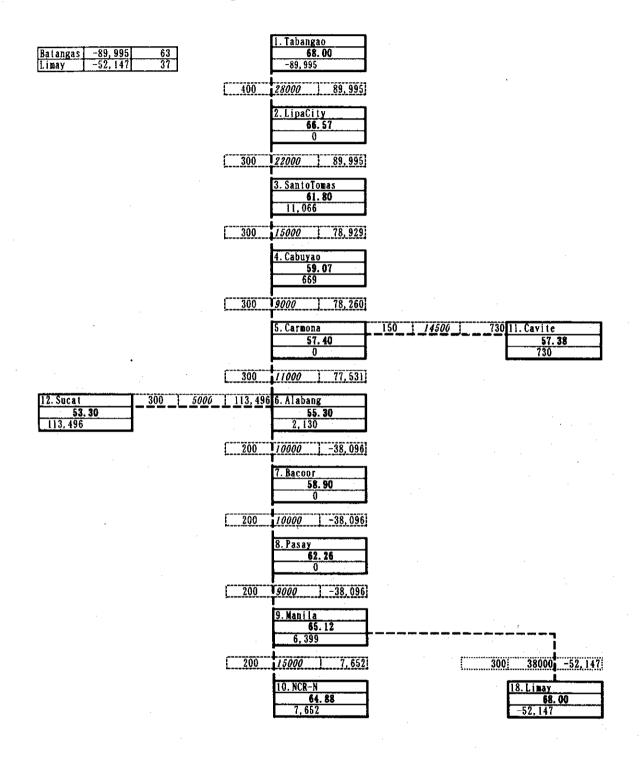
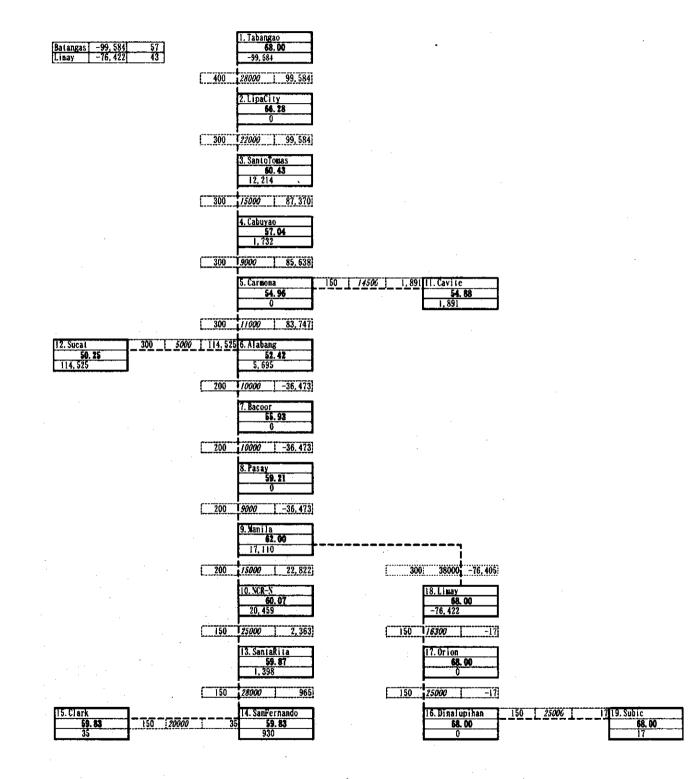


Figure 5:3:17 Pipeline Network (Option 2 / Low Case in 2013)



3 The Network in the Starting Year (2021) in the Phase 3

Figure 5.3.18 Pipeline Network (Option 2 / Low Case in 2021)

④ The Network in the Final Year (2025)

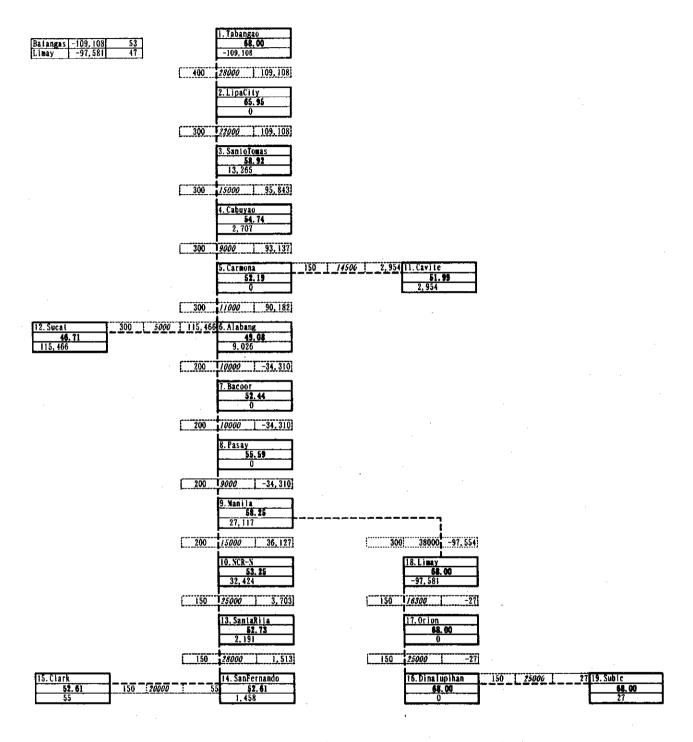


Figure 5-3-19 Pipeline Network (Option 2 / Low Case in 2025)

(3) Areas C-M and D

The peak-hourly gas flow rate in each area obtained from the two demand forecast cases is shown in Table 5-3-6.

Three natural gas source cases are studied using the following demand figures.

Area	Demand	2020	2025	2030	2035
	High Case	47,097	107,948	107,948	107,948
Area C-M	Low Case	39,903	98,141	98,141	98,141
4 . D	High Case	45,658	105,903	105, 9 03	105,903
Area D	Low Case	39,555	97,542	97,542	97,542

Table 5-3-6 Peak-hourly Gas Flow Rate in Areas C-M and Area D (Nm³/h)

1) Using Camago/Malampaya Domestic Gas

Gas will be supplied through a national pipeline from the Camago/Malampaya domestic gas landing terminal in the Batangas area to Areas C·M and D. The route is shown in Figure 5-3-20.

The route crosses a shallow ocean area and extends to Davao via Cebu Island, Iligan and Cagayan de Oro in Mindanao Island. Routes to Mindoro Island intersect the Camago/Malampaya submarine pipeline. Therefore, none of these routes is adopted.

As a result of a pipeline network analysis premised on the condition that the total length is 1,400 km and the maximum demand is 102 mmscfd, it is concluded the diameter of the transmission pipeline can be 16 inches.

It is such a long-distance transmission pipeline that careful planning is required to decide the diameter of the pipeline in consideration of possible new demand or a change in the demand in Areas C-M and D.

2) Construction LNG Terminal

Gas will be supplied directly to the supply area through a high-pressure distribution pipeline from the LNG terminals near Cebu and Davao.

The supply point cannot be forecasted now. Therefore, the network analysis has not been studied.

3) Using Trans-ASEAN Pipeline

In the Second Trans-ASEAN Gas Pipeline Forum (2001), which was held in the Philippines, a route to Luzon Island via Malaysia and Parawan Island was advocated. This route crosses the shallow ocean area and is considered to be feasible (See Figure $5\cdot3\cdot21$).

On condition that a landing terminal of the Trans-ASEAN pipeline will be in the Batangas area, gas will be supplied to Areas C-M and D through the national pipeline studied in 1) above.

As a result of the analysis, provided that the total length of the pipeline is 1,500 km and the demand is 411 mmscfd, the transmission pipeline network can be established with a booster station installed at the middle of the pipeline route.

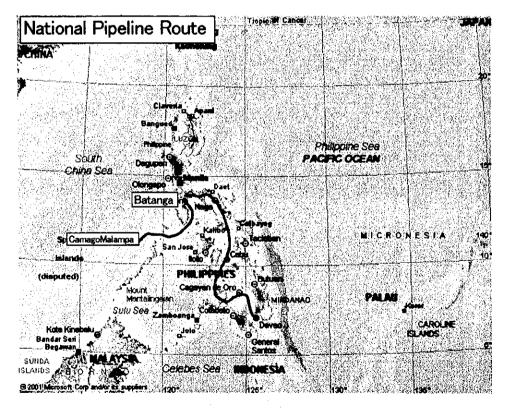


Figure 5-3-20 National Pipeline Route

3) Using Trans-ASEAN Pipeline

In the Second Trans-ASEAN Gas Pipeline Forum (2001), which was held in the Philippines, a route to Luzon Island via Malaysia and Parawan Island was advocated. This route crosses the shallow ocean area and is considered to be feasible (See Figure $5\cdot3\cdot21$).

On condition that a landing terminal of the Trans-ASEAN pipeline will be in the Batangas area, gas will be supplied to Areas C-M and D through the national pipeline studied in 1) above.

As a result of the analysis, provided that the total length of the pipeline is 1,500 km and the demand is 411 mmscfd, the transmission pipeline network can be established with a booster station installed at the middle of the pipeline route.

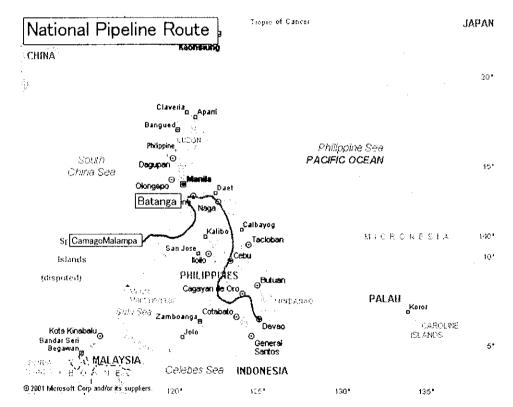


Figure 5-3-20 National Pipeline Route

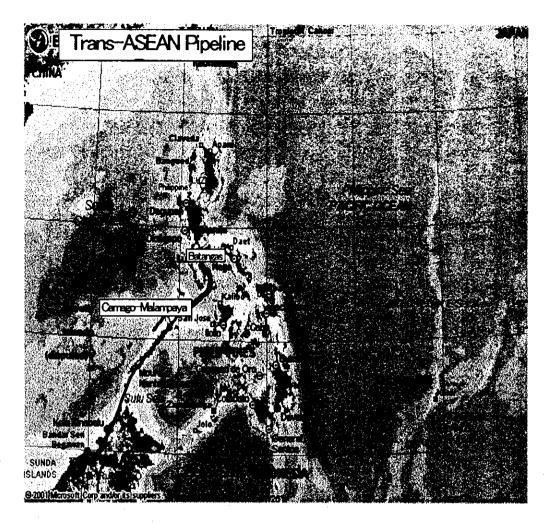


Figure 5-3-21 Trans-ASEAN Pipeline Route

5-3-7 Estimating Construction Costs

(1) Construction Costs of Transmission Pipeline

1) Construction Costs in Area L

The construction cost in Area L is estimated as shown in Table $5 \cdot 3 \cdot 6$, which is based on actual data overseas and the F/S result of a part of the route.

Pipeline dia. (inch)	Urban-area type (US\$/m)	Standard type (US\$/m)	Open Field type (US\$/m)
24	950	700	450
20	800	600	400
16	650	500	350
12	600	450	300
6	200	150	100

Table 5-3-7 Unit Construction Costs of Transmission Pipelines

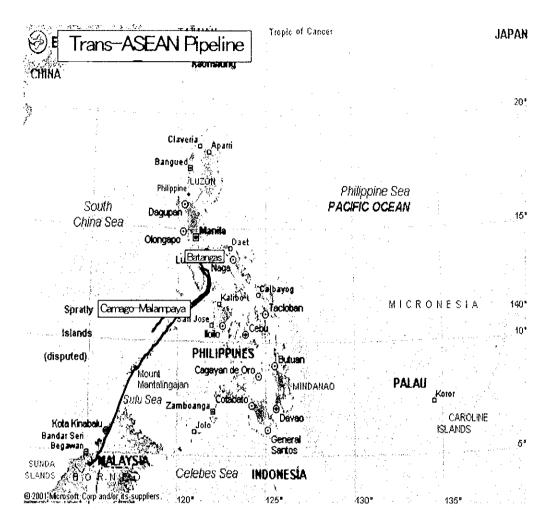


Figure 5:3-21 Trans-ASEAN Pipeline Route

5-3-7 Estimating Construction Costs

(1) Construction Costs of Transmission Pipeline

1) Construction Costs in Area L

The construction cost in Area L is estimated as shown in Table 5-3-6, which is based on actual data overseas and the F/S result of a part of the route.

		source of framplingoto.	a ciponneo
Pipeline dia. (inch)	Urban-area type (US\$/m)	Standard type (US\$/m)	Open Field type (US\$/m)
24	950	700	450
20	800	600	400
16	650	500	350
12	600	450	300
6	200	150	100

 Table 5.3.7
 Unit Construction Costs of Transmission Pipelines

2) Construction Costs in Other Areas

Construction costs for the National Pipeline and ASEAN Pipeline are estimated, on condition that standard land pipelines (US\$25/inch·m), submarine pipelines (US\$40/inch·m), and under deep sea pipelines (US\$80/inch·m) are used.

(2) Construction Costs of Distribution Pipeline

The study is based on the macro-demand estimations and no distribution points have been determined concretely. Therefore, based on the actual facilities of distribution system in Japan, the amount of facilities required per 1 km² is estimated to calculate the distribution pipeline network system cost as shown in Table 5-3-8.

Table 0 0 0		r activites per	1 2111
Item (pressure)	Installation	Unit	Quantity
	Pipe	meter	500
Main (high)	Valve	unit	1.1
	Governor	unit	0.1
	Pipe	meter	1,000
Main (medium)	Valve	unit	5
· · ·	Governor	unit	0.1
Main (low)	Pipe	meter	3,000
Main (IOW)	Valve	unit	60
Branch line (low)	Pipe	meter	6,000
Service line (low)	Pipe	meter	2,000

Table 5.3.8 Main Distribution Facilities per 1 km²

(3) Construction Costs in Each Case

.

The construction costs of the transmission pipeline are calculated for each pipeline diameter based on the unit costs described in (1) above.

The construction cost of the distribution pipeline is based on the supply area as described in (2) above.

1) Construction Cost in Area L

Option	Demand	Construction cost of		tion cost of di ine (Million		
No	Case	transmission pipeline (Million US\$)	Area L· 1	Area L-2	Area L·3	Total (Million US\$)
Option	High	136	453	48	49	687
1	Low	126	133	14	15	288
Option	High	121	453	48	49	671
2	Low	100	133	14	15	262

Table 5-3-9	Construction	Costs	in	Each	Case

2) Construction Costs in Area C-M and Area D

Supply source	Construction cost of transmission	distribu	iction cost of tion pipeline lion US\$)	Total
***	pipeline (Million US\$)	Area C-M (80 km²)	Area D (107 km²)	(Million US\$)
Domestic natural gas	655	45	76	776
LNG	624	45	76	745
Trans-ASEAN Pipeline gas	3,886	45	76	4,007

 Table 5-3-10
 Construction Costs Classified by Supply Gas Source

Note: The construction cost of the transmission pipeline for the LNG case is the construction cost of the LNG terminals.

When supplying gas to Areas C·M and D, the most economical case is the LNG case. Therefore, the analysis in Chapter 6 focuses on the LNG case.

5-3-8 Distribution Plan of Natural Gas

It is necessary to clarify the cost of investment on construction, maintenance expenses, personnel expenses, and the amount of existing gas demand each year for the economic analysis in Chapter 6. Therefore, based on the results of the study, three supply options are prepared for Area L, and the supply plan of distribution pipelines for Areas C·M

and D is prepared. In addition, two scenarios are considered in each area (i.e., the Gas Use Scenario and the Gas Promotion Scenario).

(1) Area L with High Case

1) Option 1 (Table 5-3-11)

2) Option 2 (Table 5-3-12)

(2) Area L with Low Case

1) Option 1 (Table 5-3-13)

2) Option 2 (Table 5-3-14)

(3) Area C·M

1) High Case (Table 5-3-15)

2) Low Case (Table 5.3.16)

(4) Area D

1) High Case (Table 5-3-17)

2) Low Case (Table 5-3-18)

.

•

.

.

. · .

. . •

Table 5·3·11 Gas Distribution Plan in Area L in High Case / Option 1

.

uzon Aroo asa t(High)		•	1	2002	2003	2004	2005	2005	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2010	2020	0001	2022	2023	million\$)	
otentiel demend	NCO	Industrial use		0,1	2003	0.2	2005	0.2	0.2	0.3	0.3	2010	0.4	0.5	0.5	2014	07				2019		2021		1	2024	202
otensel demend		Commercial use	ana chi	0.1	0.1	0.1	0.9	1.6	2.6	3.6	4.9	5.3	7.7	9.1	10.6	12.2	13.9	0.7 15.6	D.8 17.5	0.9	1.0 21.6	1.1	<u>1.2</u> 26,0	1.3 28.3	1.4 30.7	1.5	35
		Residential use	macti	14		22	27	32	4.4	5.8	102	19.7	19.2	23.8	28.6	33.5	385	44.2	50.1	56.2	62.4	23.8 68.7	74.9	81.1	87,4	33.3 93.8	100
•••••	Betanbae-Cavit	Industriai use	mmecfd	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0,1	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.4	0.4	
		Commerciel use	mmscfd	0.0	0.0	0.0	0.1	0.2	0.3	04	06	0.8	0.9	1.1	1.3	1.4	1.6	1.9	2.1	2.3	2.5	2.8	3.1	3.3	3.6	3,9	4
		Residential use	enectid	02	0.3	0.3	0.4	0.4	0,6	0.7	1.3	1.0	23	2.9	3.4	4.0	4.6	5_3	6.0	6.7	7.4	8.1	8.8	9.5	10.3	11.0	11
	Bulacan-Batean	Industrial use	emeciti	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	01	0.1	0.1	01	0.1	0.1	0,1	0,1	Q.1	0.1	0.2	0.2	Q.2	0.2	0.2	
······································		Çommercişi uşe	mmscfd	0.0	0.0	0.0	0.1	0.1	0.1	0.2	0.3	0.4	0.4	0.5	0.6	0.7	0.8	0.9	1.0	1.1	1.2	1.4	1.5	1.6	1.7	1.9	2
· • · · · · · · · · · · · · · · · · · ·		Residential une	mascfd	0.1	0.1	.0.1	0.2	0.2	0.3	03	0.6	0.6	1.1	1.4	1.6	1.9	2.2	2.5	2.9	3.2	3.6	3.9	4.3	4.6	5.0	5,3	
	Power generation	(Sucat, FP.1P)	macid	0.0	0.0	0.0	0.0	0.0	0.0	39.1	74.5	74.5	74.5	77.2	77.2	112	77.2	77.2	77.2		77.2	77.2	77.2	77.2	77.2	77.2	
	Total potential demand	·	mmschi	2.1	2.8	3.0	4.6	5.9	8.6	50.7	92.8	99.8	106.8	116.7	124.1	131.8	139.7	148.7	.157.9	167.4	177.3	187.5	197.3	207.4	217.8	228.4	239
	Potential supply area		km2					628.6	628.6	628.6	528.6	628.5	628.6	628.6	628.6	628.6	628.6	740.9	740.9	740.9	740.9	740.9	740.9	740.9	740,9	740.9	740
isting demend	NCR	Industrial use	macid	0.0	0.0	0.0	0.0	0.1	.0.1	0.1	0.2	0.2	0.3	0.4	0.5	0.6	0,7	0.7	0.8	0.9	1.0	1.1	1.2	1.3	1.4	1.5	1
		Commercial use	macte	0.0	0.0	0.0	0.0	0,6	1.0	1.6	2,5	3.5	4.6	5.9	7.4	9.1	11.1	13.3	15.8	18.5	21.6	23.8	26.0	28.3	30.7	33.3	35
• • • • • • • • • • • • • • • • • • • •		Residential use	mmesfd	0.0	0.0	<u> </u>	0.0	0.5	Q.8	1.4	2.9	4.8	7.1		13.1	. 16.9	21.2	26.3	32.1	38,5	45.5	53.3	61.4	70.2	79.5	89.6	100
	Betonbas — Cevit	Industrial sae		0.0 0.0	0,0 0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1 0.6	0.1	0.1 1.1	0.1 1.3	0.2 1.4	0.2	0.2	0.2	0.2	0.3	0.3	0,3	0.3	0.4	0.4	(
		Commercial use Residential use	mmecfd mmecfd	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.0	0.8	0.3	1.3	2.1	3.0	1.Q A 1	1.9 5.3	2.1 6.0	2.3 6.7	2.5 7.4	2.8	3.1 8.6	3.3 9.5	3.6	3.9 11.0	4
· · · · ·	Bulacan Bateon	Industriel uso	mmscfd	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	0,1	0.1	0.1	T	8.1		· ·	10.3		11
		Commercial use	macki	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	0.6	1.0	1.1	0.1	0.2	0.2	0.2	0.2	0.2	
		Residential use	meschi	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	0.8	1.3	1.9	2.7	3.5	4.3	4.6	5.0	5.3	ź
	Power generation	(Sucet FPIP)	mmscfd	0.0	0.0	0.0	0.0	0.0	0.0	39.1	74.5	74.5	74.5	77.2	77.2	17.2	77.2	77.2	77.2	77.2	77.2	77.2	77.2	77.2	77.2	77.2	77
	Total existing demand		mmecfd	0.0	0.0	0.0	0.0	1.1	2.1	42.5	80.4	84.0	88.2	95.9	101.7	108.4	116.1	126.4	136.5	147.5	159.5	171.6	183.9	196.5	209.9	224.2	239
	Existing supply area		km2	0.0	0.0	0.0	0.0	75.2	98 .5	121.9	145.2	185.1	224.9	264.7	304.6	344,4	384.2	452.3	492.5	532.6	572.8	613.0	647.6	670.9	694.2	717.6	740
mansmission PL		Phase]	84.5	0	0	32.3	32.3	0	0	0	0	D	0	0	0	0	o	0	0	0	0	0	0	0	0	o	
	(High pressure)	(T alanga I CR)	(mmf)			50%	50%							· .										· ·			
		Phese I	71.4	0	o	0	0	, o	0	0		0	0	0	0	35.7	35.7	0	0	0	0	0		o	0	0	
		(NCA-Betaan)	(mm\$)									05	. 05	05		50%	50%										
		Phone E	0	Q	. 0	0	. 0	0	0	0	. 0	0	· 0	0	0	0	0	. 0	0	0	0	٥	0	0	0	0	
NAME AND	Construction of local	+	(mm3)																								
Distribution PL (NCR)	trunk line		(mm§)	0.0	0.0	10.4 15%	10.4 15%	4.9	. 49		4.9 75	4.9	49 75	4.9	4.9	4.9	4.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0
	(high-greature)				~	138	05	71	- 75	F	585	. 65%	725	791	965	935	7% 100%	1000	1004	1008	1007	1007	1000	1005	1005	1005	10
	Construction of local		49.6	0.0	0.0	7.4	7.4	2.5	2.5		2.5	2.5	2.5	2.5	2.5	2.5	2.5	<u>100%</u> 2.5	100% 2.5	100% 2.5	100% 2.5	100%	1005	100%	100%	1005	10
	supply line		(mm\$)			15%	15%	55	55	55	51		55	55	55	55	55	55	55	55	55		o				
	(midde pressure)			65	01.	05	- 05	35%	405	455	50%	55%	605	65%		75%	80%	85%	905	95%	100%	<u>′ 100%</u>	100%	100%	100%	100%	10
	Construction of sweety		334.3	0.0	0.0	16.7	16.7	15.0	15.0		15.0	15.0	15.0	15.0	-15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15
	(Low-pressure)		(met)			5.0%	5.0%	4.5%	4.5%		4.55	4.55	4.56	4.55	4.5%	4.55	4.55	4.5%	4.5%	4.5%	4.5%	4.5%	4.5%	4.5%	4.5%	4.5%	4.
5186	2 Supply area		519.62					75.2	98.5	121.9	145.2	158.6	191.9	215.2	238.6	261.9	285.2	308,6	331.9	355,3	378.6	401.9	425.3	448.6	471.9	495.3	518
	Compressione supply		(ium2)				· · 1	14,5%	19.05	23.5%	28.0%	32.5%	37.0%	41.5%	46.05	50.5%	55.0%	59.5%	.64.0%	. 68.5%	73.0%	77.5%	82.0%	86.5%	91.0 %	95.5%	100.
Distribution PL	Construction of local		1,4	0.0	0.0	0.0	3.7	3.7	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	0.0	0.0	0.0	0.0	0
(Batanas to	trunk line		(mm\$)			0.0%	50.0%	50.0%				······	·····	······									· · ·				
	(high-pressure)			0.0%	0.0%		0.0%	100.05	100.0%		100.0%	100.05	100.0%	100.0%	100,05	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100
Cevito)	Construction of local supply line	Ì	5.3	0.0	0.0		0.0	0.0	. 1.1	1.1	1.1	1,1	1,1	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	C
	(middle-pressure)		(mm\$)			0.0%	0.05	0.0%	20.0%			20.05		100.07	100.08		100.00	(00.07	100.00	400.00	100.00		400.00	400.00	100.07	400.00	
••••••	Construction of supply		35.5	0,0%	0.0%	0.0	0.0%	0.0	20.0%		<u>60,0%</u>	<u>80.0%</u> 5.3	100.0% .5.3	100,0%	100.0%	100.0% 5.3	100.0% 5.3	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100
	(Low-pressure)		(0.0	. 0.0	0.05	0.05	0.05	0.0	4 .	0.0%	15.0%	í I	15.0%	15.05	5.5 15.0%	3.3 15.05	3,5 10.0%	0.0	0.0	0.0	0,0	0.0	0.0	0,0	0.0	0
	0 Supply and	1	110	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	16.5	33.0	49.5	66.0	82.5	99.0	110.0	110.0	110,0	110.0	110.0	110.0	110.0	110,0	110,0	110
· · · · ·	Low pressure supply	1	(km2)	0.0%			0.0%	0.0%	0.0%		0.0%	15.05	30.05	45.05	60 D%	75.05	90.05	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100
Distribution PL	Construction of local		7.5	0.0		0.0	0.0	0,0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3,8	3.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
(Bulacan to	Lrunk line		(\$)			ļ				ļ			0.0%	0.05	0.0%		50.0%		· · · · · · · · · · · · · · · · · · ·		I		·				
	(high-pressure)			05	0%	05	05		05	05	05	05	0%	0%	· · 0%	05	01	100%	100%	100%	100%	100%	100%	100%	100%	100%	10
Pampanga to	Construction of local		5.4	00	0.0	0.0	0.0	0.0	0.0	00	0.0	0.0	0,0	0.0	0.0	0.0		1.9	1.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	(
Beteen)	supply line		(mm\$)							·····	Į		0,01	0.05		0.0%	35.0%	35.0%			 						
	(middle_pressure) Construction of supply	+	+	01	05	+	05	05	01	05		01	05	01	0%	01	0%	70%	1005	100%	100%	100%	100%	100%	100%	100%	
	G		36.2	0.0	0.0	0.0	0.0	0,0	0.0	0.0	0.0	0,0	1 1	0.0		0.0	5.4	5,4	-5,4	5,4	5.4	5,4	3.6	0.0	0.0	0,0	C
	(Low- pressure)	·	[[mm]]]							<u></u>		·	0.05	0.0%	0.0%	0.0%	15.0%	15.0%	15,0%	15.0%	15.0%	15.0%	10.0%				
	The second se		(ian2)	0.0%	0.05	0.0%	0.0%	0.0%	0.05	0.0%	0.0%	0.01	0.0%	0.0%	0.016	0 0.0%	0.0	33.7	50,5	67.4	84.2	101.1	112.3	112.3	112.3	112.3	
112	Low-pressure supply			0.0			32.3	0.0			0.0	0.0	1	0.0		35.7	35,7		45.0%	<u>60.0%</u>	75.0%	90.0%	100.0%	100.0%	100.0%	100.0% 0.0	100
	KLow pressure supply	Transmission			1		38.2	26.0	1			28.7	28.7			27.7	38.8	0.0 32.1	0.0 24.6	0.0 23.0	0.0 23.0	0.0 20,5	0.0 18.7	0.0 15.0	0.0 15.0	15.0	
	KLow pressure supply	Transmission Distribution	136.0	00								28.7				63.4		32.1	24.6	23.0	23.0	20,5	18,7	15.0	15.0	15.0	1
	KLow pressure supply	Transmission Distribution	550.3 666.3	0.0		66.8	70.5	26.0						1		5.2	5.2	11.3									
	KLon-pressure supply	Distribution	550.3			<u>66.8</u>	70.5	26.0 5.2		52	5.2	5,2	5.2	5.2	5.2	9.4			11.3	11.3	11.3	11.3	11.8			11.3	11
Construction for	(Low pressure supply	Distribution Total	550.3			<u>56.8</u>	70.5	26.0 5.2 148,500	5.2		5.2 148,500	5.2 148,500		5.2 148.500	5,2 1 48,500	148,500	148,500		11.3 322,800	11.3 322,900	11.3 322,800	11.3 322,900	11.3 322,800	11.3	11.3	11.3 322,800	
Construction fe Maintenance fee	(Lon-pressure supply break) total (mm\$)	Distribution Total Maintenance fee(mmE)	550.3 885.3 	0.0	0.0		70.5	5.2	5.2 148,500	148,500	148,500		148,500		148,500			322,900 13.6	11.3 322.800 14.8	11.3 322.900 16.0	11.3 322,900 17.2	11.3 322 .900 18.4	11.3 322,900 19.4			11.3 322,800 21.5	322,0
Construction for	(Low presure suppy a total (mms) (Transmission Pt (\$35/m)	Distribution Total Maintenance fee(mnš) Maintenance Length(m)	550.3 886.3 35 (\$/m)	0.0	0.0	0.0		5.2 148,500	5.2 148 <u>.500</u> 3.0	148,500 3.7	148,500	148,500	148,500	148.500	148,500 9.1	148,500	148,500 11.5	322,800	322,800	322,800	322,800	322,800	322,800	11.3 322, 900	11.3 322,800	322,800	322,6 2
Construction for Maintenance, for (mm\$)	(Low presure supp total (mms) Transmission PL (\$35/m) Distribution PL	Distribution Total Mintenanço Ser(ms) Mintenanço Length(m) Mintenanço Ser(ms)	550.3 686.3 35 (\$/m) 30000	0.0	0.0	0.0	0.0	5.2 148,500 2.3	52 148,500 3.0 98.5	148,500 3.7 121.9	148,500 4.4 145.2	148,500	148,500 · 6.7 224.9	148.500 7.9	148,500 9.1 304.5	1 48,500 10.3	148,500 11,5	<u>322,900</u> 13.6 452.3	<u>322,800</u> 14.8	322,900 16.0	322,900 17.2	<u>322,900</u> 18,4	<u>322,800</u> 19.4	11.3 322,900 20.1	11.3 322,800 20.8	322,800 21.5	322,6 2 74
Construction for Maintenance, for (mm\$) Maintenance	(Low presure supp total (mms) Transmission PL (\$35/m) Distribution PL (\$30000/km2)	Distribution Total Maintenance textmes) Maintenance Length(m) Maintenance seafum() Maintenance area(ae2)	550.3 806.3 (\$/m) 30000 (\$/km2)	0.0	0.0	0.0 0.0 120	0.0	5.2 148,500 2.3 75.2	52 148,500 3.0 98.5	148,500 3.7 121.9	148,500 4.4 145.2	148,500 5.6 185.1	148.500 · 6.7 224.9 360	148.500 7.9 264.7 424	148,500 9.1 304.5 487	148,500 10.3 344,4	148,500 11.5 384.2	<u>322,900</u> 13.6 <u>452.3</u>	<u>322,800</u> 14.8 492 <u>,5</u>	322,800 16.0 532.6	322,900 17.2 572.8	322,800 18.4 513.0	322,000 19.4 647.6	11.3 <u>322,600</u> 20.1 670,9	11.3 322,800 20.8 694.2	322,800 21.5 717.6	322,8 22
Construction for Maintenance, for (mm\$) Maintenance	(Low presure supp total (mms) Transmission PL (\$35/m) Distribution PL (\$30000/km2)	Distribution Total Meintenance before3) Meintenance (angtha) Meintenance anather3) Meintenance anather3 Meintenance anather3 Personne1 (1- 6 sessee/Amr2)	550.3 806.3 (\$/m) 30000 (\$/km2)	0.0	0.0	0.0	0.0	5.2 148,500 2.3 75.2	5.2 148,500 3.0 98.5 158	148,500 3.7 121.9 195	148,500 4.4 145.2 232	148,500 5.6 185.1	148.500 · 6.7 224.9 360	148.500 7.9 264.7	148,500 9.1 304.5 487	148,500 10.3 344,4	148,500 11.5 384.2 615	<u>322,900</u> 13.6 <u>452.3</u>	<u>322,800</u> 14.8 492 <u>,5</u>	322,800 16.0 532.6	322,900 17.2 572.8	322,800 18.4 513.0	322,000 19.4 647.6	11.3 <u>322,600</u> 20.1 670,9	11.3 322,800 20.8 694.2	322,800 21.5 717.6	<u>322,8</u> 22
Construction for Maintenance, for (mm\$) Maintenance Operation	(Long presure supply a total (mm3) (3(5)/m) Cistribution FL (32000/Am2) Head Quarter Transmission	Distribution Total Meintenance Lengthal Meintenance Lengthal Meintenance anadians Meintenance anadians (1: 4 personnel (1: 4 personnel (0:5 person/km))	550.3 806.3 35 (\$/mJ) 30000 (\$/km2) 1.6	00 00 00 0	0.0 0.0 0.0 0 0	0.0 0.0 120 74	0.0 0.0 120 74	52 148,500 2.3 752 120 74	52 148,500 3.0 98,5 158 74	148,500 3.7 121.9 195 74	148,500 4.4 145.2 232 74	148,500 5.6 185.1 296 74	148,500 · 6.7 224.9 360 74	148.500 7.9 264.7 424 74	148,500 9.1 304.5 487 74	148,500 10.3 344.4 551 74	148,500 11.5 384.2 515 74	322,900 13.6 452.3 724 161	322,800 14.8 492,5 788 161	322,800 16.0 532.6 852 161	322,900 17.2 572.8 917 161	322,900 18.4 513.0 981 161	<u>322,900</u> 19.4 647.6 1,036 161	11.3 322,800 20.1 670.9 1.073 161	11.3 322,800 20.8 694.2 1,111 161	<u>322,800</u> 21.5 717.6 1.148 161	11 322,8 22 740 1.1
Construction for Maintenance for (mm\$) Maintenance Operation	(Long presure supply a total (mm3) Transmission PL (\$255/m) Cist/bution PL (\$2000/km2) Head Quarter	Distribution Total Meintenance before3) Meintenance (angtha) Meintenance anather3) Meintenance anather3 Meintenance anather3 Personne1 (1- 6 sessee/Amr2)	550.3 886.3 35 (\$/m) 30000 (\$/km2) 1.6	00 00 00 0	0.0	0.0 0.0 120 74	0.0 0.0 120	5.2 148,500 2.3 75.2 120	5.2 148,500 3.0 98.5 158	148,500 3.7 121.9 195 74	148,500 4.4 145.2 232 74	148,500 5.6 185.1 296	148,500 · 6.7 224.9 360 74	148.500 7.9 264.7 424	148,500 9.1 304.5 487 74	148,500 10.3 344.4 551	148,500 11.5 384.2 515 74	322,800 13.6 452.3 724	322,800 14.8 492,5 788	322,800 16.0 532,6 852	322,800 17.2 572.8 917	322, 900 18.4 513,0 981	322,800 19.4 647,6 1,036	11.3 322,900 20.1 670,9 1.079	11.3 <u>922,800</u> 20.8 694.2 1,111	322,800 21.5 717.6 1.148	<u>322,8</u> 22

5 - 43

. .

. .

Table 5-3-12 Gas Distribution Plan in Area L in High Case / Option 2

•

.

									······.					•••••													
Luzon Area Case 2(High)		I		2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	n-llion\$) 2024	202
	NCR	Industrial use	mmsofd	0.1	0.1	0.2	02	02	02	0.3	0.3	0.4	0.4	0.5	05	06	0.7	0.7	0.8	0.9	1.0	1.1	1.2	1.3	1.4	1.5	1.02
		4 1	menune fel		0,1	0.1	0.9	1.6	2.6	3.5	4.9	8.3	7.7	9,1	10.6	12.2	13.9	15.6	17.5	19.5	21.6	23.6	26.0	28.3	30.7	33.3	35.9
		Residential use	memac fd	1.4	2.1	2.2	2.7	3.2	4.4	5.8	10.2	14.7	19.2	23.8	28.6	33.5	38.5	44.2	50.1	56.2	62.4	68.7	74.9	81.1	87.4	93.0	100.
	Betanbas Cevit	Industriat use	mme fd	0.0	0.0	0.0	0.0	Q1	01	0.1	0.1	01	0.1	0.1	01	0.2	02	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.4	0,4	
		Commerciel use	mmecfd	0.0	0.0	0.0	0.1	0.2	0.3	0.4	<u>0.6</u> 1.3	0.8	0.9 2.3	1,1	1.3 3.4	1.4	<u>1.6</u> 4.6	1.9 5.3	<u>2.1</u> 6.0	<u>2.3</u> 6.7	<u> </u>	2.8	3.1 8.8	<u>3.3</u> 9.5	<u>3.6</u> 10.3	<u>3.9</u> 11.0	4.: 11.
	Buiece - Boteon	Industrial uso	mmoofd	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	01	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0
		Commercial une	mmacid	0.0	0.0	0.0	0,1	0,1	01	0.2	0.3	0.4	0.4	0.5	0.6	0.7	0.8	0.9	1.0	1.1	1.2	1.4	1.5	1.6		1,9	2.
		Residential use	mmectd	0,1	0.1	0.1		0.2	0.3	0.3	0.6	0.8	1.1	1.4	1.6	1.9	2.2	2.5	2.9	3.2	3.6	3.9	4.3	4.6	5.0	5.3	5.
	Power generation	(Socal FP1P)	eenest	0.0	0.0	0.0	0.0				74.5	74.5	74.5		77,2		77.2	77.2	77.2	77.2	77.2	77.2		77.2	77.2	77.2	
I	Total potential demand		mmecfd	21	2.8	3.0	4.6	5.9	8.6	50,7	92.8 526.62	99.8	106.8	116.7 628.62	124.1 628.62	131.8	139.7	148.7	157.9 740.92	<u>167.4</u> 740.92	<u>177.3</u> 740.92	<u>187.5</u> 740.92	197.3	207.4	217.8	228.4	239 740
Existing demand	Potential supply area	Induștriei use	mmec fc	0.0	00	0.0	0.0	628.62 0.1	628 62 0.1	628.62 0.1	0.2	628.62 0.2	628.52 0.3	0.4	0.5	0.6	528.62 0.7	740.92 0.7	0.8	0.9	1,0	1,1	1.2	1.3	1.4	1,5	
		Commercial use	mmecid	0.0	0.0	0.0	0.0	0.6	1.0	1.6	2.5	3.5	4.5	5.9	7.4	9.1	11.1	13.3	15.8	18.5	21.6	23.8	26.0	28.3	30.7	33.3	35.
	l	Residential use	mmacfd	0.0	60	<u>0.0</u>	0.0	0.5	0.8	1.4	2.9	4.8	7.1	9.9	13,1	16.9	21.2	26.3	32.1	38.5	45,5	53.3	61.4	70.2	79.5	89.6	100
	DatenbasCavit	industrial use	minnec fd	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0,1	0,1	0,1	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0,3	0.3	0.3	0.3	0.4	0.4	С.
	ļ	Commerciel use	mmaso fid	0.0	0.0	0.0	0,0	0.0	0.1	0.2	0.4	0.6	0.9	1.1	1.3	1.4	1.6	1,9	2.1	2.3	2.5	2.8	3.1	3.3	3.6	3.9	4
		Residentis! use		0.0	0.0	0.0	0.0	00		0.0	0.0	0.3	0.7	1.3	2.1	3.0	4.1	<u> </u>	8.0	6.7	7.4	<u> </u>	<u>8.8</u> 0.2	9.5	<u> </u>	11.0 0.2	
	Buiscen-Betenn	industriel use Commercial use	mmecfd mmecfd	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	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		0.2	1.7	0.2 1.9	
		Residential use	mmete	0.0	0.0	0.0	0.0	00	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	1.3	2.1	3.0	4.0	5
	Power seneration	(Sucat FP P)	mmotd	0.0	0.0	0.0	0.0	0.0	0.0	39.1	74.5	74.5	74.5	11.2	112	77.2	77.2	77.2	17.2	77.2	77.2	77.2	77.2	17.2	77.2	77.2	77
	Total axisting demand	<u> </u>	mmegfd	0,0	0.0	0 .0	0.0		2.1	42.5	90.4	84.0	86 .2	95.9	101.7	108.4	116.1	124.9	134.1	144.3	155.5	165.6	180.4	194.0	207.9	222.8	239
	Existing supply area	L	km2	0 .0	0.0	0.0	0.0	75.2	96.5	121.9	145.2	185.1	224.9	264.7	304.6	344.4	384.2	418.6	441.9	465.3	488.6	511.9	569.0	609.1	649.3	689.5	740
Transmission PL	Construction of trunk line (High pressure)		64.6	0	•	32.3 50%	32.3		Q					•		• •	0		0					0	o	o	h
		(rates and the set of	(mm)) 18.2		<u> </u>		<u>. 50%</u> 0										18.2	n	0	0	0				o	c	·
•••••••••••••••••••••••••••••••••••••••		(NCR-Batasa)	(mm f)							······································				05	¥		100%	0%		×	2	~			· · · · · · · · · · · · · · · · · · ·		
		Pineo II	38	Ģ	Q	0	o	0	o	o	0	Q	, o	¢	0	ç	a	U	o	o	0	19	19	0	0	٥	
	Į	l	(mm f)						l						· ·		04	0%]		505				ļ
Distribution PL	Construction of local	1	69.3	0.0	0,0	10,4	10.4	4.9	4.9	4.9	4.9	4.9	4.9	4.9	4.9	4.9	4.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0,0	0
(NCR)	trunk line		(mm)			155	151						75														
	(high-pressure) Construction of local		49.6	01	0%	24	7.4	375 2.5	2.5	51% 2,5	<u>56%</u> 2.5	<u>655</u> 2.5	72 % 2.5	79% 2.5	861 2.5	<u>93%</u> 2,5	100% 2.5	100%	1005	100%	100%	100%	100%	100%	100%	100%	10
	supply live		(mm 6)	v		7.4	155			55	51	5%	55	5%	51	5%	5%		5%	5%	5%		Ĭ		····· •		
	(middle-pressure)			05	05	0%	05	35%	I F	45%	505	555	60%	85%	70%	755	805		90%	95%	100%	100%	100%	100%	1005	100%	10
	Construction of supply		334.3	0.0	0.0	16.7	16.7	15,0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15,0	15.0	15.0	15.0	15,0	15.0	15.0	15
	(Low- pressure)	· · ·	(mm\$)			5.0%	5.0%	4.5%	4.5%	4.5%	4,55	4.5%	4.5%	4,55	4.5%	4.5%	4.5%	4.5%	4.5%	4.55	4.5%	4.5%	4.5%	4.5%	4.55	4.58	44
	Supply snee Compressure supply											168.6		21.5.2	238.6		285.2	308.6	331.9	355.3	378.6	401.9	425.3	448.6	471.9	495.3	518
	Construction of local		(kung)					14.51	1	23.5%	28.0%	32.5%	37.0%	41.5%	46.0%	50.5%	55.0%	59,5%	64.0%	68.5%	73.0%	77.5%	82.0%	86.5%	91.0% 0.0	95.5% 0.0	100
Distribution PL. (Detenges to	trunk line		7.4. (mun 4)	0.0	0,0	0.0	3.7 50.0%	3,7 50.05	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	0.0	0.0	Ň
	(high-pressure)			0.05	0.0%	1	1 1	100.0%	1 1	100.0%	100.05	100.05	100.0%	100.05	100.05	100.0%	100.0%	100.0%	100.0%	100.0%	100.05	100.0%	100.0%	100.0%	100.0%	100.0%	100
Cervite)	Construction of local		5.3	0.0		1	4 1	0.0	1,1	1,1	1.1			0.0	0.0	0.0	0.0	i: I	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
	aupty line		(mm\$)			0.0%	0.0%	0.05	20.0%	20.0%	20.05	20.05	20.0%														
	(middle-pressure) Construction of supply			0.0%	1	0.0%		0.0%	20.0%	40.0%	60.0%	90.05	100.0%	100.0%	100.05	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.05	100.0%	
	line (Low- pressure)		35.5	0.0	0.0			0.0	! !	0.0	0.0	5.3	5.3	5.3	5.3	5.3	5.3	3.5 10.0%	0.0	0.0	0.0	0.0	0,0	0,0	. 0.0	0.0	0
110	O Supply area	1	(mm \$)	0.0	0.0	0.0%	0.0%	0.0%	0.0% 0.0	0.0%	0.0% D.D	15.0% 16.5	15.0%	15.0% 49.5	15.0% 66.0	15.0% 62,5	<u>15.0%</u> 99.0	110.0	110.0	110.0	110.0	110.0	110.0	110.0	110.0	110.0	110
	(Low pressure supply		(km2)	0.0%				0.0%	0.0%	0.0%	0.0%	15.0%	30.0%	45.0%	60.0%	75.0%	90.0%	100.0%	100.05	100.0%	100.0%	100.0%	100.0%	100.01	100.0%	100.0%	100
Detribution PL			7.5	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	0.0	0.0	0.0	3.8	3,8	0.0	0.0	0.0	
(Bulacan to	trunk line		(mm)		1				·								0.0%	0.05				50.05	50.0%				1
	(high-pressure) Construction of local				076	0%	01	0%	03	05	05		01	075	0%	<u>016</u>		0%	0%	0%	05	0%	100%	100%		100%	
Parricange to Between)	supply line		5.4 (mm \$)	0.0	0.0	0.0	0.0	0.0	ao	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0 0.0%	1: 1	0.0 0.0%	0.0	0.0	· 1.9 35.0%	1.9 35.0%	1.6 30.0%	0.0	0.0	0
Catoony	(midde-pressure)			016	05	0	01	. 0%	016	05	01	05	0	055	01	- 05	0.0%	01	05	05	016	0%	70%	100%		1005	
	Construction of sumbr		36,2	0.0	1					0,0	0.0	0,0	0.0		0.0		0.0		0.0	0.0	0,0	5,4	5.4	5.4	5.4	5.4	1
	(Low-pressure)		(mm 6)				· ·		ļ							└ <u></u>	0.0%		0.05	0.05	. 0.05	15.0%	15.0%	15.0%		15.05	
1123	3 Supply area (Low-proving supply			0.0	1 · ·	1				0.0	0.0	0,0	0.0	0.0	0,0		0.0	E I	0.0	0.0	0.0	0,0	33,7	50.5	67.4	84.2	
	(internet)	Terrenteri	(km2)	0.01		T	2			<u>0.0%</u>	0.05	0.0%	0.0%		0.05	0.0%	0.0%		0.0%	0.0%	0.0%	0.0%	30.0%	45.0% 0.0	60.0% 0.0	75.0%	
Construction fee	Total (mm\$)	Transmission Distribution	120.8 550.3	0.0					0.0 23.4	0.0 23.4	0.0 23.4	0.0 28.7	28.7	0.0 27.7	0.0 27.7	27.7	18.2 27.7	0.0	0.0	0.0	0.0 17.5	19.0 26.1	26.1	22.1	20,5	20.5	
		Total	671.1	0.0						23.4	23,4	28.7	28.7	21.7	27.7	27.7	45.9	21,1	17.5	17.5	17.5	45.1	45.1	22.1	20.5	20.5	
Maintananco fao	Transmission PL	Nationance Sec(mm8)	35	1		1		5.2		5.2	5.2	5.2	5.2	5.2	5.2	5.2	5.2	1. (6 .5	6.5	6.5	6.5	. 11,4	11.4	11.4	11.4	1
(mm\$)	(\$35/m)	Maintanance Langth(m)	G\$/m)		· · · · · · · · · · · · · · · · · · ·	I	· · · ·	148,500		148,500	148,500	148,500		148.500	148,500		148,500	186,500	186,500	186,500	186,500	186,500	325,800	325,800	325,800	325.800	
	Distribution PL	Naintananca Saa(mm8)	30000	1	1		1			- 3.7	4.4	5.6	6.7	7.9	9.1	10.3	11.5	12.6	t3 .3	14.0	14,7	15,4	17,1	18.3	19.5	20.7	25
	(\$30000/hm2)	Maintananse sreekin2)	<u>(\$/km2)</u>	0.0				T	•	121.9	145.2	195.1	224.9		304.6	344.4	394,2	418.6	441.0	465.3	488.6	<u>\$11.9</u>	569.0	609.1 975	649.3 1 029	699.5	1
Maintenence Operation	Heed Querter	Personnel (1. 6 persons/lem2)	1.6	0	<u>.</u>	120	120		158	195	232	296	360		487		615	670	707		782	<u>, 819</u>	910	975	1.039	1,103	1.1
Personnel	Transmission	Personnel	0.5	0	0	74	74	74	74				74	74	74	74	74	93	93	93	93	93	163	163	163	163	1
	1	(05 person/km]	1	1			1	L																			1
														. 1		.)		E				T					1 4
	Distribution	Personne)	0.6	0	•	45	45	45	59	73	87		135	159	163	207	231	251	265	279	293	307	341	365	390		
	Distribution Total	1	0.6 (persons)	0		45				73 342			· · ·		744	207 832	231 920		265	279	293	307 1.219	341 1,415	365		414	

.

.

.

5-45

Table 5-3-13 Gas Distribution Plan in Area L in Low Case / Option 1

. •

														:												:	
Luzon Area					r		F											÷	T			c mar				nilian i)	
Case I (Low)		······································		2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Potential demand		I	nymeofd	9.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.4	0.4	0.5	05	0.5	0.6	0.6		0.6	80	09	0.9
		I	nmacifi	0.1	0.4	0.4	03	0.7	1,1		<u>1.B</u>	2.2	2.9	3.6		5.9	62	7.3	8.5	9.8		12.7	14.3	15.9	127	19.6	21.6
1			nmoofd	2.0	2.2	2.3	2.3	2.5	2.7	3.0	3.2	3.5	3.9	4.3	4.7	5.2	5.7	6.2	6,8	7.3	6.0	8.0	10.4	12.0	13.8	15.7	17.7
••••••	Betenbes-Cavit 1	I	nmeofd	0.0	0.0	0.0	00	00	01	01	01	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	01	0.2	0.2	0.2	0.2	<u>02</u> 2.1	0.2	0.3
	l l	I	nmeofd	00	90	0.0	0.0	0.1	0.1	0.2 0.4	0.2	0.3	0.3	0.4	0.5	0.6	0.7	0.9 0.8	1.0 0 B	1.1 0.9	<u>1.3</u>	1.1	1.3	<u>1.9</u> 1.4	1.5	2.3	2.5
	P Is an a Patra a		mneofd	0.3	0.3	0.3	0.3	0.3	0.0		0.0		0.0	0,0		0.6	0.7	1	0,1			0.1	0.1	0.1	01	01	<u>21</u> 01
	Bulacan Bataan I		mmaofd	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0,1	0,5	01	0.1	0.7	0.8	0.9	0.1	1.1	12
	Ē.	1	nan sofd	0.0	0.0	0.0	<u>0.0</u> 0.1	0.0	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.4	0.4	0.4	0.5	0.5	0.6	0.7	0.8	0.9	1.0
•••••••			manacid	0.0	0.0	0.0	0.0	0.0	0.0	3.5	3.5	3.5	6.5	77.2	77.2	77.2	77.2	77.2	772	77.2	77.2	77.2	77.2	77.2	772	772	77.2
	Power generation		In BOA	2.7	3.3	3.3	3.4	4.1	4.8	9.0	9.8	10.5	14.8	86.9	86.5	90.1	91.9	93.B	95.9	98.1	100.7	103.6	107.2		115.3	119.8	124.0
	Total potential demand Potential supply area		um2					184.2	184.2	184.2	184.2	184.2	184.2	217.8	217.8	217.8	217.6	217.8	217.8	217.8	217.8	217.8	217.8	217.8	217.8	217.8	217.8
Existing demand	NCR	Industriel use	maofd	0.0	0.0	0.0	0.0	0.1	0.1	0,1	0.1	0.2	0.2	. 0.2	0.3	0.4	0.4	0.5	0.5	0.5	0.6	0.6	0.7	0.8	0.8	0.9	0,9
		Commerciel use	mesofd	0.0	0.0	0.0	0.0	0.2	0.4	0,6	60	1.2	1.7	2.3	3,1	4.0	5.0	6.2	7.7	9.3	11.2	12.7	14.3	15.9	17.7	19.6	21.6
		F	Terreofd	0.0	0.0	0.0	0.0	0.4	0.5	0,7	0.9	1.1	1.4	1.8	2.2	2.6	3,1	3.7	4.3	5.0	5.9	6.9	8.5	10.4	12.5	15.0	17.7
. 7	BatanbasCavit	1	mmsofd	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0,1	0.1	0.1	0.1	0.1	0.1	0,1	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.3
		Commercial uso	minisofd	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.9	1.0	1.1	1.3	1.5	1.7	1.9	2.1	2.3	2.5
,		Residential use	masofd	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.2	0.4	0.5	0.6	0.8	0.8	0.9	1.0	1.1	1.3	1.4	1.5	1.9	2,1
!	Sulecen-Detaen		mensofd	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0,1	0,1	01	0.1	0,1	0,1	0,1	0,1	0.1	Ð.I	0.1	0,1
			menso fel	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.3	0.4	0.4	0.5	0.6	0.6	0.7	0.8	0.9	1.0	1.1	1.2
		Residentiel use	mmsofd	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.2	0.3	0.4	0.4	0.5	05	0.6	0,7	8.0	0.9	1.0
	Power generation	(Sucet, F.P.(P)	mmeofd	0.0	0.0	0,0	0.0	0.0	0.0	3,5	3.5	3,5	6.5	77.2	77.2	77.2	77.2	77.2	77.2	77.2	77.2	77.2	17.2	77.2	77.2	77.2	77.2
; , , , , , , , , , , , , , , , , , , ,	Total existing demand		mmsofd	0.0	0.0	0.0	0.0	0.7	1.1	5,1	5.6	5.3	10,4	82.3	84.0	65.8	87.8	90.1	92.6	95.3	98.5	101.5	105.3	109.5	114.0	119.1	124.6
·	Existing supply area		km2	0.0	0.0	0.0	0.0	22.0	28.8	35.6	42.4	54.2	65.9	77.6	99.4	116.1	132.9	148.0	159.8	170.0	176.8	183.6	190.5	197.3	204.1	2109	217.8
Transmission PL	Construction of trunk line	Piase I	59.6	0	0	29.8	29.8	0	٥	0	0	0	0	0	0	0	0	0	٥	o	0	o	0	٥	0	0	0
<u>.</u>	(High proseuro)	(Tetargeo-NCR)	(mm 6)			50%	50%																				
-		Phase II	66.2	0	D	O	0	٥	o	0	0	0	. 33,1	33.1	0	o	o	0	0	o	o	ø	o	o	0	ø	0
ŧ		(NCR-Dates)	(mm\$)									05	50%	50%								l				.	
		Phase II	o	0		0		. م					¢	o	o			q					0				0
			(mm§)															· ·									
Distribution PL	Construction of local		20.3	0.0	0.0	3.0	3.0			1.4.		1.4.				1.4		0,0	0.0	0.0	0.0	0.0		0.0			0.0
(NCR)	trunk line		(mm\$)	ĺ		15%	15%	75	75	7%	75	75	7%	75	75	75	7%	.									
<u>.</u>	(high-pressure)			05	0%	01	<u>. 01</u>	375		51%	58%	65%	72%	79%	86%	93%	1.00%	100%	100%	100%	100%	100%	1001	100%	100%	100%	100%
	Construction of local		14.5				2.2		0.7	0.7		0.7		0.7	0.7	0.7	0.7	0,7	0.7	0.7	0.7	0			0		0
-	supply line		(mm\$)			15%	15%	5%	. 5%	5%	5%	. 5%	51	5%	5%	5%	- 5%	- 55	55	51	55	·					
-	(middle-pressure) Construction of supply			05	_ 0%	05	0%	· 35%	40%	45%	5 0%	55%	60%	65%	705	75%	80%	855	90%	95%	100%	100%	100%	100%	100%	100%	100%
	line		97.7	Q.D	0.0	4.9	4.9	- 4.4	4.4	4.4	4.4	- 4.4	4.4	4.4	4.4	4.4	4.4	. 4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4
Į	(Low-pressure)	· · · · ·	(mm \$)			5.0%	5.07	4.3%	4.5%	4.5%	4,5%	4.3%	4.3%	4.5%	4,5%	4.5%	1.5%	4.5%	4.5%	4.55	4.5%	4.5%	4.3%	4.5%	4.5%	4.5%	4,5%
151.6	Supply area (Low pressure supply	· · · · · · · · · · · · · · · · · · ·						22.0	28.8	35,6	42.4	49,3	56.1	62.9	69,7	76.5		90.2	97.0	103,8	110,6	117.5		131,1	137,9		151.6
	(mma)		(km2)					14.5%	19.0%	23.5%	28.0%	32.5%	37.0%	41.5%	46.0%	50,5%	55.0%	59.5%	64.05	68.5%	73.0%	77.5%	82.0%	86.5%	91.0%	95.5%	100.01
Detribution PL	Construction of local			0.0	0.0	0.0	1.1		0.0	0.0			0.0	0.0		0.0	0.0		0.0	0.0		6.0	0.0	0.0	0,0	0.0	0.0
(Belanges to	trunk line		(mm\$)			0.0%		50.05					· ·		l												
	(high-pressure) Construction of local			0.0%	0.0%	0.0%	1 1	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.05	100.0%	100.0%	100.05	100.05	100.0%	100.0%	100.0%	100.0%	100.0%	100.05	100.05	100.05
Cevite)			1,6	0.0	0.0	0.0	0.0	0.0	0.3	0.3	0.3	0.3	0.3	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
	(middle=pressure)		(mm\$)			0.0%	1 1	0.0%	20.0%	20.0%		20.0%	20.0%	·													1
	Construction of supply			0.0%	0.0%	0.0%	I 1	0,0%	20.0%	40.0%	60.0%	80.05	100.01	100.05	100.05	100.0%	100.0%	100.01	100,0%	100.0%	100.0%	100.05	100.0%	100.0%	100.0%	100.0%	
	lion (Low- pressure)	1	10,5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.6	1.6	1.6	1.6	1.6	1.6	1.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Supply area		(mm \$)			0.0%		0.0%	0.0%	0.0%	0.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	10.0%									32.7
32.7	(Low-pressure supply	1	(4 m2)	0.0	0.0	0.0	0.0	0,0	0.0	0,0	0.0	4.9	9.8	14.7	19,0	24.5	29.4	32.7 100.05	32.7	32.7	32.7	32.7 100.0%	32.7	32.7	32.7 100.0%	32.7 100.05	
Distribution PL	Construction of local		(km2) 2.2	0.0%	0.0%	0.05		0.0%	0.0%	0.01	0.0%	15.0%	30.0%	45,0% 1.1	60.0% 1,1	75,0%	90.0%	100.0%	100.0% 0,0	100.0%	100.0%	0.0	100.0% 0.0	100.0% 0.0	100.0%	100.0%	100.0%
Contrast to	trunk line		(mm \$)		0.0	0.0	0.0	0.0					0.0 0.0%		50.0%		0.0	0.0	0,0		0.0			0.0	0,0		
to the car to	(high-pressure)		scining/	05		0%	05	05		01	0%	·	0,0%	50.0% 0%	100%	100%	100%	100%	100%	100%	100%	100%	1005	1005	100%	1005	1005
Pempanga to	Construction of local		1.6	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0,6	0.6	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Betaen)	supply line		(mm \$)	0.0			0.0	0.0	0.0	0.0	0.0	0.0	0.0%		35.0%	30.0%	I		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
	(middle-pressure)			0%	- 05	0%	05	0%	0%	(m			0.0%	35,0%	70%	100%	100%	100%	1005	100%	100%	100%	100%	100%	1005	1005	1005
	Construction of supply	1	10,8	0.0	0.0	0.0		0.0	0.0	0.0	016	0,0	0,0	1.0	1.6	1.6	1.6	1.6	1.6	1.1	0.0	0.0	0.0	0.0	0.0	0.0	
	(Low-pressure)		(mm š)	~	, ^{•,5}							0.0	0.0%	15.0%	15.0%	15.0%	15.0%		15.05	10.05			5.5				1
33.5	Supply area			0.0	0,0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.1	15.1	20,1	25.1	30.2	33.5	33.5	33.5	33.5	33.5	33.5	33.5	33.5
	(Low-pressure supply		(km2)	0.0%	0.0%	0.0%	1	0.0%	0.0%	0,0%	0.0%	0.0%	0.0%	0.0%	30.05	45.C%	60.0%		90.06	100.0%	100.05	100.05	100.0%	100,0%	100.0%	100.0%	100.0%
	-	Transmission	125.8	0.0	0.0	3		0.0	0.0	0.0		0.0	33,1	33.1	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Construction fee	total (mm\$)	Distribution	161.4	0.0	0.0	10.1	11.2	7.6	6.9	6,9	5.9	6.4		11.4	11.4	10.2	9.7	7.8	6.7	6.2	5,1	4.4	4.4	4.4	4.4	4.4	
		Total	287.2	0.0				7.6	6.9	6.9	6,9	<u>B.4</u>		44.5	11.4	10.2	9.7	7.8	6.7	6.2	5.1	4.4	4.4	4.4	4.4	4.4	
Maintenanco fee	Transmission PL	Maintenance fae(mm\$)	35				1	5.2	5.2	5.2	5.2	. 5,2	5.2	5.2	11.3	11.3	11.3	11.3	11.3	11.3	11.3	11.3	11.3	11.3	11.3	11.3	11.3
(mm\$)	(\$35/m)	Maintenance Longth(m)	(\$/m)		۱ ۱	1	L	148,500	148,500	148.500		148,500	148,500	148,500	322,800	322,800	322,800			322,800	322,800	322,600	322,800	322,800	322,600	322,800	322,800
1	Distribution PL	Maintenance Re(mm\$)	30000	0,0	0.0	0.0	0.0	0.7	0,9	1.1	1.3	1.6	2.0	2.3	3.0	3.5	4.0		4.8	5.1	5.3	5.5	5.7	5.9	6.1	6.3	6,5
	(\$30000/km2)	Maintenance ama(Lm2)	(\$/km2)	0.0		0.0		22.0	28.8	35,6		54.2	65.9	77.5	99.4	116.1	132.9	148.0	159.8	170.0	176.8	183.6	1905	197.3	204.1	210.9	
Maintenanca	I wed Quesser	Personnel	1,6						46	\$7		07	105	124	159	196	210	237	256	272	283	294	305	316	327	397	1 · ·
Operation		(1. 6 persons/km2)				L	-																				ļ
Personnet	Treosmission	Personnel	0.5		0			74	74		74	74			161	161	161	161	161	161		161			161	161	161
·····	1 .	(05 person/km)	I				1	I									1			1			· ·				
	I	KOD DURGHARTS)	++		+									• • • •													
	Distribution	Personnel	0.6	0	0	45	45	13	17	. 21	25	32	40	47	60	70	80	69	96	102	106	110	114	118	122	127	131
	Distribution		0.6	0		45		<u> </u>	17	. 21		<u> </u>		<u> </u>	60 380	70 417	80 454		96 513	102 535			114 580	118			L

.

5 - 47

Table 5-3-14 Gas Distribution Plan in Area L in Low Case / Option 2

-

Surprise and service and servi		;		:		:		:		:		:	:	-			:				•				5	:	
tential domand NGR indust General Communication (indust General Communication) Bulacon-Cavit indust General Communication Bulacon-Bataen indust Bulacon-Bataen indust Power generation (Suce Power generation (Suce Power generation (Suce Potential augity area Resid Batentae-Cevit indust Batentae-Cevit indust Batentae-Cevit indust Batentae-Cevit indust Batentae-Cevit indust Batentae-Cevit indust Communication (Suce Power generation (Suce Power generation (Suce Power generation (Suce Communication) Batentae-Cevit indust Batentae-Cevit indust Batentae-Cevit indust Communication (Suce Power generation (Suce Communication) Batentae-Cevit indust (Figh pressure) Construction of tocal surply line (Indus-pressure) 151 6 Supply area (Low-pressure) Construction of local batenges to (Indus-pressure) Construction of local surply line (Indus-pressure) Construction of local batenges to (Indus-pressure) Construction of local construction of local construction of local batenges to (Indus-pressure) Construction of local construction of local batenges to (Indus-pressure) Construction of local construction		i.	1-1a		0000		0005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	16on\$) 2024	2025
Series to Series to			Init	2002	2003	2004	2005		r		1						2015										
Reside Betanbas—Cavit Indust Betanbas—Cavit Indust Bulacen—Batern Iddat Power generation Ketch Potential supply area Indust Potential supply area Indust Potential supply area Indust Potential supply area Indust Bulacen—Batern Indust Baternbace Construction of Iocal Baternbace Indust Intruk line Indust Incide pressure) Indust			nmeefd	0.1	01	0.1	0.2	0.2	0.2	0.2	Q.2	0.2	03	0.3	0.3	0.4	0.4	0.5	0.5	0.5	06	0.5	0.7	0.8	0.0	20	0.9
Betantes—Cavit Indust Determined in the indust Bulacen—Batern Indust Dever generation Suce Total soundy area Potential suppy area Determined NCR Indust Potential suppy area Determined INCR Indust Batentes—Cavit Indust Determined INCR Indust Batentes—Cavit Indust Dever generation Suce Total solating demand Existing suppy area Communication of suce Total solating demand Existing suppy area Communication of suce Total solating demand Existing suppy area Communication of suce Industriant demand Existing suppy area Construction of suppy Industriant demand Construction of suppy Industriant demand Existing suppy area Construction of suppy Industriant demand Construction of suppy Industriant demand Existing Suppy area Construction of suppy Industriant demand Existing Suppy area Construction of suppy Industriant demand Suppy area Construction of suppy Industriant demand Suppy area Construction of suppy Industriant demand Suppy area Construction of suppy Industriant demand Construction of suppy Industriant			nmsofd		0.4	0.4	0.3	0.7	1.1	1.4	1.6	2.2	2.9	3.6	4.4	5.3	6.2	7.3	8,5	9.8	11.2	12,7	14.3	15.9	17,7	19.6	21.6
Comm Reside Bulacon Robert Power generation Suce Potential augity area Reside Potential augity area Reside Potential augity area Reside Reside Reside Batentas Reside Reside Reside Batentas Reside Reside Resintage Resin Resintreside <td></td> <td></td> <td>nmsofd</td> <td>2.0</td> <td>2.2</td> <td>2.3</td> <td>2.3</td> <td>2.5</td> <td>2.7</td> <td>3.0</td> <td>3.2</td> <td>3.5</td> <td>3.9</td> <td>4.3</td> <td>4.7</td> <td>5.2</td> <td> \$.7 -</td> <td>62</td> <td>6.8</td> <td>13</td> <td>8.0</td> <td>89</td> <td></td> <td>12.0</td> <td>13.8</td> <td>15.7</td> <td>. 17.7</td>			nmsofd	2.0	2.2	2.3	2.3	2.5	2.7	3.0	3.2	3.5	3.9	4.3	4.7	5.2	\$.7 -	62	6.8	13	8.0	89		12.0	13.8	15.7	. 17.7
Bulacan-Baten Bulacan-Baten Bulacan-Baten Bulacan-Baten Bulacan-Baten Baten Beter Baten Ba	nbesCavit <u>In</u>	dustriel use	mmsofd	0.0	0.0	0.0	0.0	0.0	0.1	0,1	0.1	0,1	0.1	01	0.1	0.1	0,1	0.1	0.1	0.1	0.2	0.2	0.2	0.2	02	02	0.3
Bulacan—Baten indust Comm Needs Dover generation Sura Foral potential supply area Potential supply area Potential supply area Recid Potential supply area Recid Batentre—Cevit indust Batentre—Cevit indust Batentre—Cevit indust Batentre—Cevit indust Batentre—Cevit indust Power generation Sura Total spining demand Existing supply area Recid Power generation Sura Total spining demand Existing supply area Recid Power generation Sura Power generation Sura Power generation Sura Power generation Sura Power generation Sura Power generation Sura Recid Power generation Sura Recid Power generation Sura Construction of total supply line (indise pressure) Construction of local supply line (indise pressure) Stribution PL Construction of local supply line (indise pressure) Construction of local supply line (indise pressure) Construction of local supply line (indise pressure) Construction of local Supply area (Low pressure) Stribution, PL Construction of local Supply area (Low pressure) Stribution, PL Construction of local Supply line (indise pressure) Stribution, PL Construction of local Supply area (Low pressure) Supply area (Low pressure) Construction of local supply line (indise-pressure) Supply area (Low pressure) Construction of local Construction of local Construction of local Supply area (Low pressure) Construction of local Supply area (Low pressure) Construction of local Supply area (Low pressure) Construction of local Supply area (Low pressure) Construction of local Construction of local Con	ic	ommerciel use	mmsofd	0.0	00	0.0	00	0.1		0.2	0.2	0.3	0,3		0.5	0.6	0.7	0,9	1.0		1.3	15	1.7	1.9	2.1	2.3	2.5
Communication Communication Total potential demand Potential supply area Potential supply area Potential supply area Potential supply area Communication Potential supply area Communication Potential supply area Communication Potential supply area Communication Potential supply area Communication of function of supply interes Potential supply area Construction of function of supply interes Stribution Piter Stribution Piter Construction of supply interes Stribution Construction of supply line Construction of supply line (high-pressure) Construction of supply line (high-pressure) Construction of supply line (Low-pressure) Construction of local Supply area Construction of local Construction of local Supply area Construction of local Construction of local Supply area Construction of local Construction of local Supply area Construction of local Supply area		lesidential use	miniso fd	0.3	0.3	0.3	0.3	0.3		0.4	0.4	0.4	0.5	0.5	0,6	0.5	0.7	.0.8	0.8	0.9	1.0		1.3		1,6	1.9	
Power serveration Suce Total countial demand Potential auggly area Potential auggly area Reside Reside Reside Batentre-Cevit Index Batentre-Cevit Reside Batentre-Cevit Reside Batentre-Cevit Reside Bulecen-Baten Index Common Plance Common Plance Bulecen-Baten Index Construction of runk line Reside Construction of runk line Reside Construction of local Stating auggly area Construction of local Reside Construction of local Stating auggly ine Construction of supply line Reside Construction of supply line Reside Construction of supply line Reside Construction of local Reside Stribution Reside	cen-Bateen in	nduetriel use (mmscfd	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	01	. 0.1	01	0.1	01	. 0.1		0.1	0.1	0.1	. 0,1	01
Power seneration Sugar Total potential demand Potential auggly area Potential supply area Reside Potential supply area Reside Batential supply area Common and and and and and and and and and an	<u>c</u>	commercial use	mmsofd	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	02	02	0.2	03	0.4	0.4	0.5	0.6	0.6	0.7	0.8	0.9	1.0	1.1	
Total potential demand Potential supply area noting damand NCR Recide Recide Batentram-Cevit Index Detential supply area Comm Batentram-Cevit Index Detention Super generation Stating supply area Comm Power generation Super generation Power generation Super generation Recide Construction of tocal Existing demand State Existing demand Super generation Supply area Super generation Construction of tocal Supply area Construction of local Supply area Construction of	H4	losidentist use	mmsofd	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2	02	0.3	0.3	03	0.3	0.4	0.4	0.4	0.5	0.5	0.6	0.7	80	60	10
Total potential demand Potential supply area initing damand NDR BetentesCevit BetentesCevit BetentesCevit BetentesCevit BetentesCevit BetentesCevit Comm BetentesCevit BetentesCevit Comm Construction of Incel Existing supply area Construction of Incel Supply area Construction of Incel	or generation (S	Sucat, E.P.I.P)	mmsofd	0.0	0.0	0.0	0.0	0.0	0,0	3.5	3.5	3.5	6.5	77.2	77.2	71.2	77.2	77.2	11.2	71.2	77.2	77.2	77.2	772	77.2	77.2	77.2
Potential supply area isting demand NCR Indust Batentas Reside Batentas Comm Pasid Comm Pasid Comm Pasid Construction of toral line Existing acays area Construction of local Existing acays area Construction of local Existing acays area Construction of local Exply line Construction of local Construction of local Exply line Construction of local Exply area Construction of local Exply area Construction of local Exply area			In the second	2.7	3.3	3.3	3.4	4.1	4.6	9.0	9.8	10.5	14.8	86.9	68.5	901	91.9	93.8	95.9	98.1	100.7	103.6	107.2	311.1	115.3	1198	124.0
initing damand. NOR. Indust Part of the second sec		I	km2					184.2	184.2	184.2	184.2	184.2	184.2	184.2	184.2	184.2	184.2	184 2	184.2	184.2	184.2	217.8	217.8	217.8	217.8	217.8	217.8
Anisotic Stress Construction of tocal Construction of supply inse Construction of supply inse Construction of supply inse Construction of supply inse Construction of supply inse Construction of supply inse (Figh pressure) Construction of supply inse (Construction of supply inse Construction of supply inse (Construction of supply inse Construction of supply inse (Low-pressure) Construction of local Construction of supply inse Construction of local (Low-pressure) Construction of local Construction of supply inse Construction of local Construction of local Supply area Stribution, PL Construction of local Construction of local Supply area (Low-pressure) Construction of local Supply area		I	mmcofid	0.0	0.0	0.0	0.0	0,1	Q .1	0.1	0.1	0.2	0.2	02	0.3	0.4	0.4	0.5	0.5	0.5	0.5	0.6	0.7	0.8	0.8	0.9	0.9
Reside Reside				0.0	0.0			I		0.6	0.9	1.2	1.7	2.3	3.1	4.0		6.2	7.7	93	11.2	12.7	14.3	15.9	17.2	19.6	21.6
Batantas — Cavit Index Batantas — Cavit Comm Bulacas — Batantas Comm Bulacas — Batantas Comm Power generation Success Total substantas Communication Power generation Success Total substantas Phase Construction of trunk line Phase Stribution PL Construction of local Supply line Construction of local Construction of local Supply area Construction of local Construction of local Supply area Construction of local Supply area Construction of local Supply line Construction of local Supply area Construction of local Supply area Construction of local	1	1	mmsold	· · · · · · · · · · · · · · · · · · ·	6	0.0	0.0	0.2		0.0	0.9				29	26	5,0	37	43	5.0		59			125	15.0	17.7
Commension Reside Bulacen-Baten Index Commension Reside Power generation Sure Total existing demand Existing surgly area construction of nuck line Phase Stribution PL Construction of local Supply line (high-pressure) Construction of local supply line (midde-pressure) Construction of local supply line (midde-pressure) Construction of local supply line (midde-pressure) Construction of local Detenges to Construction of local supply line (midde-pressure) Construction of local Supply area Construction of local Supply area Construction of local Supply area Construction of local Supply area Construction of local Supply line (midde-pressure) Construction of local Supply line (midde-pressure) Construction of local Supply line (Low-pressure) Stribution PL Construction of local Supply line (Low-pressure) Construction of local supply line (Low-pressure)		Residential Lan	mmsofi	0.0	00	0.0	00		05															109			
Pasid Bulacen-Baten Index Commentation Succentration Power generation Succentration Construction of such line Disting supply area Construction of such line Phene Stribution PL Construction of such line Phene Stribution PL Construction of succel Trunk line Stribution PL Construction of succel Indian-pressure) Stribution Phene S			mmsofd	0.0	0.0	0.0	0.0	0.0	0.1		0,1	0,1	0,1		0.1		0.1	01	0.1		02	0.2	0.2	0.2	0.2	0.2	0.3
Bulacan-Baten holes Com Resid Power generation (Sur Tatal solating demand Existing supply area Construction of twok line Phene (Figh pressure) Construction of local truck line (Figh pressure) Construction of local curply line (midde-pressure) Construction of local curply line (Low- pressure) Construction of local curply line (Low- pressure) Construction of local Betanges to Construction of local supply line (midde-pressure) Construction of local supply line (Inde-pressure) Construction of local supply line (Inde-pressure) Construction of local trunk line (Low- pressure) Stribution, PL Construction of local supply line (Inde-pressure) Construction of local trunk line (Low- pressure) Stribution (Inde-pressure) Construction of local trunk line (Inde-pressure) Construction of local trunk line (Inde-pressure) Construction of local trunk line (Inde-pressure) Construction of local trunk line (Indes-pressure) Construction of local trunk line (Indes-pressure) Constructio		commerciel use	mmsofd	0.0	0.0	0.0	0,0	0.0	0.0	0.1	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.9	1.0	1.1	1.3	1.5	1.7	1.9	2.1	2.3	2.5
Commentation Commentation Total existing demend Surger generation Existing supply area Existing supply area construction of trunk line Phase febricling supply area Stress febricling supply area Supply area febricling supply area Construction of local febricling supply area Supply area febricling supply area Construction of local febricling supply area Construction of local febricling supply area Supply area field -pressure Supply area field -pressure Supply area field -pressure Supply area fields -pressure Supply area fields -pressure Supply area fields -pressure Construction of local generatruction of local		Residentiel une	mmsofd	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.2	0.4	0.5	0.6	0.8	0.8	- 0.9	1.0	11	1.3	1.4	1.6		2.1
Paul Power generation (Suce Total solating demend Existing demend Existing supply area Press Rependence (Figh pressure) State Rependence Construction of trunk line Press Stribution PL Construction of trunk line Press Stribution PL Construction of local Stribution Stribution PL Construction of local Stribution Construction of local Supply line (midde-pressure) Stribution 151.6 Supply area (Low- pressure) Stribution Press Construction of local Supply area (Low- pressure) Stribution Supply area (Low- pressure) Stribution Supply line (Inde-pressure) Stribution Stribution Stribution Stribution Strine Stribution Stribut	cenBetten In	ndustriel use	mmsofd	0.0	0.0	0.0	0,0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	00	0.0	0.0	0.0	0.0	0.0	0.0	. 0.0	0.1	0,1			
Power generation Surger Total existing demand Existing auguly area construction of trunk line Phase construction of trunk line Phase stribution PL construction of trunk line Phase stribution PL construction of trunk line Phase stribution PL Construction of local supply line (Inidato pressure) Construction of local construction of local supply line (Inidato pressure) Construction of local (Iow pressure) Construction of local (Iow pressure) Construction of local Construction of local supply line (Iow pressure) Construction of local Construction of local supply line (Iow pressure) Construction of local Supply ine (Iow pressure) Construction of local construction of local Supply ine (Iow pressure) Construction of local supply line (Iow pressure) Construction of local <td>· c</td> <td>Commercial use</td> <td>mmsofd</td> <td>0.0</td> <td>0.6</td> <td>0.9</td> <td>1.0</td> <td>1.1</td> <td>1.2</td>	· c	Commercial use	mmsofd	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	0.0	0.0	0.0	0.0	0.0	0.6	0.9	1.0	1.1	1.2
Total sciating demand Existing supply area carsemission Construction of twork line (High pressure) Phere operations stribution PL Construction of twork line (High pressure) Phere operations stribution PL Construction of local trunk line (high-pressure) Phere operations Stribution PL Construction of local trunk line (high-pressure) Phere operations Stribution PL Construction of supply line (Low-pressure) Phere operation 151.6 Supply area Construction of local trunk line (Low-pressure) Phere operation Stribution PL Construction of local trunk line Phere (high-pressure) Centruction of local supply line (midde-pressure) Centruction of local trunk line Phere (high-pressure) Stribution PL Construction of local supply area Phere (high-pressure) 32.7 Supply area Phere (high-pressure) Phere (high-pressure) Stribution PL Construction of local supply line (midde-pressure) Phere (high-pressure) Beteen) Construction of local supply line (midde-pressure) Phere (high-pressure) Phere (high-pressure)	R	Residential use	mmscfd	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	0.0	0.0	0.0	0.0	0.0	0.2	0.3	0.5	0.7	1.0
Total sciating demand Existing supply area carsemission Construction of twork line (High pressure) Phere operations stribution PL Construction of twork line (High pressure) Phere operations stribution PL Construction of local trunk line (high-pressure) Phere operations Stribution PL Construction of local trunk line (high-pressure) Phere operations Stribution PL Construction of supply line (Low-pressure) Phere operation 151.6 Supply area Construction of local trunk line (Low-pressure) Phere operation Stribution PL Construction of local trunk line Phere (high-pressure) Centruction of local supply line (midde-pressure) Centruction of local trunk line Phere (high-pressure) Stribution PL Construction of local supply area Phere (high-pressure) 32.7 Supply area Phere (high-pressure) Phere (high-pressure) Stribution PL Construction of local supply line (midde-pressure) Phere (high-pressure) Beteen) Construction of local supply line (midde-pressure) Phere (high-pressure) Phere (high-pressure)	er generation (S	Suget, F.P.) P)	mmscfd	00	0.0	00	0.0	0.0	0.0	3.5	3.5	3.5	6.5	71.2	77.2	77.2	77.2	77.2	77.2	77.2	77.2	77.2	77.2	77.2	77.2	77.2	77.2
Existing supply area construction of trunk line Phase construction of trunk line Phase (Figh pressure) Trians Stribution PL Construction of local NCAP Stribution PL Construction of local NCAP Stribution PL Construction of local NCAP supply line (migh-pressure) Construction of local NCAP Stribution PL 151.6 Supply area (Low-pressure) Construction of local Betenges to trunk line (Inigh-pressure) Construction of local Stribution Construction of local Supply area Construction of local Construction of supply line (midde-pressure) Construction of local Network stres Stribution PL Construction of local Stribution PL Construction of local Stribution PL Construction of local Stribution Construction o	l existing demend		mmsofd	0.0	0,0	0.0	0,0	0.7	1.1	5,1	5.6	6,3	10.4	82.3	93.7	85.3	87,2	89.3	91.7	94.3	97.3	100.2	104.6	109.1	113.7	118.9	124.6
construction of trunk line Phee (Figh pressure) States Stribution PL Stribution PL Stribution PL Construction of local Phee Stribution PL Construction of local Phee Stribution PL Construction of local Supply line (Inidate pressure) Construction of local Construction of local Supply line (Inidate pressure) Construction of local Construction of local Supply area (Low pressure) Construction of local Stribution PL Construction of local Supply area (Low pressure) Construction of local Stribution PL Construction of local Supply area (Low pressure) Construction of local Stribution PL Construction of local Supply area (Low pressure) Construction of local Dalacento trunk line (Low pressure) Construction of local Dalacento tru			km2	0.0	0.0	0.0	0.0	22.0	28.6	35.6	42.4	54.2	65.9	77.6	89.3	101.0	112.8	122.8	129.7	136.5	143.3	150.1	157.0	1789	190.7	202.6	217.8
(Figh pressure) Creation Stribution PL Construction of local Stribution PL Construction of supply 151.6 Supply area Construction of local Instruction of local Stribution PL Construction of local Construction of local Instruction of local Supply line Construction of local Construction of local Instruction of local Supply line Construction of local Supply line Construc		These I	59.6	Q	o	29.8	29.8	o	0	0	o	o	o		0	0	0	0	0	a	0	D	0		0	0	0
Stribution Plass Stribution PL Construction of local Inight-pressure) Construction of local Supply line (hight-pressure) Construction of local Supply line (midde-pressure) (Low-pressure) Construction of local (Low-pressure) (Low-pressure) 151 6 Construction of local (Low-pressure) Construction of local (Low-pressure) Construction of local Construction of local Construction of local Supply line (Low-pressure) Construction of local Construction of local Supply line (Low-pressure) Construction of local Construction of local Beteen) Construction of local Supply line Construction of local		Tatargeo-NCR)	(mm s)	1		50%	50%					1			[•••••••••••••••••••••••••••••••••••••••				1					
Botom Construction of local with trunk line (high-pressure) Construction of local (wigh-pressure) Construction of supply line (middo-pressure) (Low-pressure) (construction of supply line (Low-pressure) (construction of supply line (Low-pressure) (construction of supply line (Low-pressure) (construction of local (Low-pressure) (construction of local Stribution, PL Construction of local Centration of local (construction of local Stribution, PL Construction of local Centration of local (construction of local Stribution, PL Construction of local Centruction of supply line (construction of local (Low-pressure) (construction of local Batesn) (construction of local Batesn) (construction of local (Low-pressure) (construction of local (Low-pressure) (construction of local (construction of local (construction of local (Low-pressure) (construction of local <td< td=""><td>L.</td><td></td><td>18.2</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>0</td><td>0</td><td></td><td>18.2</td><td>, p</td><td></td><td>e.</td><td>0</td><td>n</td><td></td><td>0</td><td>n</td><td>n</td><td>, O</td><td>Ð</td><td></td><td></td></td<>	L.		18.2								0	0		18.2	, p		e.	0	n		0	n	n	, O	Ð		
Stribution PL Scp) trunk line Itrunk line (high-pressure) Construction of local euply line (midsh-pressure) (midsh-pressure) 151 6 Supply area (Low-pressure) (construction of local (Low-pressure) (construction of local (Low-pressure) (construction of local (Low-pressure) (construction of local Stribution (Low-pressure) Construction of local (construction of local Stribution (Low-pressure) Construction of local (construction of local Stribution PL Construction of local Batean) supply line (midsh-pressure) Construction of local supply line (midsh-pressure) Stribution Supply area (tow-pressure) (tow-pressure) Stribution Supply area	I	"Tielle, A. NCR-Batase)	(mm§)	o				······································		~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~				19.4	-	·····*	······	¥		····*		·····*[·		······································	····· * ··		
istribution PL Construction of local trunk line Construction of local supply line (midde-pressure) Construction of supply line (Low- pressure) 151.6 Supply area (Low- pressure) Construction of local supply line (Low- pressure) Construction of local supply line (Indef pressure) Construction of local supply line (Low- pressure) 32.7 Supply area (Low- pressure) 32.7 Supply area (Low- pressure) Construction of local construction of local supply line (Low- pressure) Construction of local Construction of lo	Г			0	0		0					0		1404	0			0			11.05	11.05		0		h	
KCPD trunk line (high-pressure) Construction of local supply line (middle-pressure) Construction of supply line (Low-pressure) 151 6 Supply area (Low-pressure) Construction of local (Low-pressure) Construction of local Construction of local Batenaps to (high-pressure) Construction of local Supply line (middle-pressure) Construction of local Supply area (Low-pressure) Operation of local Supply area (Low-pressure) Supply area (Low-pressure) Supply area (Low-pressure) Supply line (middle-pressure) Construction of local Batean) Supply area (Low-pressure) Construction of local Supply area (Low-pressure) Construction of local Supply area	P	Thee II	22.1 (mm\$)	١		0	U U	"		"	"			U		ๆ	~	05	"	٩	11.05 505	11.05 505	~	Ų		۳	۳
KCPD trunk line (high-pressure) Construction of local supply line (middle-pressure) Construction of supply line (Low-pressure) 151 6 Supply area (Low-pressure) Construction of local (Low-pressure) Construction of local Construction of local Batenaps to (high-pressure) Construction of local Supply line (middle-pressure) Construction of local Supply area (Low-pressure) Operation of local Supply area (Low-pressure) Supply area (Low-pressure) Supply area (Low-pressure) Supply line (middle-pressure) Construction of local Batean) Supply area (Low-pressure) Construction of local Supply area (Low-pressure) Construction of local Supply area															<u> </u>												
(high-pressure) Construction of local exply line (middle-pressure) Construction of supply line (Low-pressure) 151 6 Supply area (Low-pressure) Construction of local Batanass to Unink-pressure) Construction of local Stribution, PL Construction of local Datasanto Trunk line (Low-pressure) Stribution, PL Construction of local Batean) Supply area (Low-pressure) Construction of local Supply area (Low-pressure) Construction of local Supply area (Low-pressure) Construction of supply	I		20.3	0.0	0.0	3.0	3.0	1.4	1.4	1.4	1.4	1.4	1.4	1,4	j	1.4	£.4	0.0	6,0	0.0	0.0	D.0	0.0	0.0	0.0	0.0	0.0
Construction of local supply line (middo-pressure) Construction of supply line (Low-pressure) 151 6 Supply area (Low-pressure) 151 6 Supply area (Low-pressure) Construction of local Intuit line Construction of local Stribution, PL, Construction of local Construction of local Construction of local Supply area (hidds-pressure) Construction of supply line (Low-pressure) Construction of supply line (Low-pressure) Construction of local Dalacen to (Inida-pressure) Construction of local Batesn) Supply line (Inida-pressure) Construction of local Batesn) Supply line (Inida-pressure) Construction of local Batesn) Supply area (Low-pressure) Construction of supply line (Inide-pressure) Construction of supply line (Inide-pressure) Construction of local		·····	(mm\$)			15%	15%				75			78		75								••••••			
supply line (midde pressure) Construction of supply line (Low-pressure) 151.6 Supply area (Low-pressure) Satribution, PL Construction of local Detenges to Units for supply line (Inde-pressure) Construction of local Construction of local Supply area (Inde-pressure) Construction of local Construction of supply line (Inidde-pressure) Construction of supply line Construction of local (Inver pressure) Construction of local 32.7 Supply area (Low- pressure) Construction of local Dulation PL Construction of local Batean) Construction of local (Inigh-pressure) Construction of local Construction of supply line Construction of local Construction of supply Construction of local Batean) Construction of local Supply area Construction of local Construction of supply Construction of local Construction of supply Construction			·	05	0%	05	0%	375	445	51%	58%	65%	72%	795		93%	100%	100%	100%	100%	100%	100%	1005	100%	100%	100%	100%
(midde-presure) Construction of supply line 151.6 Construction of supply line 151.6 Construction of local Construction of local Detenges to Construction of local Construction of local Construction of local Construction of local Supply line (midde-pressure) Construction of local Construction of local Supply line (Low-pressure) Construction of local Detenges to Supply line (Low-pressure) Detenges to Beteen) Construction of local supply line (Inde-pressure) Detenges to Supply line (Inde-pressure) Supply line (Inde-pressure) Supply line (Inde-pressure) 335 Supply area (Low-pressure) 335 Supply area (Low-pressure) Transmission PL <tr< td=""><td></td><td></td><td>14.5</td><td>0.0</td><td>0.0</td><td>22</td><td>22</td><td>07</td><td>07</td><td>07</td><td>07</td><td>07</td><td>67</td><td>07</td><td>07</td><td>10</td><td>07</td><td>07</td><td>07</td><td>07</td><td>07</td><td>0.0</td><td>n</td><td>0</td><td>0</td><td>0</td><td>0</td></tr<>			14.5	0.0	0.0	22	22	07	07	07	07	07	67	07	07	10	07	07	07	07	07	0.0	n	0	0	0	0
Construction of supply files (Low-pressure) 151.6 Supply area (Low-pressure) Satisfully PL Construction of local Betanges to trunk line (high-pressure) Crevite) Construction of local supply line (midde-pressure) Construction of supply line (Low-pressure) 22.7 Supply area (Low-pressure) 23.7 Supply area (Low-pressure) Delacen to Betaen) Betaen) Bate (Inde-pressure) Construction of local trunk line (high-pressure) 23.7 Supply area (Low-pressure) Construction of local supply line (midde-pressure) Construction of local trunk line (high-pressure) Construction of local supply line (Low-pressure) Construction of local supply line (Low-pressure) Construction of supply line (Low-pressure) Construction for supply Construction for supply Low-pressure) Construction for supply Construction for	aly line		(mm\$)			15%	15%		5%	5%	5%	5%	5%	5%	5%		55	55			516						
Ifine (Low- pressure) 151.6 Supply area (Low- pressure) (Low- pressure) Stribution, PL. Construction of local Estanges to trunk line (Low- pressure) (Low-pressure) Construction of local supply line (Low- pressure) Construction of local Stribution, PL. Construction of supply line (Low- pressure) Construction of supply line (Low- pressure) Construction of local 32,7 Supply area . (Low- pressure) Construction of local Dalgoen to trunk line (Inida- pressure) Construction of local Batean) Supply line (Low- pressure) Construction of local Batean) Supply line (Low- pressure) Construction of local Batean) Supply line (Low- pressure) Construction of local 335 Supply area (Low- pressure) Construction of supply (Low- pressure) Construction o				05	0%	05	. 05.	355	40%	45%	50%	555	805	653	70%	75%	80%	85%	90%	95%	180%	100%	1005	1005	100%	100%	100%
151.6 Supply area Low pressure supply Astribution, PL. Construction of local Estenges to trunk line Low pressure) Construction of local Stribution, PL. Construction of local Stribution, PL. Construction of local Creating and the pressure Construction of local Creating and the pressure Construction of supply line Construction of supply line Construction of supply line Construction of supply area Construction of local Dalgram to Trunk line Batean) Construction of local Batean) Construction of local Construction of supply line Construction of local Construction of supply line Construction of local Batean) Supply line Construction of supply line Construction of local Batean) Supply line Construction of supply line Construction of local Batean) Supply area Supply area Construction of local Supply area Construction of supply Construction fee could mail Construction of local Supply area Construction of local Supply area Construction fee could mail Construction fee coul	struction of supply		97.7	0.0	0.0	4.9	4.9	4.4	4.4	4.4	4.4	4.4	44	4,4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4,4	4.4	4,4
(Low-pressure suply interface Stribution Detenges to Construction of local Construction of local Construction of local Supply line (Inid-pressure) Construction of local Supply line (Inid-pressure) Construction of local Supply line (Low-pressure) Supply see (Low-pressure) Database Supply line (Inid-pressure) Pampenge to Datasen) Construction of local supply line (Inid-pressure) Construction of local supply line (Inid-pressure) Construction of local supply line (Low-pressure) Construction of supply Ine (Low-pressure) Construction of supply (Ine <	eressure)		(mm \$)			5.0%	5.0%	4,5%	4.5%	4.5%	4.5%	4.5%	4.55	4.5%	4.5%	4.5%	4.5%	4.5%	4.5%	4.5%	4.5%	4.5%	4.5%	4,5%	4.5K	4.5%	4.5%
(Low-pressure supply istribution, PL, Construction of local Datanaes to tunk line (high-pressure) Construction of local Script line (midds-pressure) Construction of local Supply line (midds-pressure) Construction of local Supply line Construction of local (Low-pressure) Construction of local 32,7 Supply area (Low-pressure) Construction of local Datasento (midds-pressure) Stripty area (Low-pressure) Construction of local Construction of local Datasento (midds-pressure) Construction of local Construction of local Batean) Construction of local 335 Supply line (Low-pressure) Construction of local Construction of supply Ine 335 Supply area (Low-pressure) Construction of local Construction of supply Ine 335 Supply area (Low-pressure) Construction	ply area							22.0	28.6	35.6	42.4	49.3	56.1	62.9	1	76.5	83,4	90.2	97.0	103.0	110.6	117.5	124.3	131,1	137.9	144.7	151.0
Betenges to trunk line (high-pressure) Crevite) Construction of local supply line (midde-pressure) Crevite) Construction of local supply line (how pressure) 32.7 Supply area (how pressure) 23.7 Supply area (how pressure) 24.7 Supply area (how pressure) 25.7	-pressure supply		(km2)			· · · · · · · · · · · · · · · · · · ·		14.5%	19.0%	23.5%	28.0%	32.5%	37.05	41.58	1	50.5%	55.05	59.5%	64.0%	68.5%	73.0%	77.5%	82.0%	86.5%	91.0%	95.5%	100.0%
Betenges to trunk line (high-pressure) Crevite) Construction of local supply line (midde-pressure) Crevite) Construction of local supply line (how pressure) 32.7 Supply area (how pressure) 23.7 Supply area (how pressure) 24.7 Supply area (how pressure) 25.7	struction of local		2.2	0.0	0.0	0.0	1.1	1.1	0.0	0.0	0.0	0.0	0.0	0.0	1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	00	0.0
(high-pressure) Cevite) Construction of local supply line (midde-pressure) Construction of supply line (Low-pressure) 32.7 Supply size (Low-pressure) 32.7 Supply size (Low-pressure) 32.7 Supply size (Low-pressure) Datacento (high-pressure) Quertication of local Pampenge to Boteen) (Low-pressure) Construction of local supply line (Low-pressure) Construction of local supply line (Low-pressure) Construction of supply (Low-pressure) Construction of supply Supply size 33.5 Supply area (Low-pressure) Construction of supply Inne (Low-pressure) Construction fee total(mm\$) Total Waintenance fee Transmission PL Meintenance fie		•••••••••••••••••••••••••••••••	(mma s)			0.0%		50.0%													······	·····					
Cervite) Construction of local supply line (midde-pressure) Construction of except line (Low pressure) Construction of except line (Low pressure) Construction of local trunk line (high-pressure) Construction of local supply line (Iniddo-pressure) Construction of local supply line (Iniddo-pressure) Construction of local supply line (Iniddo-pressure) Construction of events (Low pressure) Construction of events (Low pressure) Construction of events (Iniddo-pressure) Construction fee tous(Imid) Construction fee tous(Imid) Construction fee tous(Imid) Construction fee (Iniddo-pressure) (Iniddo			Cummer 1			I	50.0%			· • • • • • • •	100.00	100.00		100.00		100.0%	100.00	100.07		100.00	100.05	100.05	100.0%	100.05	100.0%	100.04	100.01
Section in the section of a section a section and a section of a section and a section of a section a				0.0%	0.0%	0.0%	0.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%			100.05	100.0%	100.0%	100.05	100.01			100.05		100.0%	100.0%
(midde-pressure) Construction of every (Low pressure) 32.7 Surphy area Construction of local Dulatent to Batent) Batent) Construction of local Dulatent to Batent) Construction of local Batent) Construction of local Batent) Construction of local Batent) Construction of local Surphy line (Inidde-pressure) Construction of local Supply line (Inidde-pressure) Construction of severy Construction of severy Construction ference (Low pressure) Construction ference (Inide-pressure) Construction ference (Low pressure) Construction ference (Inide-pressure) Construction ference (Inide-	· · · · · · · · · · · · · · · · · · ·		1.6	0.0	0.0	0.0	0.0	0.0	0.3	0.3	0.3	0.3	0.3	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
Construction of supply line (Low-pressure) 32.7 Supply area (Low-pressure) 23.7 Supply area (Low-pressure) 24.7 Supply area (Low-pressure) 25.7	1		(mm\$)			0.0%	0.0%	0.0%	20.0%	20.05	20.0%	20.0%	20.0%												i		
Inn Inn (Low pressure)				0.0%	0.0%	0.0%	0.0%	0.0%	20.0%	40.05	60.05	80.0%	100.0%	100.05	100.0%	100.0%	100.0%	100.05	100.05	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
32.7 Surply area (Low areasen supply Mathbutten PL Construction of local Dulation PL Construction of local Dulation (Inigh-pressure) Pampenge to Construction of local Batean) (middlo-pressure) Construction of supply line (Inigh-pressure) Construction of supply (Inigh-pressure) Construction of supply (Low pressure) Construction of supply (Low pressure) Construction of supply (Low pressure) Construction of supply (Low pressure) Construction of supply (Inigh-pressure) Construction of supply (Inigh-pressure) Construction of supply (Inigh-pressure) Construction of supply (Inigh-pressure) (Inigh-pressure) (Inigh-pressure) Construction of supply (Inigh-pressure) (10.5	0.0	0.0	0,0	0,0	0.0	0,0	0.0	0.0	. 1.6	1.6	1.6	1.5	. 1.6	1.6	1.1	0.0	0,0	0.0	0,0	Q,O	0.0	0.0	0.0	0.0
(Low-areasure supply analytics Xatistation PL Construction of local Dulation to (high-pressure) Pampenge to Construction of local Bataan) (high-pressure) Construction of local aupply line (midde-pressure) Construction of local Construction of seal aupply line (Low-pressure) Construction of seal 335 Supply area (Low-pressure) Construction of seal Construction fee total(mms) Dist Construction fee total(mms) Total Unintenance fee Transmission PL Main Maintenance fee Transmission PL Main Meintenance fee Level Quartier Personel Meintenance fee Transmission Personel Destruction fee Guartier Personel			(mm\$)			0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	15.05	15.0%	15.0%	15.0%	15.0%	15.05	10.0%									
Jackburgen PL Construction of local Dulacen to truck line Dulacen to truck line Bataen) Construction of local Bataen) supply line (Ind)-pressure) Construction of local Bataen) supply line (Ind)-pressure) Construction of supply line (Ind)-pressure) Construction for supply line (Ind)-pressore) Construction for supply line <td< td=""><td></td><td>•</td><td></td><td>0.0</td><td>0.0</td><td>0,0</td><td>0.0</td><td>0.0</td><td>0.0</td><td>0.0</td><td>0.0</td><td>4.9</td><td>9.8</td><td></td><td>19.6</td><td>24.5</td><td>29,4</td><td>32.7</td><td>32.7</td><td>32.7</td><td>32,7</td><td>32.7</td><td>32.7</td><td>32.7</td><td>32.7</td><td>32,7</td><td>32.7</td></td<>		•		0.0	0.0	0,0	0.0	0.0	0.0	0.0	0.0	4.9	9.8		19.6	24.5	29,4	32.7	32.7	32.7	32,7	32.7	32.7	32.7	32.7	32,7	32.7
Bulacen to trunk line Pampanes to Construction of local augity line Bataan) augity line Bataan) (midde-pressure) Construction of eventy (midde-pressure) 33.5 Supply area (Low-pressure) Construction file total(mms) Dist Construction file total(mms) Dist Construction file total(mms) Dist Construction file total(mms) Dist Maintenance file Transmission PL Maintenance file Sappoy/hms) Maintenance file Transmission PL Maintenance file Transmission PL Meinterrerue I/weil Quartier Personnel Transmission	- dressure supply		(km2).	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	15.0%	30.0%	45.0%	60.0%	75.0%	90.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.05	100.0%	100.0%	100.0%	100.0%
Dulacen to trunk line Pampanga to Construction of local Bataan) supply line (midde-pressure) Construction of local Bataan) supply line (midde-pressure) Construction of supply line (Supply super town of supply line Inne 33:5 Supply super town of supply line Construction fee total(mm\$) Detail Construction fee total(mm\$) Detail Inne (\$325/m) Maintenance fee Transmission PL (\$32000/tm2) Main Meintenance (\$32000/tm2) Meintenance Hend, Quarter (\$32000/tm2) Main Personnel Transmission	struction of local		2.2	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	0.0	0.0	0.0			0.0	0.0	0.0	0.0
Pampenga to Destruction of local supply line (midde-pressure) Construction of supply line. (Low-pressure) 335 Supply area (Low-pressure) (Low-pressu	nk line		(mm\$)	<u> </u>]											I	0.05	0.0%				50.05	50.05	••••••••••••••••••••••••••••••••••••••			
Beteen) (midde-pressure) Construction of supply (Low-pressure) 33.5 Supply area (Low-pressure) Construction fee (tow-pressure) (Low-pre	zh-pressure)			05	05	05	05	05	0%	05	05	OK.	05.	01	05	65	05		0%	05	01	05	1005	1005	1005	100%	1005
Betoen) (middo-pressure) Construction of surely ine. (Low-pressure) 335 Suppy area (Low-pressure) (Low	nstruction of local		1.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	D.D	0.0	0.0	0.0	0.0	0.0	0.0	0,0	0.0	0.0	0.0	0.6	0,6	0.5		0.0	0.0
(midde-pressure) Construction of supply line. 335 Supply area (Low-pressure) 335 Supply area (Low-pressure) 335 Construction fee total(mms) Detail Tota Maintenance fee Distriction PL (\$35/m) Maintenance fee (\$35/m) Distriction PL Meintenance (\$30000/hm2) Meintenance Distriction PL Meintenance Personnel Transmission Personnel	ply line		(mm\$)						······································	~~~		-,-					0.0%	0.0%	0.0%			35.05	35.0%	30.0%			+.7
Construction of supply Inn. 33.5 Supply area (Low pressure) 33.5 Supply area (Low pressure) Transition PL Meintenance fee (\$35/m) Destruction PL Mein (\$35/m) Meintenance (\$4.5 Meintenance	I				0%	05	05	05	05	0%		05	مع		01		0%	05		05	. 01	00.04	705	100%	100%	1005	toos
335 Supply area (Low-pressure supply Construction fee total(mm\$) Carstruction fee total(mm\$) Carstruction fee Transmission PL Main (\$30000/sm2) Meintenence fee Transmission PL Main (\$30000/sm2) Meintenence Personnel Corration (5.6			100								01		0.0										101	1.6	1	100%	1001
335 Supply area (Low-pressure supply Construction fee total(mm\$) Carstruction fee total(mm\$) Carstruction fee Transmission PL Main (\$30000/sm2) Meintenence fee Transmission PL Main (\$30000/sm2) Meintenence Personnel Corration (5.6		•••••••••••••••••••••••••••••••••••••••	10.8	0.0	0.0	0.0	0.0	0,0	0.0	0.0	0,0	0.0		0,0	0.0	<u>0,0</u>	0.0	0,0	0.0	0.0	0.0	1,6	1.6		1.6		
(Low-pressure supply (Low-pressure supply Train Construction free total(mm\$) Usintenance fee (\$25/m) Destruction PL (\$30000/sm2) Mein Meintenance (\$30000/sm2) Meintenance Personnel Transmission Personnel Transmission Personnel		····· · · · · · · · · · · · · · · · ·	(mm s)				l										0.0%	0.05	0.0%	0.0%	0.0%	15.0%	15.0%	15.0%	15.0%	15.0%	25.0%
Construction fee total(mms). Construction fee total(mms). Tota Maintenance fee Transmission PL Mein (\$35/m) Mein (\$35000/km2) Mein Meintenence I Need Quarter Pers Oceration (1.6 Personnel. Transmission Pers				0.0	0,0	0.0	0,0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	í	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.1	15.1	20.1	25.1	33.5
Construction fee total(mm\$) Dist Tota Valintenance fee Transmission PL Main jmm\$) (\$25/m) Main Distribution PL Main (\$30000/hm2) Main Meintenence Lived Quester Perio Oceration (1.5 Personnel Transmission Perio		· · · · · · · · · · · · · · · · · · ·	(km2)	0.0%		0.0%		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0	1	0.05	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	30.01	45.05	60.0%	75,0%	100.0%
Tota Tota Maintenance fao Transmission PL Main (\$35/m) Main Distribution PL Main (\$30000/km2) Main Meintenance Lived, Quarter Operation (1.6 Parsonnel Transmission		Transmission	99.9	0.0	0.0	29.8	29.6	0.0	0.0	0.0	0.0	0.0	0.0	18.2	1	0.0	0.0	0.0	0.0	0.0	11.1	11.1	0,0	0.0	0.0	0.0	0.0
Maintenance fee Transmission PL Mein (<u>\$95/m</u>) Vein Distribution PL Mein (<u>\$30000/km2</u>) Mein Meintenence Lived Quarter Pers Oceration (1.6 Personnel Transmission Pers	(mm i)	Distribution	161.4	0.0	0.0	10,1		7.6	6.9	6.9	6.9	8.4	8.4	8.1	8.1	8.1	81	5.2	5.1	5.1	5,1		1.1	6.5	5.0	6,0	
imm\$)		Total	261,3	0.0	0.0	39.9	41.0		δ.9	6,9	6.9	8.4	8.4	26.3	8.1	B.1	8.1	52	5.1	5.1	16.2	18.2	1.7	6.5	6.0	5. 0	7.1
Distribution PL. Mein (\$30000/km2) Mein Meintenense fleed Quarter Pen Oceration (). 6 Personnel Transmission Pen	inamission PL	Maintenance fee(mm\$)	35		! I			5.2	5.2	5.2	5.2	5.2	5.2	5.2	6.5	6.5	8 .5	6.5	6.5	6.5	6.5	6.5	11.4	11.4	11.4	11.4	11.4
Distribution PL. Mein (\$30000/km2) Mein Meintenense fleed Quarter Pen Oceration (). 6 Personnel Transmission Pen	5/m)	Meintenance Length(m)	(\$/m)		1			148,500	148,500	148,500	148,500	148,500	148,500	148,500	196,500	166,500	186,500	186,500	186,500	186,500	186,500	186.500	325,800	325,800	325,800	325.800	325.800
(530000/km2) Meintemense (530000/km2) Meintemense Personnel (5.5 Personnel Personnel (5.5		Maintanance fee(mm\$)	30000	0.0	0.0	0.0	0.0	0.7	0.9	1.1	1.3	1.5	2.0	2.3	1	3.0	3.4	3,7	3.9	4.1	4.3	4.5	5.0	5.4	5.7	6.1	5.5
Meintenence Llevel Quarter Petr Oceration (1.6 Personnel Transmission Pers	I	Maintenançe erşe(km2)	(\$/km2)	8	1 1	0.0	0.0	22.0	28.8	35.6	42.4	54.2	65.9	.71.6	1	101.0	112.8	122.8	129.7	136.5	143.3	150.1	157.0	178.9	190.7	202.6	217.8
Oceration (1.6 Personnel Transmission Pers		Personnel	1.6	1		120	120	35	46	57	68	67	105	124	1	162	190	197	207	218	229	240	267	286	205	324	348
Personnel Transmission Pen			, 	.	····						9 0					104							497	400			
		(1.6 pamons/km2)	1							76						·····							100	100			
	I	Perconnel	0,5		0.					74 .					93	93	93	93	9 3	93	83	93	163	163	163	163	163
	1	(05 person/km)	+	<u>†</u>	{ -	<u></u> •••				├────┤		<u></u> ∱			+					<u> </u>							
	I	Personnel	0.6	0	0	45	. 45	13	17	21	25	32	40	47	54	61	68	74	78	B2	86	90	100	107	114	122	131
		K06 person/km2)	1	1	 	l	ļ		-····			├ ─────		·· · · ·	1					ļ-							<u> </u>
Total	taì	:	(persons)		lQ_	239	239	123	138	153	168	193	219	245	290	316	341	364	379	394	409	424	530	556	582	609	642

.

5-49

.

• , t

.

•

Table 5-3-15Gas Distribution Plan in Area C·M in the High Case

1		:		-					:												-		1		i (million \$)							1		ŧ	1	
: Cebu (High)			Unit.etc.	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Potential	· ·· · · · · · ·	Industrial	mmscfd	00	00	00	00	0.0	00	00	00	00	00	00	0.0	0,1	01	0,1	0.1	0.1	01	0,1	0.1	01	0.1	0.1	01	01	0,1	01	01	0.1	0.1	0.1	01	01	01
Demand		Commercial		0.1	0.1	0.1	02	02	0.3	03	06	08	1.1	1.4	1.6	1.9	22	2.5	29	32	35	3.9	4.3	4.6	5.0	53	51	57	5.7	5.7	5.7	5.7	57	57	5.7	· 5.7	57
		Residential		00	0.0	00	01	0,1	0.1	02	03	0.4	0.4	05	0.6	07	0.8	0.9	10	1.1	12	1.4	1.5	16	1.7	1.9	2.0	2.0	5.7 2.0	2.0	20	2.0		20	2.0	2.0	20
	Power Generation	1	mmscfd	00	0.0	00	0.0	0.0	0.0	00	0.0	0.0	00	00	0.0	0.0	00	0.0	00	00	22.7	22.7	21.7	21.4	21.1	50.8	507	50.7	50.7			50.7	50.7	50.7	50.7	50.7	
	Total Potential Demand		mmscfo	0.1	0,1	02	0.2	0.3	0.4	0.6	0.9	12	1.6	1.9	2.3	2.7	3.0	3.5	3.9	4.4	27.6	28.1	27.6	27.7	27.9	58.1	58.6	58.6	58.6	58.6	58.6	58.6	58.6	58.6	58.6	58.6	50.7 58.6
	Potential Supply Area	1	km2					1												· · ·	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80
Existing		Industrial	mmscfd	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	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0,1	0.1	0,1	Q.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Demand		Commercial		0.0	0.0	0.0	00	00	0.0	0.0	0.0	0.0	0.0	00	0.0	0.0	0.0	0.0	0.0	0.0	1.4	2.3	3.4	4.6	5.0	5.3	5.7	5.7	5,7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7
		Residential		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	0.0	0.0	0.0	02	0.3	0.4	0.6	0.7	0.8	1.0	1.1	12	1.3	1.4	1.5	1.5	1,7	1.8	1.9	201
	Power Generation	1	mmscfd	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	00	0.0	00	0.0	0.0	0.0	00	22.7	22.7	21.7	21.4	21,1	50.8	50.7	50.7	50.7	1.3 50.7	1.4 50.7	50.7 58.0	50.7	50.7	1.8 50.7	50.7	50.7
	Total Existing Demand	1	mmscfd	0.0	0.0	00	00	0.0	0.0	0.0	0.0	0.0	0.0	00	0.0	0.0	0.0	0.0	00	00	24.4	25.5	25.7	267	26.9	57.1	575	57.6	57.7		579	58.0	<u>50.7</u> 58.1	582	58.3 72.0	58.4	586
	Existing Supply Area	<u> </u>	km2	00	0.0	00	0.0	0.0	0.0	00	0.0	0.0	00	0.0	0.0	0.0	00	0.0	0.0	0.0	16.0	20.0		280	32.0	36.0	40.0	44.0	48.0	52.0		60.0	64.0	68.0	72.0	76.0	50.7 58 6 80 0
	Transmission PL		0	0	0	Û	0	0	Ó	0	0	0	0	0	0	0	0	0	0	Û	0	0	Ô	0	0	0	0	0	0	0	0	(0	0	0	0	Û
	(High-Pressure)	1																																			
Distribution PL	Distribution PL		15.7		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	3.9	3.9	3.1	3.1	1.6	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
Construction Fee	(High-Pressure)																		255		20%	205								[
ţ				05	0K	01	01		01	0	05	0%	0%	01	0%	OK	01	Ŭ s	016		70%	90%		100%	100%	100%	100%	100%	1008	100	100%	1009	100%	100%	100%	100%	100%
	Distribution PL		3.8	0	0	0	0	0	0	0	0	0	0	0	<u>0</u>	0	0	0	0	0.7648		0.7648		0.7648]0		0	0	0	0	0	,	0	0	0f		
	(Middle-Pressure)																			205	20%	201		205											!		
1				- 05		0%	05	0\$	0%	0%	- 09	01	016	¥.		0%	016	05	CK	0%	40%	60%		100%	1005	100%	100%	100%	100%	100%	1005			100%	100%	100%	100%
	Distribution PL		25.8	00	0.0	0.0	0.0	0.0	00	0.0	0.0	0.0	00	0.0	0.0	00	00	0.0	00	26	26	1.3	13	1.3	1.3	13	1.3	1.3	1.3			1.3		1.3	13	1.3	1.3
	(Low-Pressure)	1	- <u> </u>			 	ļ										·			100%	10.01	501	5.0%	5.0%	5.0%	5.0%	5.0%	5.05	5.0%				1	5.0%	5.01	5.0%	5.0%
80	Supply Area					· • • • • • • • • • • • • • • • • • • •	ļ	0	0	0	0	0	0	0	0	0	0	· 0	0	0	16	20	24	28	32	36	40		48	52		60		68	72		80
		<u> </u>					ļ	0.0%		0.0%	0.0%	0.01	0.0%				0.0%	0.0%		• • • • • • • •	t	25.0%	+ • • • • • •	35.01	40,0%			55.0%	60.03			75.09	1	85.0%	90.0%	95.0%	100.0%
1	Transmission PL	Fee	. 35	i I		ļ		0.0	0.0	0.0	00	0.0	0.0	00	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	0.0	00	0.0	0.0	0.0	00	0.0	0.0	0.0
Maintenance	(\$35/m)	Length	0			<u> </u>	L	0								1			<u> </u>											<u> </u>	ļ		<u>↓</u>				
Fee (mm\$)	Distribution PL	Fee	30000		0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0		0.0	0.0	0.0		0.5	0.6		0.8	1.0		1.2	13	1.4	1.6	1.1	1.8	1.9	2.0		2,3	2.4 80.0
<u>.</u>	(\$30000/km2)	Area	80	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	+		16.0	20.0		28.0	32.0	35.0	40.0	44.0	48.0			60,0		68.0	72.0	. 76.0	80.0
	Head Quarter	Personel	1.5)·0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	24	30	36	42	48	54	60	66	72	78	84	90	96	102	108	114	120
Maintenance	ļ	(1.6Å/km					l										·		L	1							1				· · · · ·				/		
Operation	Transmission	Personal	0.5	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	0	0	0/	0	0
Personal		(0.5P/km)		L												ţ	L														ļ				′		
	Distribution	Personal	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40
i		(06P/km2)				L		l												L										L	ļ	L			'		
	Totel		1	0	0	0	0	0	0	0	0	0	0	0	0	0	. 0	0	0	0	32	40	48	56	64	72	80	88	.96	104	112	120	128	135	144	152	160

Table 5-3-16Gas Distribution Plan in Area C·M in the Low Case

Cebu (Low)			Unit.etc.	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	(million \$) 2024	2025	2026 j	2027	2028	2029	2030	2031	2032	2033	2034	2035
Potential	<u> </u>	Industrial	mmscfd	0.0			2003	0.0	00	0.0	0.0	10	0.0	0.0	- 0.0	0.0	2015	0.0	0.0	0.0	0,1	01	0.1	01	0.1	0.1	0.1		0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Demand		Commercial		0.0	01	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	03	03	0.0	0.4	0.0	0.5	0.1	0.1	0.6	07	0.8	0.9	1.0	0.1	1.0		1.0	1.0	1.0	1.0	1.0	1.0	1.0
00110110		Residential		0.0			0.0	0.0	0,1	0.1	01		02	02	03	0.3	0.3	0.4	0.5	<u> </u>	0.5	0.5	0.8	0.9	1.0	11	1.2	12	12	12	1.2	1.2	12	12	12	12	1.2
	Power Generation	rvesiusriciai	mmscfd	0.0			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.4	0.0	0.0		0.0		23.8	22.6	22.1	53.6	51.9	51.9	51.9	51.9	51.9	51.9	51.9	51.9	51.9	51.9	1 2 51.9
	Total Potential Demand	1	mmscfd	0.1			0.0	0.2	02	0.3	0.3	0.0	0.0		0.6		0.0	0.0	0.9		1.1		25.3	242	23.9	55.6	54.2	54.2	542	542	54.2	542		54.2	54.2	542	542
	Potential Supply Area	<u> </u>	km2		V.4	V.6	- 14					- 0.3					0.1	V.0		1.0	80		20.0	17.1 90	80	- 05.0		80		012	80	80		80	80	80	542 80
Existing	Forential Subh Vica	Industrial	mmscfd	0.0	00	0.0	00	0.0	0.0	0.0	0.0	00	0.0	0.0	0.0	0.0	00	0.0	0.0	. 0.0	0.0		0,1	0.1	0.1	0.1	01	0,1	0,1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Demand		Commercial		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	0.0	0.0	0.0	0.3	0.5	07	0.8	0.0	1.0	1.0				1.0	10	10	1.0	10	10
Departing		Residential		0.0			00	0.0	00	00	0.0	00	0.0	00	00	00	0.0	0.0	0.0	00	01	0.2	02	03	0.4	0.5	0.6	0.7	10	0.8	0.9	0.9	10	10	11	12	12
•••••	Power Generation	I Vesicencial	mmscfd	0.0		t · · ·	00	0.0	00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	00	0.0	00	251	23.8	22.6		53.6	51.9	51.9	51.9			51,9	51.9	519	51.9	51.9	51.9
	Total Existing Demand	1	mmscfd	0.0		<u>, , , , , , , , , , , , , , , , , , , </u>		0.0	0.0	0.0	0.0	00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		23.6	23.6		55.0	53.6	53.7	53.8			53.9	54.0	54.1	54.1	. 54.2	542
	Existing Supply Area	· · ·	km2	0.0			00	0.0	0.0	0.0	0.0	0.0	00	00	0.0	0.0	0.0	0.0	00		16.0	20.0		28.0	32.0	35.0	40.0	44.0	48.0			60.0	64.0	68.0	72.0	76.0	80.0
	Transmission PL		0	0			0.0	· · ·	<u>- v.v</u>	0	0.0		n	0.0	0.0	0.0	<u>.0.0</u> ภ	0.0	0.0		0.0	10.0	n	10.0	01.0	01	0					0	01.0	0		<u>,,,,</u>	0
	(High-Pressure)		· · · · · · · · · · · · · · · · · · ·	· · · · · · · · · · · · · · · · · · ·	·····*	×	×	···· · · ·	· · · · · Y	·····¥		······*			v	······				'	······	· · · · · · · · · · · · · · · · · · ·			·····	····· • • • • • • • • • • • • • • • • •	····· . *	····· •		`	·····		······	····· ĭ	······································	·····	······································
Distribution PL	Distribution PL		15,7	1	0.0	0.0	00	0.0	0.0	00	0.0	.00	0.0	0.0	00	00	00	00	- 3.9	39	3.1	3.1	1.6	0.0	00	00	0.0	0.0	00	00	00	0.0	0.0	0.0	0.0	00	0.0
Construction Fee	:		10.7	1		0.0		0.0			0.0		0.0	v .v	0.0	0.0	0.0	l · • • •	25		20%			0.0	0.0			0.0	0.0			0.0		0.0	0.0	0.0	
			·	05	CAL	05	Û K		05			05	08	05	05	n s .	C1L	C	(· · · · · · · · · · · · · ·		701			100%	100%	1005	1005	100%	100%	100	100%	100%	100%	100%	100%	100%	100%
	Distribution PL		3.8	n i	0	0	0	0	0	0	0	0	0	0	0 0	0	0			0.7648		0.7648		0.7648		100%	000	0	0	100/		1000	1004	0		0	0
	(Middle-Pressure)			1						••••••			Ť	· · · · · · · · · · · · · · · · · · ·	····.					20%	205	205		205	·····		·····*)					·		·····		
			· [· · · · · · · · · · · · · · · · · ·	05	05	016	05	05	05	0K	05	05	05	05	05	0	01	01	C		405	60%		100%	100%	100%	100%	100%	1005	100	100%	100%	100%	100%	100%	100%	100%
	Distribution PL	1	25.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0			0.0				26	13		1.3	13	13	1.3	1.3	1.3			1.3	1.3	1.3	1.3	1.3	100% 1,3
	(Low-Pressure)	1		1	1		1													10.01	10.05			5.05	5.0%	505	505	50%	5.0%	5.0		50%	5.0%	5.0%	5.0%	5.0%	50
. 80	Supply Area		1	<u> </u>			1	0	0	0	0	a	ព	. 0	0	0	0	0		1 0	15	20				36	40	44	49			60		68	72	76	80
			· [· · · · · · · · · ·	1				0.0%	0.0%	0.0%	0.05	0.0%	0.0%	0.05	0.0%	0.05	0.0%	0.0%	0.01	0.0%	20.05	25.0%	30.0%	35.0%		45.0%	50.0%	55.0%	60.0%			75.0%	80.0%	85.0%	90.0%	95.0%	100.05
	Transmission PL	Fee	35			t	t i	0.0	0.0	00	00	0.0	0.0	00	0.0	00	0.0	00			0.0			0.0	0.0		00	0.0	0.0			0.0	00	0.0	0.0	0.0	00
Maintenance	(\$35/m)	Length	0		1 · .			. 0					•																0.0							•	1
Fee (mm\$)	Distribution PL	Fee	30000	0.0	0.0	00	0.0	0.0	0.0	0.0	00	0.0	0.0	0.0	0.0	00	0.0	0.0	00	0.0	0.5	06	0.7	08	1.0	1.1	12	1.3	14	1.6	17	1.8	19	2.0	22	2.3	24
,	(\$30000/km2)	Area	80	00	00	00	00		00	00	00	00	00	00	0.0	00	00	00			16.0	20.0		28.0	32.0	36,0	40.0	44.0	48.0			60,0	64.0	68.0	72.0	76.0	80.0
	Head Quarter	Personal	15	0	0	0	0	0	0	0	0	ß	0	0	0	0	1	1 0	0	0	24			42	48	54	60	56	72		+	90	96	102	108	114	120
Maintenance		(1. 6Å/km2	3	· · · · · · ·		1	·		······							······································		1	ļ	1										1	f						[
Operation	Transmission	Personal	0.5	6 Ö	0	0	0	0	0	0	Û	0	0	0	- 0	0	G	0	1 0	0	0	D	0	.0	0	0	0	0	0	1 0	1 0	0	0	0	0	0	0
Personal		(0.5P/km)	1	1	1	1	1	l	-								·······	1	·····*	· ······	1	t		¥.	†• •				¥.	f	1	†	······		¥.ļ	·····	1
	Distribution	Personal	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36		40
		(0.6P/km2)	1	1	1	1	1	1	1		••••••	· · · · · · · · ·		····· *·	v .	1	······	······°	1	1		·····	1	CA.	! ¥.		··· ··· ħ₩				1				······································		1
	Total			0	t c	0	0	0	0	0	0	ß	0	0	0	0	0	1 0	0	0	32	40		56	64	72	80		96	104	112	120	128	136	144	152	160
			· · · · · ·	· · · · · · · · · · · · · · · · · · ·		·	·•	<u> </u>	·*				·····				· · · · ·	<u> </u>	<u> </u>	, ,				· · · · · · ·	1	·						1110	1 160	, QQ		102	

.

.

5 - 51

•

•

.

Table 5·3·17	Gas Distribution Plan in Area D in the High Case

												:													1	million\$)	·····	••••	••••••••••••			••••••		• •••••	······		
Davao (High)			Unit etc.	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Potential		Industrial	mmscfd	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	00	0.0	0.0	0.0	0.1	0.1	01	0.1	0.1	0.1	01	0.1	01	01	0.1	0.1	0.1	01	01	0.1	0.1	<u></u> <u>01</u>	01	01	0.1
Demand		Commercial	mmscfd	0.1	0.1	01	0.1	0.1	02	0.3	0.5	071	0.9	11	1.4	1.6	1.8	2.1	2.4	27	3.0	33	36	39	42	45	48	4.8	4.8	4.8	48	48	48	4.8	48	48	4.8
		Residentiel	mmscfd	0.0	0.0	0.0	00	01	0.1	02	02	03	0.4	04	05	06	0.7	0.8	08	09	10	11	13	14	15	1.6	1.7	1.7	17	1.7	17	1.7	1.7	17	1.7	17	1.7
	Power Generation	1	mmscfd	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	0.0	0.0	0.0	22.7	22.7	21.7	21.4	211	50.8	50,7	50.7	50.7	50.7	50.7	50.7	50.7		50.7	50.7	507
	Total Potential Demand		mmscfd	0.1	0.1	0.1	02	02	0.3	0.5	0.7	1.0	13	1.6	1.9	22	2.5	2.9	3.3	3.7	26.8	27.3	26.7	26.8	26.9	57.0	57.4	57.4	57.4	57.4	57.4	57.4	57.4	50.7 57.4	57.4	57.4	57.4
	Potential Supply Area		km2																	<u> </u>	107	107	107	107	107	107	· 107	107	107	107	107	107	107	107	107	107	50.7 57.4 107
Existing		Industriel	mmscfd	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	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	01	0.1	0.1	0.1	0.1	0.1
Demand		Commercial	mmscild	0.0	0.0	0.0	00	0.0	0.0	00	0.0	0.0	0.0	0.0	0.0	0.0	00	0.0	00	00	0.6	1.0	1.4	2.0	2.5	32	3.9	4.4	48	48	48	48	48	48	48	48	48
		Residential	mmscfd	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	0.0	0.0	0.0	02	0.3	0.4	0.5	0.6	0.7	0.9	1.0	1.0	11	1.2	1.3	1.4	1.5	1.6	1.7	17
	Power Generation		mmscfd	0.0	0.0	0.0	0.0	0.0	0.0	00	0.0	0.0	0.0	00	0.0	00	0.0	0.0	00	00	22.7	22.7	21.7	21.4	21.1	50.8	50.7	50.7	50.7	507	507	50.7	50.7	507	50.7	507	50,7
	Total Existing Demand		mmscfd	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	0.0	0.0	23.6	24.0	23.6	23.9	24.3	54.8	55.5	55.1	56.7	56.8	56.9	57.0	57.0	57.1	57.2	57.3	50.7 57.4
	Existing Supply Area		km2	0.0	0.0	0.0	00	00	0.0	0.0	0.0	0.0	0.0	00	0.0	0.0	0.0	0.0	0.0	0.0		20.0	240	28.0	32.0	36.0	40.0	44.0	48.0	52.0	56.0	60.0	64.0	680	72 0	76.0	80.0
	Transmission PL		18.9	0	0	0	0	0	0	0	0	. 0	0	0	0	0	0	0	4.7163	4.7163	3.773	3.773	1.8865	0	Ũ	0	0	0	0	0	0	0	0	0	0	0	0
	(High-Pressure)	1									· .								255	255	20%	20%	10%				1							1		1	
Distribution PL	Distribution PL		17.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	00	0.0	0.0	00	0.0	00	00	0.0	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.9	0.0	00	0.0	0.0	0.0	0.0	0.0	0.0	00
Construction Fee	(High-Pressure)										ł	ĺ							10%	105	10%	10%	105	10%	106	105	10%	106	i								
				016	0%	0%	05		ON	016	0%	05	0%	0%		0%	01	05	0%	01	30%	40%	50%	50 %	70%	80%	90%	100%	100%	100%	1005	100%	100%	100%	100%	100%	100%
	Distribution PL		5.1	0	0	Q	0	ļQ	0	0	0	0	0	0	<u> </u>	0	0	0	<u> </u> 0	0.5115	0.5115	05115	0.5115	0.5115	0.5115	05115	0.5115 0	511469	0.511469	0	0	0	0	0	Q	0	0
	(Middle-Pressure)																			10%	10%	10%	10%	10%	10%	10%	105	105	105								
		1	ļ	01	016	05	016	016	_0%	0%	0%	01	01	0%	0%	05	05	~~	<u> </u>	01	20%	30%	40%	50%	60%	70%	80%	90%	100\$	100%	100%	100%	100%	100%	100%	100%	100%
	Distribution PL		345	0.0	0.0	0.0	0.0	0.0	0.0	00	0.0	0.0	00	0.0	0.0	0.0	0.0	0.0	00	3.4		1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.3	1.7	1.7	1.7	1.7	1.7	· 1.1
	(Low-Pressure)																		· .	10.05	10.0%		5.0%	5.0%	5.0%	5.01	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%
80	Supply Area							0	0	이	0	. 0	0	0	0	0	0	· 0	· 0	0 0	16	20	24	28	32	36	. 40	- 44	וייד ו	52	56	60	64	68	72	76	80
		<u> </u>	+	·				0.0%		0.0%	0.0%	0.0%		0.0%			0.0%					25.0%	30.0%	35.0%	40.0%	45,01	50.0%	55 0%	60.0 %	65.0%	70.0%	75.0%	80.0%	85.0%	90.0%	95.0%	100.0%
	Transmission PL	Fae	35					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		1.7	1.7	1,7	1.7	1.7	1.7	1.7	1.7	1.7	1.7		1.7	1.7	17	1.7	1.7
Maintenance	(\$35/m)	Length	49000					0											ļ	ļ	34300		49000	49000		49000	49000	49000	49000	49000	49000	49000	49000	49000	49000	49000	49000
Fee (mm\$)	Distribution PL	Fee	30000		0.0		0.0			0.0	0.0	0.0	0.0		0.0		0.0	0.0					0.7	0.8	1.0	1.1	12	1.3	1.4	1.6	1.7	1.8	1.9	2.0	2.2	2.3	2.4
	(\$30000/km2)	Area	+	0.0	00	0.0	0.0	0.0	0.0	00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	16.0		240	28.0	32.0	36.0	40.0	440		52.0	56.0	60.0	64.0	68.0	72.0	76 0	80.0
	Head Quarter	Personal	15		0	0		1 0	0	0	0	0	0	0	0	0	0	0	- 0	0	24	30	36	42	48	54	60	66	72	78	84	90	96	102	108	114	120
Maintenance		(1. 8//km2	1													I		 		 																	
Operation	Transmission	Personal	0.5	Q	0	0	Ç.,	0	0	0	0		0	0	0	0	0	0	0	0		25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	
Personal		(0.5P/km)	- <u> </u>			·												L		ļ	L																
	Distribution	Personal	0.5	0	0	0			ļ0.	0	0		0	0	0	0	0	0	0	0	8	10	12		16	18	20	22	24	26	28	30	32	34	36		40
ļ		(0.6P/km2)	<u> </u>		· · · · · ·	·	<u> </u>	L .	<u> </u>						ļ			I		<u> </u>			·														
·	Totel		<u>.</u>	<u> </u>	0	0	0	1 0	0	0	0	0	0	0	0	0	0	0	0	0	49	65	73	81	89	97	105	113	121	129	137	145	153	161	169	177	185

Table 5-3-18Gas Distribution Plan in Area D in the Low Case

.

.

							:					;	••••••		· · · · · · · · · · · · · · · · · · ·							;				million\$)					•••••••					••••••	••••••
Daveo (Low)	· · · · · · · · · · · · · · · · · · ·		Unit.etc.	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2015	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Potential		Industrial	mmscfd	00	00	0.0	0.0	0.0	00	00	0.0	00	0.0	00	00	00	00	00	00	00	00	0.0	11	01	01	0,1	01	0.1	0.1	0.1	01	0.1	01	0.1	0.1	0.1	0.1
Demand		Commercial	mmscfd	01	0.1	01	01	01	01	01	02	02	02	02	02	02	0.3	03	03	0.4		6.0		0.6	07	08	0.9	0.9	0.1	0,9		0.9	0.9	0.9	0.9	0.9	0.9
		Residential	mmscfd	0.0	0.0	0.0	0.0	00	0.1	01	01	01	01	02	02	03	03	04	04	05	05	0.0	07	08	0.9	0.9	10	10	1.0		10	10		10	1.0		1.0
	Power Generation		mmscfd	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	00	0.0	00	00	251	23.8	22.6	22.1	53.6	51.9	51.9	51.9		51.9	51.9		51.9	51.9	519	51.9
	Total Potential Demand		mmscfd	0.1	01	0.1	0.1	02	0.2	02	0.3	0.3	0.3	0.4	05	05	08	07	08	0.9	10	26.2	25.0	240	237	553	53.9	53.9	53.9	53.9	53,9	53.9	53.9	53.9	53.9	53.9	53.9
	Potential Supply Area		km2												1					- 13	107	107	107	107	107	107	107	107			107	107		107	107	107	107
Existing		Industrial	mmscfd	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	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0,1	0.1	0.1	0.1	0,1	0,1	0.1	0.1	0.1	0.1	0,1	0.1
Demand		Commercial	mmscfd	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	00	0.0	0.0		01	02	03	0.4	0.5	0.7	0.8	0.9	0.9	0.9	0.9	0.9	0.9	09	09	0.9
		Residential	mmscfd	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	0.0	0.0	0.0	0,1	0.2	02	0.3	0.3	0.4	05	0.6	0.6	0.7	07	0.8	0.8	0.9	0.9	10	10
	Power Generation		mmscfd	00	00	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	0.0	0.0	25.1	23.8	22.6	22.1	53.6	51,9	519	51.9	519	51.9	51.9	51,9	519	51.9	51.9	519
	Total Existing Demand		mmscfd	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	0.0	0.0	0.0	0.2	25.4		23.1	22.9	54.6	53.2	53.3	53.5		53.6	53.6	53.7	53.7	53.8	53.9	53.9
	Existing Supply Area		km2	0.0	00	0.0	0.0	0.0	0.0	0.0	0.0	00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	16.0	20.0	24.0	28.0	32.0	36.0	40.0	440	48 0	52 0	56 0	60.0	64.0	68.0	72.0	76.0	80.0
	Transmission PL	1	18.9	0	0	0	9	0	0	0	0	0	0	0		0	0	0	4.7163	4,7163	3,773	3.773	1.8865	0	0	0	· 0	0	0	0	0	0	0	0	0	0	0
	(High-Pressure)																		255	25%	20%	201	10%														
Distribution PL	Distribution PL		17.8	0.0	00	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	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	00	0.0
Construction Fee	(High-Pressure)	1]				105	10%	105	10%	10%	10%	10%	10%	10%	105			1			1			
				016	.0%	0\$	0%		01	01	0%	0%	Ű	CN	Û)	05	016	0%	05	0%	30%	40%	50%	60%	70%	80%	90%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
	Distribution PL		5.1	0	0	0	0	0	0	0	0	0	0	0	[(0	. 0	0	0	0.5115	0.5115	0.5115	0.5115	0.5115	05115	0.5115	0.5115	0.511469	0.511469	0	0	0	0	0	0	0	0
	(Middle-Pressure)																			10%	10%	10%	10%	10%	10%	10%	10%	1016	1016	•							
-				0%	0%	0%	05		05	01	- 0%	05	01	ÛS	01	01	0%	0%	05	01	201	301	40%	50%	60 %	70%	80%	90%	100%	100%	100%	100%	100%	100%	100%	100%	100%
	Distribution PL		34.5	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	0.0	0.0	3.4	3.4	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7
	(Low-Pressure)							<u> </u>												10.0%	10.0%	5.0%	5.0%	5.0%	5.0%	5.0%	50%	5.05	5.0%	5.0%	5.0%	5.0%	5.0%	50%	5.0%	50%	5.0%
80	Supply Area			•	İ	İ	ļ	0] 0	0	0	oļ	. 0	0	· (0	0	0	· 0	0	16	20	24	28	32	36	40	. 44	48	52	56	60	64	68	72	76	80
·		-				<u> </u>		0.0%	0.00	0.0%	0.0%	0.0%	0.05	0.0%	-							25.0%	30.0%	35.0%	40.0%	45.0%	50.0%	55.0%	60.0%	65.0%	70.0%	75.0%	80.0%	85.0%	90 OX	95.0%	100.0%
	Transmission PL	Fee	35				Ι.	0.0	00	00	0.0	0.0	0.0	00	0.0	00	0.0	0.0	0.0	0.0	1	· 1.7	. 1.7	1.7	1.7	1,7	1.7	- 1.7	1.7	17	1.1	1.7	1.7	1.7	1.7	17	17
Maintenance	(\$35/m)	Length	49000			L	_	0	 	i .				· · ·	<u> </u>			L · ·			34300	49000	49000	49000	49000	49000	49000	49000	49000	49000	49000	49000	49000	49000	49000	49000	49000
Fee (mm \$)	Distribution PL	Fea	30000	00		0.0			0.0	00	0.0	0.0	0.0	0.0	00		00	0.0	0.0	0.0	05	0.6	0.7	08	1.0	11	1.2	1.3	1.4	1.6	1.7	1.8	1.9	2.0	2.2	2.3	2.4
	(\$30000/km2)	Area		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	0.0	0.0	0.0	16.0	20.0	24.0	28.0	32.0	36.0	40.0	44.0	48.0	52.0	56.0	60.0	64.0	68.0	72.0	76.0	80.0
	Head Quarter	Personal	1.5	0	0	0		0	0	0	0	0	٥	0	0	0	0	0	0	0	24	30	36	42	48	54	60	66	72.	78	84	90	96	102	108	114	120
Maintenance	L	(1. 6人/km2)			<u> </u>		<u> </u>	I																									1			
Operation	Transmission	Personal	0.5	0	0	0	0	0	0	0	0	0	0	0	. D	0	l o	0	0	0	17	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25
Personel		(05P/km)	·				_	<u> </u>	1	<u> </u>							· ·																i I				
	Distribution	Personal	0.5	D.	0	0	0	0	0	0	0	0	Q	0	0	0	<u> </u>	• 0	0	0	8	10	12	14	16	- 18	20	22	24	26	28	30	32	34	36	38	40
	L	(06P/km2)	ļ				l	 	<u> </u>	ļ ļ					1						1																· · · · · · · · · · · · · · · · · · ·
	Total		:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	49	65	73	81	89	97	105	113	121	129	137	145	153	161	169	177	185

5 - 53

-

.

. .

. . .

. .

`

5-4 Study on LNG Receiving Terminal

5-4-1 Conditions for a LNG Receiving Terminal

The following conditions will be considered for receiving terminals:

· Harmony with/ Acceptance by Local Community

How to maintain local environment after accepting the siting of an LNG receiving terminal will be important for secure operation. This requires the confidence of local residents regarding safety, protecting preferred local distinctions such as natural landscape and monuments, and maintaining the everyday lives of the residents. It is preferred not just to maintain them but also to improve them when introducing terminals.

Proximity to Transmission and Use

The location of an LNG terminal should accommodate easy connection to gas transmission, and eventual distribution and end use.

• Easy Reception of LNG Ships

The size of generally used LNG ships is 130,000 to 140,000 m³. Ships of this scale should be easily accepted and operated safely and securely in the seaport to accommodate the terminal.

• Supply Security

When two or more geographically separate markets or distribution areas are conceived, and thus two or more terminals are planned, such terminals should be located in a certain distance from each other to accommodate a good gas network balance to raise security, and thus eventual economies.

5.4-2 Volume of LNG on the Basis of Gas Demand

The volume of LNG that would need to be imported based on the forecast of natural gas supply and demand is shown in Tables 5.4.1, 5.4.2, 5.4.3 and 5.4.4.

	•		-			•
		2009	2013	2017	2021	2025
Ontine 1	L·2	0.00	0.34	1.25	2.48	3.52
Option 1	L-3	0.26	1.22	1.89	2.95	4.42
Ontion 0	L-2	0.00	0.34	1.24	2.47	3.52
Option 2	L·3	0.26	1.22	1.88	2.93	4.42

 Table 5.4-1
 Required LNG imports for Area L (High Case) (Million t /year)

Table 5-4-2 Required LNG imports for Area L (Low Case) (Million t /year)

		2013	2017	2021	2025
Option 1	L-2	0.00	0.61	1.65	2.54
	L·3	0.30	1.22	2.48	3.31
Ontion 9	L·2	0.00	0.61	1.65	2.54
Option 2	L-3	0.30	1.21	2.48	3.31

Table 5.4.3 Required LNG imports for Area C·M and D (High Case) (Million t /year)

· · ·	2019	2022	2025
Area C·M	0.23	0.23	0.49
Area D	0.22	0.22	0.48

	2020	2024	2025
Area C·M	0.22	0.20	0.45
Area D	0.22	0.20	0.45

In comparison of Option 1 with Option 2 in Area L, required LNG imports are almost the same in both the High and Low Cases. In the High Case, the volume of LNG that would need to be supplied to Area L-2 and Area L-3 in 2025 would reach 3.5 million tons and 4.4 million tons annually, respectively. In the Low Case, demand would be 2.5 million tons for Area L-2 and 3.3 million tons for Area L-3, respectively.

On the other hand, Area C-M and D would need approximately 500,000 tons each.

Thus, we base our projections for the size of the LNG terminal on 4 million t/y for Area L-2 and 5 million t/y for Area L-3 in the High Case, and on 3 million tons for Area L-2 and 4 million tons for Area L-3 in the Low Case.

Areas C·M and D would need one million t/y.

The LNG volume for each Case would be applicable in the Gas Promotion Scenario.

5-4-3 LNG Tanker and Receiving Facilities

(1) Conditions of LNG Tanker

The specifications of LNG carriers for this study are shown below

LNG Capacity:	130,000kl
Length of ship:	290m
Length between perpendiculars:	276m
Beam:	48m
Loaded draft:	11.8m
Loaded displacement:	98,800t

(2) Passage and Anchorage

The passage width shall be 300m and the turning basin shall be 600m in diameter (circle). The depths of the passage and the anchorage shall both be 14m.

(3) Jetty

Pier alignment shall be determined based on passage, turning basin, capacity of LNG carrier, frequency of arrival and leaving of carriers, operability of carriers, installation plans for send-out pipelines, and meteorological and ocean meteorological conditions. In this study, a pier shall be extended 300m up to a 14m deep position to minimize dredging work, and shall be of the dolphin type.

(4) Unloading Arms

The 16 inch \times 60 feet unloading arm, which is the main type used in Japan, shall be adopted. This one is of the rotary counterweighted marine arm suspended type, wherein the pressure retaining members and suspension members are isolated from each other so that thermal stress does not act on the pressure members. Furthermore, all of the arms shall be provided with an emergency release system.

(5) Unloading Pipeline

Two lines with 750mm diameter shall be installed so as to allow gas receiving to be completed from a 130,000kl LNG ship in 12 hours. Installation of two pipelines permits gas receiving within 24 hours, even when one line cannot be operated for some reason.

5-4-4 LNG Tanks

(1) Type

The typical types and respective features of LNG tanks in world use are shown in Appendix. According to the recent trend of LNG tank construction, the aboveground type PC tank (integral type of outer container and PC dike) is the mainstream tank and is adopted in this study.

(2) Calculation of Required Number of Tanks

The required reserve at an LNG terminal is calculated using the following equation:

Required reserve = Storage + Seasonal differentials + LNG for receiving

Although the quantity maintained in storage may vary depending on the importance to consumers of a continuous supply for power and gas, and our assessment of the risks present in the LNG chain, for the purposes of this report we assume a storage amount equal to seven days average daily send-out. Accordingly, if we assume an annual handling volume of five million tons, storage would be:

5 million t/y \div 0.4565 t/m³ \div 365 d/y \times 7 days = 210,000 kl(1)

Considering the climate in the Philippines, we may disregard seasonal differentials.

We assume the amount received to be equivalent to the capacity of two LNG vessels. For greater transportation efficiency, a large LNG vessel (130,000 kl) is presumed. Accordingly, the required amount for storage for receiving would be:

 $130,000 \text{ kl x } 2 = 260,000 \text{ kl} \cdots (2)$

In this case, the annual frequency of arrivals would be:

5 million t/y \div 0.4565 t/m³ \div 130,000 kl = 84 vessels/y,

and the interval of arrivals,

 $365 \text{ d/y} \div 84 \text{ vessels/y} = 4.3 \text{ d/vessel}.$

Thus, the requisite LNG in storage is

$$(1) + (2) = 470,000 \text{ kl}$$

If we assume a 140,000 kl tank with a dead capacity of 5%, the number of tanks required would be four, according to the following equation:

 $470,000 \text{ kl}/(140,000 \times 0.95) = 3.53$

(3) Tank Construction Plan

Following the same computation procedure as for (2), the annual construction plan is drawn up for an LNG terminal to be established in Area L for the High Case and Low Case. The number of tanks required would be two, three and four respectively for the nominal LNG handling weight 1.6, three and four million tons per annum, assuming a 140,000 kl tank. Therefore, the tank construction plan for Area L-2 in the High Case can be made by dividing the term up to 2025 into three phases based upon the amount of LNG import as follows.

Year	2013~2019	2020~2023	$2024 \sim 2025$
Imported LNG (Million t/year)	0.34~1.37	1.98~2.85	3.31~3.52
Nominal annual LNG quantity (million t/year)	1.6	3	4
Required storage capacity (thousand kl)	265	390	430
Number of 140,000kl tanks	2	3	4

Table. 5:4:5 Construction plan for LNG storage tank (High Case; Area L-2)

For Area L-3 in the High Case, the tank construction plan can be made by dividing the term up to 2025 into four phases.

Year	2009~2016	$2017 \sim 2021$	2022~2024	2025
Imported LNG (Million t/year)	0.26~1.30	1.89~2.95	3.51~3.67	4.42
Nominal annual LNG quantity (million t/year)	1.6	3	4	5
Required storage capacity (thousand kl)	265	390	430	480
Number of 140,000kl tanks	2	3	4	4

Table. 5.4.6 Construction plan for LNG storage tank (High Case; Area L-3)

For Area L-2 in the Low Case, a terminal with a nominal handling capability of 1.6 million t/y and three million t/y would be constructed by dividing the term from 2017 to 2025 into two phases.

Year	2017~2020	$2021 \sim 2025$
Imported LNG (Million t/year)	0.61~1.31	$1.65 \sim 2.54$
Nominal annual LNG quantity (million t/year)	1.6	3
Required storage capacity (thousand kl)	265	390
Number of 140,000kl tanks	2	3

Table. 5.4.7 Construction plan for LNG storage tank (Low Case; Area L-2)

For Area L-3 in the Low Case, a terminal with a nominal handling capability of 1.6, three and four million t/y would be constructed by dividing the term from 2013 to 2025 into three phases.

Table 5.4.8	Construction plan for LNG storage tank (Low Case; Area L-3)
-------------	---

Year	2013~2018	2019~2023	2024~2025
Imported LNG (Million t/year)	0.30~1.60	1.76~2.72	3.20~3.31
Nominal annual LNG quantity (million t/year)	1.6	3	4
Required storage capacity (thousand kl)	265	390	430
Number of 140,000kl tanks	2	3	4

The following are tank construction plans for Areas C-M and D.

Table 5-4-9	Construction plan for	LNG storage tank	(High Case; Areas ()•M & D)

Area	C-M	D
Year	2019~2025	2019~2025
Imported LNG (million t/year)	0.23~0.49	0.22~0.48
Nominal annual LNG quantity (million t/year)	1	1
Required storage capacity (thousand kl)	310	310
Number of 140,000kl tanks	2	2

Table 5-4-10 Construction plan for LNG storage tank (Low Case; Areas C·M & D)

Area	C·M	D
Year	$2020 \sim 2025$	2020~2025
Imported LNG (million t/year)	0.22~0.45	0.22~0.45
Nominal annual LNG quantity (million t/year)	1	1
Required storage capacity (thousand kl)	310	310
Number of 140,000kl tanks	2	2

(4) LNG Pumps

The number of LNG pumps to be established is determined by the number of tanks. If we assume the primary (1ry) pump has a capacity of 170 t/h, the transfer pump capacity 150 t/h, and the secondary (2ry) pump capacity 150 t/h, the number of pumps required in a terminal for Area L in High Case would be (See Table 5.4-11 and 5.4-12):

rabie o T TT - Live pump instantation plan (ingh oase) filea E 2/					
Year	2013~2019	2020~2023	2024~2025		
Imported LNG (million t/year)	0.34~1.37	$1.98 \sim 2.85$	3.31~3.52		
Nominal annual LNG quantity (million t/year)	1.6	3	4		
Number of primary pumps	4(2)	6(2)	7(2)		
Number of transfer pumps	3(1)	3(1)	3(1)		
Number of secondary pumps	4(2)	6(2)	7(2)		

Table 5-4-11 LNG pump installation plan (High Case; Area L-2)

(Note) Numbers in parentheses show the number of back-up pumps.

Year	2009~2016	$2017 \sim 2021$	2022~2024	2025
Imported LNG (million t/year)	0.26~1.30	1.89~2.95	3.51~3.67	4.42
Nominal annual LNG quantity (million t/year)	1.6	3	4	5
Number of primary pumps	4(2)	6(2)	7(2)	8(2)
Number of transfer pumps	3(1)	3(1)	3(1)	3(1)
Number of secondary pumps	4(2)	6(2)	7(2)	8(2)

Table 5-4-12 LNG pump installation plan (High Case; Area L-3)

(Note) Numbers in parentheses show the number of back-up pumps.

LNG pumps installation plan for Area L in the Low Case, is shown in the following tables.

Table 5-4-13 LNG pumps installation plan (Low Case; Area L-2)

Year	2017~2020	2021~2025
Imported LNG (million t/year)	0.61~1.31	$1.65 \sim 2.54$
Nominal annual LNG quantity (million t/year)	1.6	3
Number of primary pumps	4(2)	6(2)
Number of transfer pumps	2(1)	2(1)
Number of secondary pumps	4(2)	6(2)

Table 5-4-14 LNG pump installation plan (Low Case; Area L-3)

		the second second second second second second second second second second second second second second second se	
Year	2013~2018	2019~2023	2024~2025
Imported LNG (million t/year)	0.30~1.60	1.76~2.72	3.20~3.31
Nominal annual LNG quantity (million t/year)	1.6	3	4
Number of primary pumps	4(2)	6(2)	7(2)
Number of transfer pumps	3(1)	3(1)	3(1)
Number of secondary pumps	4(2)	6(2)	7(2)

If we assume the primary (1ry) pump has a capacity of 85 t/h, the transfer pump capacity is 85 t/h, and the secondary (2ry) pump capacity is 65 t/h, the number of pumps required in a terminal for Area C·M and D would be (See Table 5.4.15 and 5.4.16):

Area	Area C·M	Area D
Year	2019~2025	2019~2025
Imported LNG (million t/year)	0.23~0.49	0.22~0.48
Nominal annual LNG quantity (million t/year)	1	1
Number of primary pumps	4(2)	4(2)
Number of transfer pumps	3(1)	3(1)
Number of secondary pumps	4(2)	4(2)

Table 5.4.15 LNG pump installation plan (High Case; Areas C·M & D)

(Note) Numbers in parentheses show the number of back up pumps.

Table 5-4-16 LNG pump installation plan (Low Case; Areas C-M & D)

Area	Area C·M	Area D
Year	$2020 \sim 2025$	2020~2025
Imported LNG (million t/year)	0.22~0.45	0.22~0.45
Nominal annual LNG quantity (million t/year)	1	1
Number of primary pumps	4(2)	4(2)
Number of transfer pumps	3(1)	3(1)
Number of secondary pumps	4(2)	4(2)

(Note) Numbers in parentheses show the number of back-up pumps.

5-4-5 LNG Vaporizers

(1) Types of LNG Vaporizer

A vaporizer uses seawater as an LNG heating source, because LNG terminals are mostly constructed along seashores. An open rack-type LNG vaporizer (hereinafter abbreviated as ORV) and a shell & tube-type LNG vaporizer (hereinafter abbreviated as STV) are currently available as LNG vaporizers using seawater as the LNG heating source. In addition, a submerged-type LNG vaporizer (hereinafter abbreviated as SMV) is also available, which recycles the heat that results from LNG combustion. Generally, either ORV or STV is employed considering running costs. On the other hand, the SMV is adopted as a countermeasure against peak gas demand.

This study adopts the ORV, which is adopted worldwide, taking comprehensive consideration of operability, maintainability, and cost.

(2) Calculating Required Numbers

The capacities of LNG vaporizers are determined by the maximum send out rate per hour. Gas is sent out for power generation and other purposes. For 2025, we are assuming a ratio of power generation demand to non-power generation demand of 82.1% to 17.9%. For power generation demand, if we assume a power generation capacity in 2025 of 4.3 million kW, and power generation efficiency of 50% (based on a high heating value),

4.30 million kW × 860 kcal/kWh \div 0.5 \div 13,000 kcal/kg (HHV) \div 1,000 = 569 t/h - (3)

To calculate the peak ratio (maximum send-out per hour against daily send-out), assuming 5 million tons are handled annually, the daily average demand for power generation in 2025 would be:

5 million t/y \times 0.821 \div 365 d/y = 11,200 t/d

Accordingly, the peak ratio is:

569 t/h \div 11,200 t/d \times 100 = 5.1%.

Because the percentage for non-power generation is 17.9%, daily average demand for non-power generation for an annual amount of 5 million tons would be:

5 million t/y \times 0.179 \div 365 d/y = 2,450 t/d

If we assume a peak ratio of 7.8% (based on similar data in Southeast Asia) and an allowance factor in Japan of 1.2:

2,450 t/d \times 0.078 \times 1.2 = 230 t/h - (4) The maximum output is (3) + (4) = 799 t/h.

Using ORV (open rack vaporizer) with a send-out capacity of 150 t/h, the number of vaporizers required would be:

799 t/h \div 150 t/h unit = 5.3, or 6. If we were to use one back up vaporizer, the number would increase to 7.

(3) Vaporizer Installation Plan

Following the same procedure as for (2) above, we have come up with a vaporizer installation plan for Area L in the High Case until 2025. The results are shown in Table $5\cdot 4\cdot 17$ and $5\cdot 4\cdot 18$.

Yea	ar	2013~2019	2020~2023	$2024 \sim 2025$
Imported LNG (million t/year)		0.34~1.37	$1.98 \sim 2.85$	3.31~3.52
Nominal annual LNG quantity (million t/year)		1.6	3	4
Required	Power	159	371	477
amount of	Non-power	72	108	143
vaporization (t/h)	Total	231	479	620
Number of 150t/h vaporizers*1		3	5	6

Table 5.4.17 LNG vaporizers installation plan (High Case; Area L-2)

*1 Including one back-up unit

Table 5-4-18	LNG vaporizers installation	n plan (High Case; Area L-3)

	-		-	~	
Ye	ar	2009~2016	2017~2021	2022~2024	2025
Imported LNG	(million t/year)	0.26~1.30	1.89~2.95	3.51~3.67	4.42
Nominal annua (million t/year)	l LNG quantity	1.6	3	4	5
Required	Power	159	358	464	569
amount of	Non-power	68	133	200	230
vaporization (t/h)	Total	227	491	664	799
Number of 150t	/h vaporizers*1	3	5	6	7

*1 Including one back-up unit

Plans for Area L in the Low Case are shown below.

Table 5-4-19	LNG vaporizers	installation r	olan (Low	Case; Area L-2)

Year Imported LNG (million t/year) Nominal annual LNG quantity (million t/year)		$2017 \sim 2020$	2021~2025		
		Imported LNG (million t/year)		0.61~1.31 1.65~	$1.65 \sim 2.54$
		1.6	3		
Required amount of	Power	159	371		
vaporization	Non-power	18	38		
(t/h)	Total	177	409		
Number of 150t/h vaporizers*1		3	4		

*1 Including one back-up unit

Year Imported LNG (million t/year) Nominal annual LNG quantity (million t/year)		2013~2018	2019~2023	$2024 \sim 2025$
		0.30~1.60	1.76~2.72	3.20~3.31
		1.6	3	4
Required	Power	212	371	477
amount of	Non-power	15	43	65
vaporization (t/h)	Total	227	414	542
Number of 150t	/h vaporizers*1	3	4	5

Table 5-4-20 LNG vaporizers installation plan (Low Case; Area L-3)

*1 Including one back-up unit

Plans for Areas C-M and D are shown below.

Table 5.4.21 LNG vaporizers installation plan (High Case; Areas C·M & D)

	-		
Ar	ea	Area C-M	Area D
Year Imported LNG (million t/year)		2019~2025	2019~2025
		0.23~0.49	0.22~0.48
Nominal annual (million t/year)	LNG quantity	. 1	1
Required	Power	67	67
amount of	Non-power	35	36
vaporization (t/h)	Total	102	103
Number of 60t/h	vaporizers*1	3	3

*1 Including one back-up unit

Table $J \neq 22$ find vaporizers installation plan (Low Case) Areas O in $G D$	Table 5-4-22	LNG vaporizers installation pla	an (Low Case; Areas C-M & D)
---	--------------	---------------------------------	------------------------------

	-	-	
Area Year Imported LNG (million t/year)		Area C·M	Area D
		2020~2025	2020~2025
		0.22~0.45	0.22~0.45
Nominal annual (million t/year)	LNG quantity	1	1
Required	Power	67	67
amount of	Non-power	10	10
vaporization (t/h)	Total	77	77
Number of 60t/h	n vaporizers*1	3	3

*1 Including one back-up unit

5.4.6 BOG (boil-off gas) Treatment Facilities

(1) BOG Generation

Factors influencing BOG generation include:

1) BOG due to spontaneous heat input to LNG tanks and pipes;

2) BOG due to heat loss of rotating equipment including LNG pumps;

3) BOG when unloading from an LNG tanker; and,

4) BOG from unloading arms.

Because (1) above is permanently generated, the following is assumed.

1.5 t/h tank unit + 5 t/h (piping)

BOG generated when unloading tanks is assumed to be 40 t/h, based on past data on 130,000 kl tankers. Accordingly, BOG generation based on a tank installation plan in Area L for the High Case is shown in Table 5-4-23 and 5-4-24.

Table 5-4-23 BOG generation (High Case; Area L-2)

Ŷ	ear	2013~2019	2020~2024	2024~2025
Imported LNG (million t/ye		0.34~1.37	1.98~2.85	3.31~3.52
Nominal annu quantity (mill		1.6	3	4
Number of tanks		2	3	4
BOG	At holding	8	9.5	11
generation (t/h)	At receiving	46.5	48.0	49.5

	14510 0 1 01	DOG generati	Caribin Oraci	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	
Y	ear	2009~2016	$2017 \sim 2021$	2022~2024	2025
Imported LNC (million t/yes		0.26~1.30	1.89~2.95	3.51~3.67	4.42
Nominal annu quantity (mill		1.6	3	. 4	5
Number of tanks		2	3	4	4
BOG	At holding	8	9.5	11	. 11
generation (t/h)	At receiving	46.5	48.0	49.5	49.5

Table 5.4.24 BOG generation (High Case; Area L-3)

BOG generation based on a tank installation plan in Area L for the Low Case is shown in Table 5-4-25 and 5-4-26

Year		2017~2020	2021~2025
Imported LNG (million t/year)		0.61~1.31	1.65~2.54
Nominal annual LNG quantity (million t/year)		1.6	3
Number of tanks		2	3
BOG	At holding	8	9.5
generation (t/h)	At receiving	46.5	48.0

Table 5-4-25 BOG generation (Low Case; Area L-2)

Table 5-4-26 BOG generation (Low Case; Area L-3)

Y	ear	2013~2018	2019~2023	2024~2025
Imported LNC (million t/yea		0.30~1.60	1.76~2.72	3.20~3.31
Nominal annu quantity (mill		1.6	3	4
Number of tanks		2	3	4
BOG	At holding	8	9.5	11
generation (t/h)	At receiving	46.5	48.0	49.5

BOG generation for Areas C·M and D are shown below

Table 5-4-27	BOG generation (High Case; Areas C·M & D)	

Area Year		Area C·M	Area D 2019~2025	
		2019~2025		
Imported LNG (m	illion t/year)	0.23~0.49	0.22~0.48	
Nominal annual LNG quantity (million t/year) Number of tanks BOG generation At holding		1	1 2 8.0	
		2		
		8.0		
(t/h)	At receiving	46.5	46.5	

Table 5-4-28 BOG generation (Low Case; Areas C-M & D)

AreaYearImported LNG (million t/year)Nominal annual LNG quantity (million t/year)Number of tanksBOG generationAt holding		Area C·M	Area D	
		2019~2025	2019~2025 0.22~0.48 1 2 8.0	
		0.23~0.49		
		1		
		2		
		8.0		
(t/h)	At receiving	46.5	46.5	

(2) BOG Reliquefaction Facilities

When there is sufficient LNG send out to meet needs, BOG may be reliquefied by mixing it with LNG. Suppose BOG is reliquefied using the base amount (50% of the peak) of fuel LNG for power generation. Table 5-4-29 and 5-4-30 show the amount of BOG that could be reliquefied in Area L of the High Case, assuming seven tons of LNG is needed to reliquefy one ton of BOG.

Year	2013~2019	$2020 \sim 2023$	$2024 \sim 2025$
Imported LNG (Million t/year)	0.34~1.37	1.98~2.85	3.31~3.52
Nominal annual LNG quantity (million t/year)	1.6	3	4
Minimum send-out rate (t/h)	20~80	119~186	$225 \sim 239$
Available BOG reliquefied(t/h)	2.8~11.4	17.0~26.5	32.2~34.1

Table 5.4.29 BOG reliquefaction (High Case; Area L.2)

Table 5-4-30 BOG reliquefaction (High Case; Area L-3)

Year	2009~2016	2017~2021	2022~2024	2025
Imported LNG (million t/year)	0.26~1.30	$1.89 \sim 2.95$	3.51~3.67	4.42
Nominal annual LNG quantity (million t/year)	1.6	3	4	5
Minimum send-out rate (t/h)	20~80	119~179	219~232	285
Available BOG reliquefied(t/h)	2.8~11.4	$17.0\sim\!25.6$	31.2~33.1	40.6

Table 5-4-31 and 5-4-32 show the amount of BOG that could be reliquefied in Area L of the Low Case.

Table 5:4:31 BOG reliquefaction (Low Case; Area L:2)

Year	2017~2020	2021~2025
Imported LNG (Million t/year)	0.61~1.31	1.65~2.54
Nominal annual LNG quantity (million t/year)	1.6	- 3
Minimum send-out rate (t/h)	40~80	106~186
Available BOG reliquefied(t/h)	5.7~11.4	$15.1 \sim 26.5$

Table 5-4-32 BOG reliquefaction (Low Case; Area L-3)

Year	2013~2018	2019~2023	2024~2025
Imported LNG (Million t/year)	0.30~1.60	1.76~2.72	3.20~3.31
Nominal annual LNG quantity (million t/year)	1.6	3	4
Minimum send-out rate (t/h)	20~106	106~186	225~239
Available BOG reliquefied(t/h)	2.8~15.1	17.0~25.6	32.2~34.1

Similarly, Table 5-4-33 and 5-4-34 show the amount of BOG that could be reliquefied in Areas C-M and Area D.

	Area	Area C·M		a D
Year	'19~'2 3	'24~'25	'19~'23	'24~'25
Imported LNG (million t/year)	0.23	0.49	0.22	0.48
Nominal annual LNG quantity (million t/year)	1	1	1	1
Minimum send out rate (t/h)	13	34	13	34
Available BOG reliquefied (t/h)	1.9	4.8	1.9	4.8

Table 5.4.33 BOG reliquefaction (High Case; Areas C·M & D)

Table 5-4-34 BOG reliquefaction (Low Case; Areas C-M & L	Table 5-4-34	BOG reliquefaction (Low Case; Areas C-M & D)
--	--------------	--

· · · · · · · · · · · · · · · · · · ·	Area C·M		Area D	
Year	'20~'23	'24~'25	·'20~'23	'24~'25
Imported LNG (million t/year)	0.22	0.45	0.22	0.45
Nominal annual LNG quantity (million t/year)	1	1	1	1
Minimum send out rate (t/h)	13	34	13	34
Available BOG reliquefied (t/h)	1.9	4.8	1.9	4.8

(3) Types of BOG Compressor

A reciprocal compressor and a centrifugal compressor are generally used in LNG receiving terminals. These two types of compressor are compared in Appendix. The operability of the reciprocating compressor is better than the centrifugal compressor for both start-stop and cool down performance. On the other hand, the centrifugal compressor is excellent in terms of maintainability and is more compact than the reciprocating compressor. From the comparative results, this study adopts the reciprocating type with the good operability and low power cost.

(4) BOG Compressors and Reliquefaction Facilities Installation Plan

1) Area L

Assuming a capacity of 15 t/h for a BOG compressor capable of raising the atmospheric pressure to 0.8 MPa, the number of compressors required would be

When nominal annual LNG quantity is 1,600,000 t/year,

46.5/15 = 3.1 (Two LNG tanks)

When nominal annual LNG quantity is 5,000,000 t/year,

$$49.5/15 = 3.3$$
 (Four LNG tanks)

Thus, if we include one backup compressor, five compressors are required in both the High Case and Low Case.

A booster is used to raise the pressure of BOG that cannot be reliquefied to 0.8 MPa. Assuming a booster capacity of 15 t/h, the number of compressors required would be:

When nominal annual LNG quantity is 1,600,000 t/year,

 $(46.5 \text{ t/h} - 2.8 \text{ t/h}) \div 15 \text{ t/h} \cdot \text{unit} = 2.9$

Accordingly, if we include one back-up compressor, four booster compressors are required in High Case or Low Case.

2) Area C·M, Area D

If we assume the capacity of a BOG compressor that can raise atmospheric pressure to 0.8 MPa to be 15 t/h, the number of compressors required would be 46.5/15 = 4 (3.1), or 5, including one back up compressor. The number of compressors required would be:

 $(46.5 \text{ t/h} - 1.9 \text{ t/h}) \div 15 \text{ t/h} \cdot \text{unit} = 2.97$, or four with one back-up compressor.

A summary of the above can be found in Table 5-4-35 and 5-4-36.

Case	High	High Case		Case
Area	L·2	L-3	L-2	L•3
Year	2013~2025	2009~2023	$2017 \sim 2025$	2013~2025
Number of BOG compressor units	5	5	5	5
Number of booster units	4	4	4	4
BOG reliquefaciton capacity (t/h)	Max 34.1	Max 40.6	Max 26.5	Max 34.1

Table 5-4-35 BOG treatment facilities (Areas L-2 & L-3)

Area	Area C·M	Area D
Year	2019~2023	2019~2023
Number of BOG compressor units	5	5
Number of booster units	4	4
BOG reliquefaciton capacity (t/h)	Max 4.8	Max 4.8

Table 5-4-36 BOG treatment facilities (Areas C-M & D)

5-4-7 Seawater Facilities

(1) Required Seawater Volume

Seawater facilities supply water drawn from the sea to a vaporizer and a disaster control facility. Supply capacity depends upon the number of vaporizers. Assuming the design seawater temperature to be 10° C, the required seawater volume for an open rack vaporizer (our plan) would be 35t/t-LNG.

Accordingly, the volume of seawater required for one vaporizer would be.

 $150 \text{ t/h} \times 35 = 5,250 \text{ m}^3/\text{h} \cdot \text{unit}.$

Table 5.4.37 and 5.4.38 indicate the volume of seawater required for vaporizers, together with that for the seawater electrolyte and the disaster-control facility, in Areas L.2 and L.3 in the High Case. The volume for disaster-control is based on a disaster affecting one tank.

(H	ligh Case; Area	a L·2)	· · · ·
Year	2013~2019	2020~2023	$2024 \sim 2025$
Imported LNG (million t⁄year)	0.34~1.37	1.98~2.85	3.31~3.52
Nominal annual LNG quantity (million t/year)	1.6	3	4
Number of vaporizer units	2	4	5
Number of LNG storage tanks	2	3	4
Sea water volume for vaporizers (m ³ /h)	10,500	21,000	26,250
Sea water volume for chlorinator equipment(m ³ /h)	80	130	150
Sea water for disaster prevention (m ³ /h)	4,400	5,000	5,400

Table 5-4-37 Required sea water volume for vaporizers and chlorinator equipment

5 - 72

(fligh Case, Area L 5)				
Year	2009~2016	$2017 \sim 2021$	$2022 \sim 2024$	2025
Imported LNG (million t⁄year)	0.26~1.30	1.89~2.95	3.51~3.67	4.42
Nominal annual LNG quantity (million t/year)	1.6	3	4	5
Number of vaporizer units	2	4	5	6
Number of LNG storage tanks	2	3	4	4
Sea water volume for vaporizers (m³/h)	10,500	21,000	26,250	31,500
Sea water volume for chlorinator equipment(m ³ /h)	80	130	150	180
Sea water for disaster prevention (m ³ /h)	4,400	5,000	5,400	5,400

 Table 5-4-38
 Required seawater volume for vaporizers and chlorinator equipment

(High Case; Area L·3)

Table 5.4.39 and 5.4.40 indicate the volume of seawater required for vaporizers, together with that for the seawater electrolyte and the disaster-control facility, in Areas L·2 and L·3 in the Low Case.

Table 5-4-39 Required seawater volumes for vaporizers and chlorinator equipment

(Low Case, Area L-2)				
Year	$2017 \sim 2020$	2021~2025		
Imported LNG (million t⁄year)	0.61~1.31	1.65~2.54		
Nominal annual LNG quantity (million t/year)	1.6	3		
Number of vaporizer units	2	3		
Number of LNG storage tanks	2	3		
Sea water volume for vaporizers (m ³ /h)	10,500	15,750		
Sea water volume for chlorinator equipment(m ³ /h)	80	100		
Sea water for disaster prevention (m ³ /h)	4,400	5,000		

(Low Case; Area L-2)

(Low Case; Area L-3)					
Year	2013~2018	2019~2023	2024~2025		
Imported LNG (million t⁄year)	0.30~1.60	1.76~2.72	3.20~3.31		
Nominal annual LNG quantity (million t/year)	1.6	3	4		
Number of vaporizer units	3	5	. 6		
Number of LNG storage tanks	2	3	4		
Sea water volume for vaporizers (m ³ /h)	10,500	15,750	21,000		
Sea water volume for chlorinator equipment(m ³ /h)	80	100	130		
Sea water for disaster prevention (m ³ /h)	4,400	5,000	5,400		

Table 5-4-40 Required seawater volumes for vaporizers and chlorinator equipment

For Area C·M and D, the volume of seawater required for one vaporizer would be $60 \text{ t/h} \times 35 = 2,100 \text{ m}^3/\text{h} \cdot \text{unit.}$

Table 5-4-41 indicates the volume of seawater required for vaporizers, together with that for the seawater electrolyte and the disaster control facility, in the High Case and the Low Case.

(Areas $C \cdot M$ and D)

Case	High Case		Low	Case
Area	Area C·M	Area D	Area C·M	Area D
Year	'19~'25	'19~'25	20~25	'20~'25
Imported LNG (million t⁄year)	0.49	0.48	0.45	0.45
Nominal annual LNG quantity (million t/year)	1	1	1	1
Number of vaporizer units	2	2	2	2
Number of LNG storage tanks	2	2	2	2
Sea water volume for vaporizers (m ³ /h)	4,200	4,200	4,200	4,200
Sea water volume for chlorinator equipment (m ³ /h)	30	30	30	30
Sea water for disaster prevention (m³⁄h)	4,400	4,400	4,400	4,400

(2) Seawater Pumps and Seawater Lines

Seawater pumps for vaporizers are with 7,000 m³/h of capacity and 30 m of lift with two back ups, booster pumps for disaster control are centrifugal types with 3,000 m³/h of capacity and 80 m of lift with one back up. The intake is installed where the required water depth is assured, taking into account ocean topography, currents, and waves. For greater reliability, one back up should be included for the intake and intake line. The diameter of the intake opening is based on a maximum flow of 0.2 m/s, and that of the seawater main pipe on a maximum flow of 2 m/s. Specifications of the main seawater facilities are provided in Tables $5\cdot4\cdot42\sim5\cdot4\cdot45$.

Year	2013~2019	2020~2023	$2024 \sim 2025$
Imported LNG (Million t/year)	0.34~1.37	1.98~2.85	3.31~3.52
Nominal annual LNG quantity (million t/year)	1.6	3	4
Number of sea water pumps	4(2)	6(2)	6(2)
Number of booster pumps for disaster prevention	3(1)	3(1)	3(1)
Sea water intake end portion 10,000 ϕ	2	2	2
Sea water main pipeline 3,500 Ø	2	2	2

 Table 5-4-42
 Seawater facilities plan (High Case; Area L-2)

(Note) Numbers in parentheses show the number of back-up pumps.

Table 5.4.43 Seawater facilities plan (High Case; Area L-3)

Year	2009~2016	2017~2021	$2022 \sim 2024$	2025
Imported LNG (Million t/year)	0.26~1.30	1.89~2.95	3.51~3.67	4.42
Nominal annual LNG quantity (million t/year)	1.6	3	4	5
Number of sea water pumps	4(2)	6(2)	6(2)	7(2)
Number of booster pumps for disaster prevention	3(1)	3(1)	3(1)	3(1)
Sea water intake end portion $10,000 \phi$	2	2	2	2
Sea water main pipeline $3,500 \phi$	2	2	2	2

(Note) Numbers in parentheses show the number of back-up pumps.

Year	2017~2020	2021~2025
Imported LNG (Million t/year)	0.61~1.31	$1.65 \sim 2.54$
Nominal annual LNG quantity (million t/year)	1.6	3
Number of sea water pumps	4(2)	5(2)
Number of booster pumps for disaster prevention	3(1)	3(1)
Sea water intake end portion $10,000 \phi$	2	2
Sea water main pipeline 3,500 φ	2	2

Table 5-4-44 Seawater facilities plan (Low Case; Area L-2)

(Note) Numbers in parentheses show the number of back-up pumps.

Year	2013~2018	2019~2023	$2024 \sim 2025$
Imported LNG (Million t/year)	0.30~1.60	1.76~2.72	3.20~3.31
Nominal annual LNG quantity (million t/year)	1.6	3	4
Number of sea water pumps	4(2)	5(2)	6(2)
Number of booster pumps for disaster prevention	3(1)	3(1)	3(1)
Sea water intake end portion $10,000 \phi$	2	2	2
Sea water main pipeline $3,500 \phi$	2	2	2

Table 5.4.45 Seawater facilities plan (Low Case; Area L-3)

(Note) Numbers in parentheses show the number of back up pumps.

For Areas C·M and D, seawater pumps for vaporizers are with 2,200 m³/h of capacity and 30 m of lift with two back-ups, booster pumps for disaster control are centrifugal types with 3,000 m³/h of capacity and 80 m of lift with one backup. Seawater facilities installation plan is shown in Table 5-4-46.

Table 5.4.46Seawater facilities plan (Areas C·M and D)

Case	High Case		Low	Case
Area	Area C·M	Area D	Area C·M	Area D
Year	'19~'2 5	'19~'25	20~'25	'20~'25
Imported LNG (Million t/year)	0.49	0.48	0.45	0.45
Nominal annual LNG quantity (million t/year)	1	1	1	1
Number of sea water pumps	4(2)	4(2)	4(2)	4(2)
Number of booster pumps for disaster prevention	3(1)	3(1)	3(1)	3(1)
Sea water intake end portion 2,800 ϕ	2	2	2	2
Sea water main pipeline 900 ϕ	2	2	2	2

(Note) Numbers in parentheses show the number of back-up pumps.

5-4-8 Gas Sendout Facilities

(1) Odorizers

The Gas Utility Industry Law in Japan requires that "the concentration of city gas must be at a level that is detectable when diluted in the atmosphere at a volume of 1/1,000." Ten mg/Nm³ of a mixture of DMS (Dimethyl Sulfide) and TBM (Tertiary Butyl Mercaptan), which Osaka Gas uses, will be employed as an odorizer. A facility plan assuming an odorizer tank capacity of thirty days' worth is shown in Tables 5-4-47, 5-4-48, 5-4-50 and 5-4-51 (Note: Specific weight of odorant is 0.8).

Year	2013~2019	2020~2023	$2024 \sim 2025$	$2020 \sim 2025$
Imported LNG (Million t/year)	0.34~1.37	$1.98{\sim}2.85$	3.31~3.52	4.10~6.28
Nominal annual LNG quantity (million t/year)	1.6	3	4	~ 6.5
Nominal LNG handling volume (million Nm ³ /day)	5.3	10	13	22
Odorant (kg/day)	53	100	130	220
Capacity of odorant tank (m ³)	2.0	3.7	4.9	7.9

Table 5-4-47 Installation of odorant facilities (High Case; Area L-2)

Table 5-4-48 Installation of odorant facilities (High Case; Area L-3)

Year	2009~2016	2017~2021	2022~2024	2025				
Imported LNG (Million t/year)	0.26~1.30	1.89~2.95	3.51~3.67	4.42				
Nominal annual LNG quantity (million t/year)	1.6	3	4	5				
Nominal LNG handling volume (million Nm ³ /day)	5.3	10	13	17				
Odorant (kg/day)	53	100	130	170				
Capacity of odorant tank (m ³)	2.0	3.7	4.9	6.1				

Table 5-4-49	Installation o	f odorant :	facilities (Low (Case; A	rea L-2)
--------------	----------------	-------------	--------------	-------	---------	----------

Year	2017~2020	2021~2025
Imported LNG (Million t/year)	0.61~1.31	1.65~2.54
Nominal annual LNG quantity (million t/year)	1.6	3
Nominal LNG handling volume (million Nm ³ /day)	5.3	10
Odorant (kg/day)	53	100
Capacity of odorant tank (m ³)	·2.0	3.7

Year	$2013 \sim 2018$	2019~2023	$2024 \sim 2025$
Imported LNG (Million t/year)	0.30~1.60	1.76~2.72	3.20~3.31
Nominal annual LNG quantity (million t/year)	1.6	3	4
Nominal LNG handling volume (million Nm³/day)	5.3	10	13
Odorant (kg/day)	53	100	130
Capacity of odorant tank (m ³)	2.0	3.7	4.9

Table 5-4-50 Installation of odorant facilities (Low Case; Area L-3)

Table 5-4-51 Installation of odorant facilities (Areas C·M & D)

1

Case	High	Case	Low Case		
Area	Area C·M	Area D	Area C·M	Area D	
Year	2019~2025	$2019 \sim 2025$	$2020 \sim 2025$	$2020 \sim 2025$	
Imported LNG (million t/year)	0.49	0.48	0.45	0.45	
Nominal annual LNG quantity (million t/year)	1	1	1	1	
Nominal LNG handling volume (million Nm ³ /day)	3.3	3.3	3.3	3.3	
Odorant (kg/day)	33	33	33	33	
Capacity of odorant tank (m ³)	1.3	1.3	1.3	1.3	

(2) Measurement and Quality Control

The send out pipe is equipped with measuring instruments and quality control devices. The orifice meter and the delta meter can be used to measure the volume of gas, and the calorimeter, the specific weight meter, and the analyzers including gas chromatography can be used to control quality.

5-4-9 Utility Facilities

A list of the required utility facilities is provided in Table 5-4-52.

e e e e e e e e e e e e e e e e e e e
Specification
300m ³ /h unit×3 units
1000m ³ /h unit×3 units
20m ³ /h unit×2 units
500m ³
20m ³ /day

Table 5-4-52 Utility facilities

5-4-10 Electrical equipment

(1) Basic Design Concept

- The capacity of the equipment must accommodate the maximum power demand.

- To manufacture and supply gas during regular maintenance periods, two systems will be necessary for key equipment (from power receiving to distribution). For reliability, the two systems will operate independently.
- If commercial power fails, back-up power needs to be secured by means of back-up power generation equipment. The capacity of this power generation equipment must be large enough to operate disaster-control facilities.
- · Monitoring and control must be centralized.

(2) Power Demand

The integration of electric power for gas manufacture/supply and maintenance is shown below.

Year		2013~2019	Τ	$2020 \sim 2023$		$2024 \sim 2025$	
LNG 1ry pump	4	220kW×2	6	220kW×4	7	220kW×5	
LNG 2ry pump	4	1,45 0kW ×2	6	1,450kW×4	7	1,450kW×5	
LNG transfer pump	3	170kW×1	3	170kW×1	3	170kW×1	
Sea water pump	4	780kW×2	6	780kW×4	6	780kW×4	
Sea water electrolyte equipment	2	320kW×1	2	320kW×1	2	320kW×1	
BOG compressor	5	1,100kW×4	5	1,100kW×4	5	1,100kW×4	
BOG booster	4	2,800kW×3	4	2,800kW×3	4	2,800kW×3	
Return gas blower	2	250kW×1	2	250kW×1	2	250kW×1	
Minimum basic electric power		2000kW		2000kW		2000kW	
Electric power required for plant construction	1000kW			1000kW	1000kW		
Total electric power	21210kW			26340kW		28010kW	
Required power receiving capacity		32MVA		40MVA		43MVA	

Table 5.4.53 Required electric power (High Case; Area L.2)

(Note) Power factor 0.8; Allowance factor 1.2

Year	2	009~2016	2	2017~2021	2	022~2024	Γ	2025				
LNG 1ry pump	4	220kW×2	6	220kW×4	4	220kW×2	6	220kW×4				
LNG 2ry pump	4	1450kW×2	6	1450k\X×4	4	1450kW×2	6	1450k₩×4				
LNG transfer pump	3	170kW×1	3	170kW×1	3	170kW×1	3	170kW×1				
Sea water pump	4	780kW×2	6	780k\¥×4	4	780kW×2	6	780k₩×4				
Sea water electrolyte equipment	2	320k₩×1	2	320k₩×1	2	320k₩×1	2	320k₩×1				
BOG compressor	5	1100k\¥×4	5	1100k\¥×4	5	1100kW×4	5	1100k\\×4				
BOG booster	4	2800kW×3	4	2800kW×3	4	2800kW×3	4	2800kW×3				
Return gas blower	2	250kW×1	2	250kW×1	2	250kW×1	2	250kW×1				
Minimum basic electric power		2000kW		2000k₩		2000kW		2000kW				
Electric power required for plant construction		1000k₩	1000k₩		1000kW		1000		1000k₩ 10			1000kW
Total electric power		21210kW		26340kW		28010kW		30620kW				
Required power receiving capacity		32MVA		40NVA	43MVA		51MVA					

Table 5-4-54 Required electric power (High Case; Area L-3)

(Note) Power factor 0.8; Allowance factor 1.2

Year	2	2017~2020	2	021~2025
LNG 1ry pump	4	220kW×2	5	220kW×3
LNG 2ry pump	4	1450kW×2	5	1450kW×3
LNG transfer pump	3	170kW×1	3	170kW×1
Sea water pump	4	780kW×2	5	780kW×3
Sea water electrolyte equipment	2	320kW×1	2	320kW×1
BOG compressor	5	1100k\¥×4	5	1100kW×4
BOG booster	4	2800kW×3	4	2800kW×3
Return gas blower	2	250kW×1	2	250kW×1
Minimum basic electric power		2000kW		2000kW
Electric power required for plant construction		1000kW		1000kW
Total electric power	T	21210kW		23890kW
Required power receiving capacity	ŀ	32MVA		36MVA

Table 5.4-55 Required electric power (Low Case; Area L-2)

(Note) Power factor 0.8; Allowance factor 1.2

Year	2	013~2018	2	019~2023	20	$)24 \sim 2025$	
LNG 1ry pump	4	220kW×2	5	220kW×3	6	220kW×5	
LNG 2ry pump	4	1450kW×2	5	1450k\%×3	6	1450kW×5	
LNG transfer pump	3	170kW×1	3	170k\X×1	3	170k\X×1	
Sea water pump	4	780kW×2	5	780kW×3	6	780kW×4	
Sea water electrolyte equipment	2	320k₩×1	2	320kW×1	2	320k₩×1	
BOG compressor	5	1100k\X×4	5	1100k\¥×4	5	1100kW×4	
BOG booster	4	2800kW×3	4	2800kW×3	4	2800kW×3	
Return gas blower	2	250kW×1	2	250kW×1	2	250kW×1	
Minimum basic electric power		2000k₩		2000kW		2000kW	
Electric power required for plant construction	1000k₩		1000k₩			1000kW	
Total electric power		21210kW		23890kW		26340kW	
Required power receiving capacity		32MVA	36MVA		40MVA		

Table 5-4-56 Required electric power (Low Case; Area L-3)

(Note) Power factor 0.8; Allowance factor 1.2

Table 5.4.57 Required electric power (High Case and Low Case; Areas C-M and D)

Year		~2025	
LNG 1ry pump	4	110kW×2	
LNG 2ry pump	4	630kW×2	
LNG transfer pump	6	110kW×1	
Sea water pump	4	780kW×1	
Sea water electrolyte equipment	2	30kW×1	
BOG compressor	5	1,100kW×4	
BOG booster	4	2,800kW×3	
Return gas blower	2	250kW×1	
Minimum basic electric power		2,000kW	
Electric power required for plant construction	1,000kW		
Total electric power		19,920kW	
Required power receiving capacity		29MVA	

(Note) Power factor 0.8; Allowance factor 1.2

5 - 81

Equipment name	Motor capacity	Number of unit	Required power	Required total power	Rash power at starting		
Minimum basic electric power	1,000 kW	-	1,000 kW	1,000 kW	2,000 kW		
Hi-Ex, Water pump	500 kW	1	500 kW	1,500 kW	2,000 kW		
Sea water pump for vaporizer	780 kW	1	780 kW	2,280 kW	3,060 kW		
Sea water pump for fire fighting	900 kW	1	900 kW	3,180 kW	4,080 kW		
Sea water pump for fire fighting	900 kW	1	900 kW	4,080 kW	4,980 kW		

Table 5-4-58 Required minimum electric power for fire prevention and extinguishing

* "Rush power" is pre-start electric power surge (capacity of respective motor \times 2).

Emergency power generation equipment: Gas turbine 5,000 kW (power factor: 0.8) \times 1 unit, designed at 40°C

(3) Outline of Equipment

(Power-receiving/distribution equipment)

- Power receiving equipment must entail two systems capable of supplying enough power to manufacture/supply gas and unload LNG while commercial power equipment is being inspected.
- Power receiving transformers must entail two systems of equipment capable of supplying enough power to manufacture and supply gas. They must be capable of meeting an increase in power demand when unloading LNG, running the two systems together. The two systems must operate independently.
- The bus line configuration of the distribution equipment must be capable of supplying enough power to manufacture and supply gas when one bus line is disconnected for regular maintenance and others.
- The equipment supplies power to large motors and regional transforming equipment. Power is supplied to regional transforming equipment via two systems.

① Power receiving equipment

Method 69 kV - 60 Hz, two lines (permanent, reserve)

Capacity 50 MVA/line (420 Å)

Type GIS (gas insulation switch gear), installed outdoors

Power receiving/transformer
 Capacity 25 MVA x 2

5 - 82

Type69 kV/6.24 kV, hydraulic self-cooling, installed outdoorsOperationOperate two systems independently

3 Distribution equipment

Type Single bus line divided into four

System Metal-clad switchgear, installed indoors

Operation Operate two systems independently

(Areal transforming equipment)

- Areal transforming equipment is responsible for supplying power to small- and medium-sized motors and lighting equipment.

- The bus line configuration of the distribution equipment must be capable of supplying enough power to manufacture and supply gas when one bus line is disconnected for regular maintenance and others.

(DAreal transforming equipment

· Metal-clad switchgear, installed indoors

· Use combination starter for high-voltage distribution equipment

· Operate two systems independently

- Transformer for distribution Power 6.24 kV/440 V, Lighting 6.24 kV/110-220 V, installed outdoors

(Building for substation room)

- The substation room must be of the enclosed type, ferro-concrete, and equipped with an air-conditioner.

(Distribution in the plant)

· Cables must be constructed in an open-pit.

· Fire-retardant CV cables must be used.

5.4.11 Control and supervision systems

(1) Design Policy

This LNG terminal has the responsibility to maintain a stable gas send out capability according to varying gas demand for town gas consumption, electric power generation, and NGV vehicles. The process control and supervision system must consider the following items.

- Gas send-out reliability and system and facilities redundancy in case of mal function or incident.
- Terminal management efficiency and labor reduction.
- · Easy and efficiency maintenance.
- Easy and efficiency system expansion according to increment of gas demand in future and system hardware replacement almost every 15 years.
- Adoption of experienced and proven latest technology, especially the integrated information system.

So, this system is based on Distributed Control System (DCS) and Integrated Information System.

(2) System Composition.

To realize stable, reliable, and efficient management of latest LNG terminal, several systems will be required, and all system information shall be integrated.

Required major systems are as follows.

- Distributed Control system of LNG facilities that include high-voltage electric power supply equipments.
- Supervision computer system for process data saver and interface of office network.
- Disaster prevention facilities control and supervision system for detecting LNG and/or gas leakage, fire detection and control of fire extinguisher and/or water deluge system of LNG tanks.
- · Laboratory system for unloaded or storage LNG and gas analyzer for send out gas.
- Mooring monitoring system included for weather, tidal and wave condition monitoring.
- · Unloading arm supervision system, which is closely related to arm operation.
- · As an independent system, intruder supervision and alarm system for Guardhouse.
- · Closed circuit television system for the entire terminal area.
- · Paging system for the entire terminal area.
- Standalone system for software debugging when changing or adding programs, and training of new operators.

Note;

• This system excludes Vessel Navigation System for harbors. This kind of navigation system is assumed to be controlled and supervised by a Governmental Organization or others.

- Also exclude personnel affairs, organizational management, financial data saver, and other systems related to company management. These systems shall be realized for office automation systems.
- Abbreviations

DCS = Distributed Control System

SSS = Safety and Security System

MMS = Marine Monitoring System

PMS = unloading arm Position Monitoring System

ESD = Emergency Shut Down system

- SCS = Supervision Computing System
- (3) Design Concept
- 1) System segregation and integration.
- (a) DCS segregate SSS (Safety and Security System), because of importance and operability in case of an accident.
- (b) DCS segregate PMS (unloading arm Position Monitoring System), MMS (Marine Monitoring system), and Laboratory System, because of these particular functions.
- (c) Most data from DCS, SSS, and Laboratory System are integrated in SCS (Supervision Computing System), and connected to an office network through Data server and firewall.

2) Redundancy and reliability.

duplex or dual structure for redundancy.

(a) DCS and SSS are composed of a full back-up system. Main system and back-up system are almost the same to apply the same software to reduce software production costs.

After approximately 15 years system hardware must be replaced. This design structure makes it easy for hardware replacement without shutting down the process by applying a "Hot Cut Over" operation.

Switching over is done automatically in the case of a computer watchdog, but in other cases an operator can switchover manually according to his judgment.

(b) DCS is divided into two groups. Each group system is located in a different room independently and electric power is supplied by different systems. Each group handles approximately half of the LNG terminal facilities to avoid all

facilities being shut down at the same time due to electric power failure and/or fire. (c) Common elements such as Data way, operator consoles, and printers have as (d) To cope with simultaneous shutdown, which is mostly caused by electric power failures, computer software is basically designed to operate interactively with the operator.

5-4-12 Main facilities and Layout

Table 5-4-59 shows a list of the main facilities for each case. Figures 5-4-1, 5-4-2 and 5-4-3 show the layout of LNG receiving terminals for five million, four million and three million tons per annum.