

Myanmar

Integrated Liquefied Petroleum Gas Project (Phase I-Part 2) (Phase II)

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Field Survey: September, 2001

1. Project Profile and Japan's ODA Loan



Site Map



Site Photo : LPG Extraction Plant at Minbu

1.1 Background

In Myanmar (formerly Burma), oil and natural gas were available as natural resources, with proved reserves of 2,141 million barrels and 5,158 billion cubic feet, respectively. In an effort to take advantage of these resources, the Government made a policy to acquire foreign currency through the export of LPG. In addition, increasing exports through diversification was presented as one of the country's most important economic targets in the Fourth 4-year Economic Plan (April 1982 to March 1986). Meanwhile, it was anticipated that domestic demand for LPG, which was low at that time, would increase by appropriate energy policy for LPG. This project was considered a key to the materialization of the above plan.

1.2 Objectives

To produce 30,000 ton/year (T/Y) of LPG in Phase II project and to export 53,000 T/Y of LPG by utilising the LPG Export Facility in Phase I-Part 2 Project, and thereby promote the diversification of export items.

1.3 Project Scope

LPG Terminals (Phase I-Part 2) at Mann and Thanlyin

1. Construction of LPG Terminals at Mann; consisting of LPG tanks, shipping pumps, LPG pipelines from Mann Refinery to the jetty and other related facilities
2. Construction of LPG Terminals at Thanlyin; consisting of LPG tanks, shipping pumps, LPG pipelines from Thanlyin Refinery to the jetty and other related facilities
3. Procurement of 4 number of LPG River Barges with loading unit of 250 Ton x 2 loading capacity
4. Engineering and Supervision

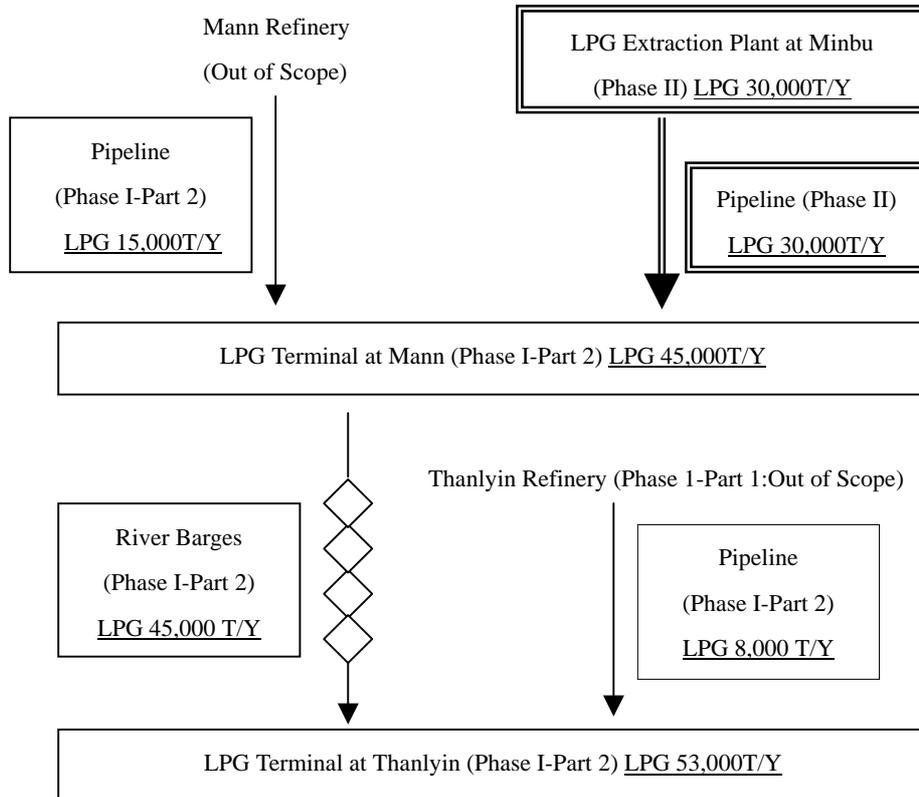
LPG Extraction Plant (Phase II) at Minbu

1. Construction of LPG Extraction Plant with 30,000 T/Y LPG production capacity

2. Construction of shipping facilities; consisting of LPG pipelines from LPG Extraction Plant at Minbu to LPG Terminal at Mann, transportation pumps and auxiliary facilities
3. Engineering and Supervision

The Loan was available for the foreign currency portion of the above items.

Figure 1: Project Scope



1.4 Borrower/Executing Agency

The Petrochemical Industries Corporation (PIC)

1.5 Outline of Loan Agreement

	Phase I –Part 2	Phase II
Loan Amount	7,960 million yen	7,100 million yen
Loan Disbursed Amount	7,960 million yen	7,100 million yen
Exchange of Notes	July 1982	November 1982
Loan Agreement	August 1982	January 1983
Terms and Conditions		
Interest Rate	2.25% p.a.	2.25% p.a.
Repayment Period (Grace Period)	30 years (10 years)	30 years (10 years)
Procurement	Partially Untied	Partially Untied
Final Disbursement Date	July 1987	January 1988

2. Results and Evaluation

2.1 Relevance

The proven oil reserves in Myanmar at the time of appraisal were around 2,141 million barrels, and natural gas reserves totalled 5,158 billion cubic feet (equivalent to 860 million barrels oil). Actual production of oil in 1980 was 11.2 million barrels and of natural gas, 20 billion cubic feet. On the other hand, the capacity of refineries in Myanmar was 19.5 million barrels per year, including the Mann Refinery, which was constructed in June 1982 under a Japanese ODA Loan. The economic policy set out in the Fourth 4-year Economic Plan (April 1982 to March 1986) laid emphasis on the acquisition of foreign currency through production and export of LPG, an effort that would also take advantage of available natural resources and utilize oil refinery capacity to the maximum extent.

However, as discussed further below, the volume of oil reserves and natural gas, that are raw materials of LPG, were both much lower than expected at the time of appraisal. The C₃ (propane)/C₄ (butane) content of the natural gas was lower than expected, too. Because of these matters, this project failed to accomplish its objectives. Judging from the result, the plan for this project was inappropriate.

2.2 Efficiency

2.2.1 Project Scope

The project scope was essentially the same as that of the original plan.

2.2.2 Project Implementation Schedule

The LPG Export Facility was completed almost as per original schedule. However, the LPG Extraction Plant was completed in February 1987, 11 months behind schedule. This was mainly due to a delay in finalizing the agreement with the construction contractor, since it took longer than expected to finalize the basic design such as gas availability.

2.2.3 Project Cost

The actual total project cost, both foreign and local currency portions, was almost within budget.

2.3 Effectiveness

2.3.1 Volume of LPG Actual Production at LPG Extraction Plant at Minbu

The targeted volume of LPG production was 30,000 T/Y:11,200 T/Y C₃ LPG and 18,800 T/Y C₄ LPG. However, actual production is much less than the target volume, as shown in Table 1.

Table 1: LPG Production Volume in LPG Extraction Plant at Minbu
(Unit: T/Y)

Fiscal Year	C ₃ LPG	C ₄ LPG	LPG Total
Target	11,200	18,800	30,000
1987	2,595	3,993	6,588
1988	2,763	3,271	6,034
1989	1,023	1,177	2,200
1990	1,787	2,207	3,994
1991	2,564	2,622	5,186
1992	3,155	3,793	6,948
1993	3,910	4,256	8,166
1994	3,978	4,202	8,180
1995	2,933	3,036	5,969
1996	2,104	2,099	4,203
1997	1,846	2,305	4,151
1998	2,360	2,719	5,079
1999	2,698	3,153	5,851
2000	2,731	3,128	5,859

Source: Data prepared by Minbu LPG Extraction Plant

The discrepancy between target and actual figures is due to the low natural gas volume and low C₃/C₄ content of the natural gas (see Table 2), not due to defects or failures in the operation and maintenance of the plant.

Table 2: Gas Supply Volume and Gas Composition

Fiscal Year	Appraisal	Actual												
	Plan (1982)	1987-88	1988-89	1989-90	1990-91	1991-92	1992-93	1993-94	1994-95	1995-96	1996-97	1997-98	1998-99	1999-2000
Volume (MMSCFD ¹)	24.0	14.0	14.0	14.1	14.0	14.0	13.2	13.1	14.6	15.3	14.8	15.6	15.4	13.7
Composition of C ₃ /C ₄ (Mol.%)	7.07	4.51	3.62	3.25	3.05	2.55	3.59	3.80	3.88	2.96	2.31	2.02	2.37	n.a.

Source: PIC(Appraisal), data submitted by Ministry of National Planning and Economic Department, Foreign Economic Relations Department (FERD;Actual)

According to Myanmar Petrochemical Enterprise (MPE), no improvement in natural gas supply or content of natural gas can be expected, because the Mann gas field, which provides natural gas to the extraction plant at Minbu, is being depleted. Under these conditions, it is unforeseeable that the target volume of producing LPG 30,000T/Y will be accomplished in the future.

2.3.2 Volume of LPG Actual Transportation

The total target volume for LPG transportation is 53,000 T/Y. However, actual volumes are much less than target values, due to shortages from all three sources, as shown in Table 3.

¹ MMSCFD: Million Standard Cubic Feet per Day

Table 3: LPG Transportation Balance

(Unit: T/Y)

Fiscal Year	From Mann Refinery to Mann Terminal	From Minbu Extraction Plant to Mann Terminal	From Thanlyin Refinery to Thanlyin Terminal	Total
Target (C ₃ +C ₄)	15,000	30,000	8,000	53,000
1987	804	6,588	0	7,392
1988	2,555	6,034	337	8,926
1989	3,608	2,200	496	6,304
1990	3,125	3,994	197	7,316
1991	2,847	5,186	447	8,480
1992	3,123	6,948	667	10,738
1993	2,810	8,166	1,324	12,300
1994	2,978	8,180	495	11,653
1995	2,527	5,969	1,960	10,456
1996	1,808	4,203	1,960	7,971
1997	1,800	4,151	4,463	10,414
1998	1,521	5,079	4,552	11,152
1999	1,928	5,851	5,764	13,543
2000	2,408	5,859	6,551	14,818

Source: PIC (Target), data prepared by MPE, Minbu LPG Extraction Plant (Actual),

According to the FERD, both the Mann Refinery and the Thanlyin Refinery could not achieve target production volumes because of the lack of crude oil for processing.

However, some countermeasures are already being implemented to increase the volume of LPG. According to FERD, imported crude oil is already transported to Mann Refinery, and there are plans to increase the annual amount of foreign crude oil imported to run the Mann Refinery at full capacity. As for Thanlyin Refinery, some facilities, such as a stabilizer, were added to the Refinery in 1999 so that it could process imported crude oil more efficiently. As a result, an additional 2,000-3,000 of LPG were transported to Thanlyin Terminal.

2.3.3 Recalculation of Internal Rate of Return

At the time of Appraisal, the Economic Internal Rate of Return (EIRR) was 8.3%. However, the recalculation of the EIRR was negative. This discrepancy is due mainly to the low benefit of the project. Actual LPG production was less than 20% of the planned volume from 1987 to 2000. The low performance of LPG production has strongly affected the EIRR recalculation.

2.4 Impact

2.4.1 Export and domestic demand for LPG

At the time of appraisal, there was little demand for LPG in Myanmar. In addition, MPE (at the time of appraisal, PIC) estimated that local consumption would be about 3,000 T/Y in 1985 and would not increase dramatically in the future. On the basis of these figures, the plan for this project focused on

exporting all of the LPG produced (53,000T/Y), thereby acquiring foreign currency. However, as Table 4 shows, local consumption increased drastically. A substantial volume of LPG was supplied to the domestic market, instead of for export. According to MPE, LPG supplied to the domestic market is used as cooking and heating fuel at homes and restaurants, and also for industrial purposes. It is likely that LPG served as an alternative to kerosene, timber and charcoal, and partially contributed to saving those natural resources.

Table 4: LPG Domestic, Export & Import Market Balance
(Unit: T/Y)

Fiscal Year	Local Consumption	Export	Import
1987	5,027	2,585	0
1988	6,495	0	0
1989	5,932	664	0
1990	7,666	0	0
1991	9,472	1,026	0
1992	9,001	0	0
1993	11,037	0	0
1994	12,793	0	0
1995	9,196	0	0
1996	11,617	0	2,346
1997	12,200	0	1,249
1998	12,887	0	1,782
1999	13,375	0	0
2000	14,097	0	0

Source: Data submitted by FERD

The detailed data concerning LPG exports are shown in Table 5. LPG was exported in 1985, 1987, 1989 and 1991. The total amount of LPG exports is 7,358 Tons, which is about 5% of the total LPG production volume, 141,463 Tons (see Table3). According to FERD, foreign currency the equivalent of 509,906 US\$ was acquired through LPG export.

Table 5: Export of LPG

Exported Year	Amount of Export	Export Price of LPG	Subtotal
1985	3,082 Ton	71.74 US\$/Ton	221,103 US\$
1987	2,585 Ton	48.28 US\$/Ton	124,804 US\$
1989	664 Ton	90.06 US\$/Ton	59,800 US\$
1991	1,027 Ton	101.46 US\$/Ton	104,199 US\$
Total	7,358 Ton	-	509,906 US\$

Source: Data submitted by FERD

2.4.2 Technology Transfer

This is the first LPG project in Myanmar. Through implementation of this project, knowledge of and experience with LPG production, transportation and handling was transferred to the appropriate organizations in Myanmar. This technology transfer is contributing to the materialization of two skid-mounted LPG extraction plants, currently being executed by Myanmar on its own.

2.4.3 Environmental Impact

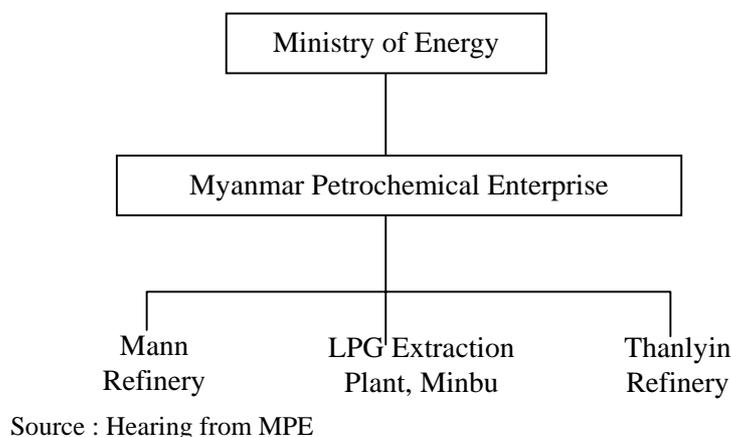
According to MPE, no adverse impacts on the environment have been observed in terms of air pollution, water pollution or solid waste disposal since project completion.

2.5 Sustainability

2.5.1 Organization of Operation and Maintenance

Today, the operation and maintenance agency is Myanmar Petrochemical Enterprise (MPE), an arm of the Ministry of Energy (MOE). The organization chart is shown below.

Figure 2: Organization of Operation and Maintenance



Actual operation and maintenance for each activity in this project is taken care of by the following enterprises:

- LPG Export Facility at Mann (Phase I- Part 2): By 3-5 personnel under the management of Mann Refinery
- LPG Export Facility at Thanlyin (Phase I-Part 2): By 5-8 personnel under the management of Thanlyin Refinery
- LPG Transportation using River Barges (Phase I-Part 2): By Crude Oil and Petroleum Products Movement Department under MPE
- For LPG Extraction Plant at Minbu (Phase II) and Pipeline from Minbu to Mann (Phase II): By LPG Extraction Plant at Minbu, with a total of 341 personnel: Planning=151, Production=66, Administration=91, Finance=19 and Laboratory=14.

The manpower for O&M services, administrative and organizational structure, and technical competence is sufficient. Intensive courses on various O & M subjects and on safety during LPG production, storage and transportation are conducted on a regular basis for all factory personnel of the MPE. As a result, technical knowledge to complete the O & M work is sufficient, and O & M planning capacity is fair.

2.5.2 Financial Status of MPE

MPE is a public sector organization operating under the Ministry of Energy. Table 6 shows a breakdown of MPE's profit and loss balance sheet. Judging from the table submitted by FERD, the financial condition of MPE seems to be sufficient.

Table 6: Profit and Loss Balance of MPE (2000-2001)

(Million Kyat)				
	Particulars	1998-1999	1999-2000	2000-2001
1	Sales	47529.487	52813.753	48031.003
2	Production cost	5920.274	19778.193	17533.36
3	Gross profit & loss (=1-2)	41609.213	33035.56	30497.643
4	Administrative expenses	204.224	198.645	332.174
5	Selling and distribution expenses	82.51	59.717	198.547
6	Invention & research	0.611	0.516	1.826
7	Commercial tax	14022.362	14058.037	11630.758
8	Profit & loss (=3-4-5-6-7)	27299.506	18718.645	18334.338
9	Other income	56.522	49.048	50.788
10	Interest	249.629	95.136	67.727
11	Net profit & loss (=8+9-10)	27106.399	18672.557	18317.399

Source: Data submitted by FERD

2.5.3 Sustainability of the project

Today, the project is not generating a profit. This is due mainly to the low production volume of LPG. The insufficient supply of natural gas and crude oil, and the low content of C₃/C₄ in the natural gas have contributed to this low performance. According to the MPE, the supply of natural gas and crude oil is not likely to improve in the future, and the target production volume of 53,000T/Y cannot be realized. Under these circumstances, it can be concluded that this project is no longer sustainable.

3. Lessons Learned

On the occasion of appraisal for the project whose outcome derives from natural resources, due diligence to secure the natural resource reserves is indispensable through analysis of related information from the viewpoint of its method, process and the capacity of the conducting institution.

Comparison of Original and Actual Scope

Item	Plan	Actual
1. Project scope		
<u>LPG Export Facility</u>		
1) LPG Terminal at Thanlyin		- Same as Plan -
(1) C3LPG Tank	1,000m ³ x 4	
C4LPG Tank	1,000m ³ x 1, 2,000m ³ x 3	
(2) C3LPG Shipping Pump	150m ³ /H x 3	
C4LPG Shipping Pump	150m ³ /H x 3	
(3) LPG Pipeline	2km length	
(4) Utilities Facilities	Water Intake, Cooling Water, Instrument Air, Nitrogen Generator, Power Receiving	
2) LPG Terminal at Mann		- Same as Plan -
(1) C3LPG Tank	800m ³ x 2	
C4LPG Tank	1,000m ³ x 1	
(2) C3LPG Shipping Pump	100m ³ /H x 3	
C4LPG Shipping Pump	100m ³ /H x 3	
(3) LPG Pipeline	3km length	
(4) Utilities Facilities	Water Pond Cooling Water Hydrant Pump Sprinkler Pump	
3) River Barges		- Same as Plan -
(1) LPG River Barges	4 number	
(2) Loading Unit	250tons x 2	
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<u>LPG Extraction Plant</u>		
1) LPG Extraction Facility	LPG 30,000 T/Y	- Same as Plan -
2) LPG Pipelines	34 km length	
2. Implementation Schedule		
<u>LPG Export Facility</u>		
1) Start of Project	Sep.1982	Sep.1982
2) Commissioning of Mann Terminal	Dec.1985	Dec.1985
3) Commissioning of Thanlyin Terminal	Apr. – Jun.1985	Sep.1985
<hr style="border-top: 1px dashed black;"/>		
<u>LPG Extraction Plant</u>		
1) Start of Project	Feb.1983	Jun.1983
2) Completion of Construction	Oct.1985	Dec.1986
3) Test-Run	Nov.1985 – Feb.1986	Jan.1987
3. Project Cost		
Foreign Currency	15,060 Million Yen	15,060 Million Yen
Local Currency	3,681 Million Yen	4,034 Million Yen
Total	18,741 Million Yen	19,094 Million Yen
ODA Loan Portion	15,060 Million Yen	15,060 Million Yen
Exchange Rate	30.0 Kyat / Yen	30.0 Kyat / Yen