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Impact Evaluation Study Series (Number 36)

IMPACT EVALUATION STUDY

OF

BANK OPERATIONS IN THE GAS SECTOR

IN

PAKISTAN

December 1995

CURRENCY EQUIVALENTS

Currency Unit – Pakistan Rupee (PRs)

ABBREVIATIONS

DGG	-	Directorate General (Gas)
HESS	-	Household Energy Strategy Study
KESC	-	Karachi Electric Supply Corporation Limited
LPG	-	Liquefied Petroleum Gas
MPNR	-	Ministry of Petroleum and Natural Resources
OGDC	-	Oil and Gas Development Corporation
PCR	-	Project Completion Report
PGCL	-	Pirkoh Gas Company Limited
PPAR	-	Project Performance Audit Report
SGTC	-	Sui Gas Transmission Company Limited
SNGPL	-	Sui Northern Gas Pipeline Limited
SSGC	-	Sui Southern Gas Company Limited
TA	-	Technical Assistance

WEIGHTS AND MEASURES

kg	-	kilogram
MCF	-	thousand cubic feet
MMCF	-	million cubic feet
toe	-	tons of oil equivalent

NOTES

(i) The fiscal year (FY) of the Government ends on 30 June.
(ii) In this Report, "$" refers to US dollars.

CONTENTS

I. INTRODUCTION

1. Since commercial quantities of gas were discovered in 1952, Pakistan has developed an extensive natural gas distribution network and natural gas has come to represent an important source of energy. In most years, gas has been second only to oil as a source of primary energy.[1] In 1993/94, for example, natural gas accounted for almost 38 percent of the primary energy available in Pakistan compared with about 42 percent for oil (see Appendix 1). In some years, gas consumption exceeded that of oil.

2. Gas is used mainly for power generation, which accounts for almost 36 percent of natural gas consumed in Pakistan; production of fertilizer, 23 percent; and domestic uses, 16 percent (see Appendix 2). Exploration, development, and production of natural gas have been undertaken by both the private and public sectors. The Oil and Gas Development Corporation (OGDC) and its subsidiary, Pirkoh Gas Company Limited (PGCL), have been the responsible public sector entities.

3. Transmission and distribution of gas are largely handled by Sui Southern Gas Company Limited (SSGC), which operates in Sindh and Balochistan; and Sui Northern Gas Pipeline Limited (SNGPL), which operates in the northern part of Pakistan. The SSGC system, which has a capacity of approximately 600 million cubic feet (MMCF) per day and serves about 990,000 end users in 66 towns and cities, is slightly larger than that of SNGPL.

4. Since the early 1970s, the Bank has played an important part in the development of the gas sector in Pakistan through both loans and technical assistance (TA). The first loan of $29.66 million was given in 1974 for the Sui-Karachi Gas Pipeline Project.[2] Altogether, the Bank has provided 12 loans with a total value of $598.12 million for ten projects in the gas sector in Pakistan (see Appendix 3). This includes a supplementary loan for the Sui-Karachi Gas Pipeline Project[3] and two loans for the Third Pirkoh Gas Development Project.[4] The most recent loan of $178 million was given in 1991 for the Sui-Southern Gas System Rehabilitation and Expansion Project. In addition, the Bank has given 11 TAs with a value of $3.9 million for the sector (see Appendix 4). The most recent TA was $680,000 in 1991 for the Environmental, Safety and Efficiency Improvement of SSGC's Operations.

5. Five of the projects funded by the Bank have been primarily for gas development and five for transmission and distribution. The Bank has not provided assistance for exploration. The Bank's loans and TAs have been provided to assist in the activities of SSGC (or its predecessors) for the transmission and distribution projects, and PGCL for the development of the Pirkoh gas field and OGDC. The Bank has not provided any direct assistance to SNGPL. Since 1990, however, SNGPL has been receiving allocations of gas from the Pirkoh gas field (see Appendix 5), and the company has received considerable assistance from the World Bank.

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1 This makes no allowance for energy derived from "traditional" sources such as firewood and dung, which are important in the household sector.

2 Loan No.181-PAK: *Sui-Karachi Gas Pipeline*, for $29.66 million, approved on 14 March 1974.

3 Loan No. 187-PAK: *Sui-Karachi Gas Pipeline (Supplementary),* for $23.51 million, approved on 6 August 1974.

4 Loan No. 929-PAK: *Third Pirkoh Gas Development*, for $65.35 million, approved on 13 December 1988; and Loan No. 930-PAK(SF): *Third Pirkoh Gas Development*, for $45.00 million, approved on 13 December 1988.

6. Project Completion Reports (PCRs) and Project Performance Audit Reports (PPARs) have been prepared for six projects (seven loans) and, in spite of various technical problems and sometimes lengthy delays, all completed projects have been classified as generally successful. However, many projects were interrelated and this made it difficult to determine project boundaries. This means that by focusing on individual projects, broader issues may have been ignored. These matters have been recognized and a number of the PPARs have recommended that an impact evaluation study be undertaken.

II. BACKGROUND

A. Objectives, Approach, and Methodology

7. The major purpose of this Study is to assess the impact and overall effectiveness of Bank assistance in the natural gas subsector in Pakistan in meeting development objectives. In particular, the Study aims to identify and review issues that may have had implications for the sustainability of the efficient performance of both past and future Bank-assisted projects.

8. One of the major recommendations in PPARs relates to the importance of conducting an impact study. This Study has been designed to be issues oriented and does not make any attempt to quantify the aggregate development impact of the projects. Instead, the Study focuses on important issues relating to the Government's close involvement in the natural gas subsector. The major issues to be covered include (i) pricing, (ii) resource allocation, (iii) institutional arrangements, (iv) environmental impact, and (v) major beneficiaries.

9. The Study required an Impact Evaluation Mission (the Mission), which was undertaken by Bank staff in August 1995, to identify the main issues and new developments in the sector as well as confirm earlier findings indicated in the Bank reports. The Mission had consultations with officials from the Government, Executing Agencies, other gas companies, and a cross section of major industrial consumers. The Study also used the results of the recent surveys on Household Energy Demand,[1] Household Integrated Economic Survey[2] and the Survey on Sui Gas Market Potential in Karachi.[3] These surveys provided information on the current pattern of natural gas consumption by households and the major factors affecting consumption.

B. Macroeconomic Setting

10. Pakistan's economic performance for most of the 1980s and early 1990s was impressive, with an average growth of 6 percent in gross domestic product (GDP). Preliminary estimates for 1995 indicate that GDP will grow by 4.7 percent compared with 3.8 percent in 1994. On the demand side, exports increased and fixed investment rose by 17 percent. While the real sectors of the economy continued to improve in 1995, an inflation of 13 percent and a current account deficit of 4.7 percent were larger than anticipated. The current account deficit is expected to be financed from increased capital flows, of which those associated with foreign investments in the energy sector are of particular importance.

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1 UNDP. 1993. "Household Energy Demand: Consumption Patterns, Pakistan. Household Energy Strategy Study."

2 Federal Bureau of Statistics. 1992. "Household Integrated Economic Survey." Government of Pakistan.

3 "Sui Southern Gas Company, Limited. and Department of Social Work, University of Karachi. 1993. "Report of Sui Gas Market Potential: A Survey Conducted in Karachi."

11. Through policy measures, the Government has been emphasizing its commitment to industrial deregulation and privatization. Its stated objective is to prioritize the functions and operations that can be more efficiently and cost-effectively carried out by the private sector. Starting in 1991, it initiated the public enterprise privatization process. Concerns have been raised about the transparency of this process. In many cases, such matters as the evaluation of assets, financial health, and reserve price have been kept secret, and investors have frequently been required to bid on the basis of unaudited accounts.

12. In the natural gas subsector, privatization efforts have been initiated for both SNGPL and SSGC under which the Government intends to divest a substantial percentage of its shares. In July 1992, approximately 5 million shares of SNGPL were offered to the general public as part of the Government's plan to reduce its holdings from 91 percent to under 50 percent. However, only 15 percent of SNGPL's shares were subscribed to by the public. Under the most recent Bank loan to the subsector, Sui-Southern Gas System Rehabilitation and Expansion Project, the Bank provided support to the Government for divesting its shareholding in SSGC to private sector interests. Under the provisions of the plan, the Government was requested to reduce its shareholding from 98 percent to less than 40 percent by mid-1994. Although considerable preliminary work has been undertaken, the divestment has still not taken place and consultants are still assisting in the preparatory efforts.[1]

13. In the gas sector, doubts have also been raised about the Ministry of Petroleum and Natural Resources' (MPNR's) efficiency and effectiveness in its operations, particularly its ability to govern both public and private sector entities in the oil and gas industry. Gas price increases enacted in 1991 as part of the Petroleum Policy did not create the exploration and development stimulus that the Government desired. Further, while progress was made in adjusting the level of the consumer price of gas, a corresponding realignment in the structure of these prices was not implemented. This has resulted in continued distortions.

14. In 1994, the Government introduced a new Petroleum Policy, which also covered the gas sector.[2] Among other things, it provided for (i) increased autonomy for OGDC, which is to be restructured on commercial lines and given complete autonomy and authority in all administrative, operational, and financial matters; (ii) separation of the Government's ownership and regulatory functions; and (iii) increases in gas prices to 67.5 or 77.5 percent of imported crude oil prices (depending on the area). In addition, the Policy covers such matters as natural gas imports, sale of natural gas to the private sector, natural gas allocations for manufacturing industries, consumer prices, and policies with respect to liquefied petroleum gas (LPG) and compressed natural gas.

C. The Bank's Operational Strategy

15. The Bank's overall operational strategy for Pakistan is to support the ongoing measures for structural adjustments of the economy to correct macroeconomic imbalances, and to support measures to ensure consistent real economic growth with social equity. Given the Government's resource constraints, the Bank emphasizes the importance of creating an appropriate environment in which the private sector will be willing to share in the Government's development task. In the natural gas subsector, the Bank's main objective is to increase gas

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1 Loan No. 1138-PAK: *Sui-Southern Gas System Rehabilitation and Expansion Project*, for $178 million, approved on 3 December 1991.

2 Government of Pakistan, Ministry of Petroleum and Natural Resources. March 1994. "Petroleum Policy 1994."

supply capacities in both the urban and rural areas to sustain the projected growth of the economy. Thus, the Bank aims to assist the Government in (i) mobilizing investment resources by establishing an adequate pricing structure that reflects the economic cost of supply; (ii) expediting privatization in all aspects of energy development, transmission, and distribution; (iii) supporting the public sector Core Investment Program; and (iv) formulating institutional reforms.

III. OBJECTIVES AND SCOPE OF THE BANK'S PROGRAM

16. The objectives of Bank-assisted projects have largely been to increase the availability of gas in the country by overcoming constraints on production, transmission or distribution (see Appendix 6). For example, the objective of the Bank's first project in the sector, the Sui-Karachi Gas Pipeline Project, was to expand Sui Gas Transmission Company Limited's (SGTC's) transmission capacity to meet the increasing demand for gas in the Sui-Karachi area. Subsequent projects had similar objectives, but Government concerns about foreign exchange "shortages" and the country's heavy dependence on "imported energy resources" also seem to have influenced the selection of projects.

17. The Sui-Karachi Gas Pipeline Project identified foreign exchange earnings (arising from the replacement of domestically produced fuel oil) as the "major quantifiable benefit." The Oil and Gas Development Project[1] aimed to meet the growing energy demand and to reduce the country's dependence on imported energy by supporting the development of indigenous energy resources, and the Sui-Southern Gas System Rehabilitation and Expansion Project was expected to save the country $140 million in foreign exchange.

18. Most projects have also argued that the availability of a cheaper fuel, such as natural gas, would provide incentives for industrial expansion and economic growth in general. The major industries that were expected to benefit from the availability of natural gas were cement, steel manufacturing, fertilizer, and power generation.

19. Although the above objectives might generally be classified as being related to economic growth, other concerns have also been recognized. Most projects noted that increased consumption of natural gas would have major environmental benefits because natural gas is a significantly cleaner fuel than the alternative fuels – coal and fuel oil. Reduced pressures on timber resources in rural areas have also been noted as a benefit of increased availability of natural gas. In addition, household consumption has been recognized as an important outlet for the increased production of natural gas arising from the projects.

20. The Bank's initial assistance in the sector involved increasing the transmission capacity of SSGC's system. However, a major component of the Bank's subsequent assistance has related to the development of the Pirkoh gas field. This field, which is located in the tribal area of Balochistan, was discovered by OGDC in 1977. Four of the loans provided by the Bank have been specifically for development (including integration into the national system) of the field.[2] In addition, other loans, including Gas Purification and Compression Project and Indus Right Bank Pipeline Capacity Expansion Project, have complemented the development of the Pirkoh gas field so as to enable SSGC to fully off-take its allocated volume of gas from that field.

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1 Loan No. 869-PAK: *Oil and Gas Development Project*, for $43.00 million, approved on 3 December 1987.

2 Pirkoh Gas Development, Second Pirkoh Gas Development, Third Pirkoh Gas Development, and Third Pirkoh Gas Development (Special Funds).

21. More recently in the Oil and Gas Development Project, the Bank has provided assistance for the development of four small gas fields – Sari, Hundi, Khothar and Nandpur – which had also been discovered by OGDC. In the Sui-Southern Gas System Rehabilitation and Expansion Project, the scope was more diverse than in many of the earlier projects but was basically concerned with improvements to SGTC's system.

22. The projects financed by the Bank have mainly been in the south of Pakistan (see map). The only exception to this was a small component for the development of the Nandpur gas field under the Oil and Gas Development Project.

IV. IMPACT OF THE BANK'S OPERATIONS

A. Macroeconomic Impact

23. The Bank has played the major role in supporting the development of the Pirkoh gas field and has had a significant impact on the development of the gas system in Pakistan, particularly in the south of the country, in the area serviced by SSGC. Although virtually all the Bank's investment has taken place in the southern part of the country, the impact nevertheless has clearly been much wider. Although initially all gas from the Pirkoh field was allocated to SSGC (SGTC), the availability of this gas reduced the demands on other fields, notably the Sui gas field, and thus increased the amount available to SNGPL and the various end users in SNGPL's service area, including fertilizer plants and power stations.

24. On the basis of evidence from only one well, the Bank commenced a program of assistance that has developed Pirkoh into the third largest gas field in the country in terms of both reserves and production. Pirkoh is estimated to have about 12 percent of the recoverable reserves of gas in Pakistan (see Appendix 7) and account for more than 10 percent of annual production. The only larger fields are Sui and Mari. However, Mari produces a gas of much lower quality. The gas from Pirkoh accounts for about 16 percent of SSGC's annual gas allocation and for almost 14 percent of SNGPL's allocation.

25. In addition, the Bank has played a major role in developing SSGC's transmission capabilities. The Bank's first project, Sui-Karachi Gas Pipeline Project, aimed to increase the transmission capacity of SSGC (then SGTC) from 140 MMCF per day to 271 MMCF per day. Subsequent projects raised this capacity to 400 MMCF per day. The Sui-Southern Gas System Rehabilitation and Expansion Project has further added to SSGC's system.

26. Although various studies have emphasized the importance of the projects in terms of their contribution to foreign exchange savings, it is not feasible to make any precise assessment of the impact that the additional supplies of gas have had on the overall development of the country. There is little information on the use of gas in industry. Despite extensive inquiries in Pakistan and in the Bank, the Mission was not able to obtain input-output tables for Pakistan. Nonetheless, it is clear that the availability of gas has been important for many industries and in particular for steel, power, cement, and fertilizer. It has also played an important role in the household sector.

27. If the gas supplied under the various projects funded by the Bank had not been available, Pakistan would have had to depend on other sources and/or forms of energy. Because of the pricing and allocation policies that have been pursued by the Government, it is not possible to say with any reliability what these other sources and forms would have been. It is likely that energy consumption and in particular consumption by industries that have benefited from cheap

gas (e.g., fertilizer and power) would be relatively lower. However, it also seems likely that, given Pakistan's limited supply of alternative energy, there would have been greater imports of oil, gas, and perhaps coal.

28. Any assessment of the contribution made by the Bank must be tempered by the recognition that in the absence of Bank funding, other sources of funding would probably have emerged. In earlier years, it is probably unlikely that funding would have come from the private sector. If the investment had been undertaken by the Government instead of the Bank, it would obviously have imposed an additional burden on domestic resources. However, given the size of the Pirkoh field and the Bank's postevaluation findings regarding the success of individual projects, it is probable that another bilateral or multilateral financier would have provided funding.

B. Institution Building

29. Although the Bank's TA program for the gas sector did not begin until the mid-1980s, the lending program has enabled the Bank to have a major influence on the evolution of the sector and the major public sector institutions.

1. Sui Southern Gas Company Limited

30. At the time of the first Bank-financed project – Sui-Karachi Gas Pipeline Project – the Executing Agency (SGTC) was responsible for purification and transmission of gas within Sindh Province. The gas was then sold to either the Karachi Gas Company (KGC) for distribution within Karachi, or to the Indus Gas Company (IGC) for distribution in the rest of Sindh. In 1985, KGC and IGC were merged to form the Southern Gas Company Limited (SGCL). KGC, which was about twice as large as IGC in terms of the volume of sales, was recognized as the more efficient of these two companies; even now, problems with the distribution system are largely attributable to the former IGC system.

31. In 1989, SGCL and SGTC were merged, with the support of the Bank, to form SSGC. The Bank commented that the two companies were financially sound and that "A merger between the two companies would ... result in better coordination, improved operations and savings in costs ...."[1] Subsequently, the company experienced problems in integrating the operations of the different units. In the light of these problems, the Bank provided TA to assist in strengthening SSGC's financial management capability.[2]

32. It is difficult to identify performance indicators for SSGC. The general view has been that SSGC is a soundly run company that has performed well. In normal circumstances, this should be reflected in the company's financial performance.

33. The Bank's loans have contained certain financial covenants including requirements that SSGC should maintain (i) a debt/service ratio of not less than 1.5:1, (ii) a current ratio of not less than 1.2:1, (iii) a debt/equity ratio of not more than 65:35, and (iv) a return on net fixed assets of 17 percent. Over the years, SSGC has generally complied with these financial covenants. However, this is more a reflection of the Government's sector policies than of the company's performance. Prices and gas allocations have been determined by the

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1 Loan No. 836-PAK: *Indus Right Bank Pipeline Capacity Expansion Project*, for $29 million, approved on 25 August 1987.

2 TA No. 1618-PAK: *Financial Restructuring and Management Strengthening of SSGC*, for $860,000, approved on 3 December 1991.

Government and indeed have been manipulated to achieve specific goals. In cases where there had been any risk that SSGC might not meet the Bank's financial covenants, the Government had increased gas prices. Nonetheless, although the profitability of SSGC may not reflect the company's operational performance, the existence of the Bank's covenants has ensured that SSGC has had access to sufficient resources to cover its operating costs and this may, in turn, be partly responsible for the undoubted success of the company.

34. SSGC's Board of Directors consists of 14 members, three of whom represent private shareholders.[1] This has meant that, together with controls on prices and allocation, the Government has been able to exert its influence on virtually all areas of SSGC's operations. The Government has played a role in determining employment levels and conditions in the company. For example, the Mission was informed that SSGC had recently been required to employ approximately 500 additional workers without any regard for their qualifications. There are frequent allegations that SSGC and other companies have been used as employment agencies by the Government.

35. Further, although not tied to Government levels, SSGC remuneration has been heavily influenced by salaries paid to Government employees. This inevitably affected staff turnover and the quality of staff. A number of PCRs and PPARs expressed concerns about the quality of the staff in SGTC/SSGC and the high rate of turnover. Although there has been some increase, salaries remain below those paid by the private sector. Despite this, the problem of turnover appears to have lessened, partly because of reduced opportunities in the Middle Eastern countries. In addition, SSGC appears to have managed to continue to attract professional and technical staff of a high caliber by paying special attention to management development. This has involved in-house, on-the-job, and external and foreign training.

36. The impact of Government involvement can also be seen in the requirement that SSGC undertake investments in areas and townships where such investment might not be warranted on purely commercial grounds. This means that other possible performance indicators, such as number of connections and level of sales, may also be misleading. Nonetheless, SSGC has managed to increase sales at an average annual rate of 6.5 percent between 1984 and 1994 (see Appendix 8). Over the same period, the distribution network increased by 118 percent.

37. Under the most recent loan to the sector, Sui-Southern Gas System Rehabilitation and Expansion Project, the Government has agreed to the privatization of SSGC. Under an accompanying TA,[2] the Bank has provided support to prepare a strategy for privatization. It is now expected that privatization of SSGC will be completed by the end of FY1995/96 but, given the difficulties that have occurred in the privatization of SNGPL, there may be doubts about this schedule.

2. Oil and Gas Development Corporation

38. OGDC was established in 1961 under an agreement with the then Union of Soviet Socialist Republics to cooperate in prospecting for oil and gas. The original intention was to offer 49 percent of the Corporation's shares to the public. Because of the opposition of the Soviet Government, however, this proposal was dropped and OGDC remained a wholly Government-

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1 Private shareholders hold 10 percent of SSGC's total share capital, the Government of Pakistan holds 70.43 percent, and the remainder is held by Government-controlled financial institutions.

2 TA No. 1618-PAK: *Financial Restructuring and Management Strengthening of SSGC.*

owned corporation with responsibility for undertaking oil and gas production, refining, and selling in Pakistan. It now has the largest exploration program in the country.

39. Until 1987/88, OGDC depended on financial support from the Government. Its weak financial position largely reflected the Government's policies, in particular, pricing and allocation policies, and the role OGDC was required to play as a vehicle for Government policies (including promoting regional development, particularly in certain frontier areas; and sustaining exploration and production activity for strategic/security reasons). Like other organizations in the sector, OGDC experiences considerable Government intervention. As with SSGC, the Government has played a role in determining employment conditions. Members of the Board of Directors are all appointed by the Government and certain senior positions, most notably the Director of Finance, are filled by the Government. However, under pressure from funding agencies, including the Bank, the Government stopped its financial support to OGDC in June 1989, with the intention that OGDC would become autonomous and commercially oriented. Under the Government's most recent Petroleum Policy, OGDC is to become a joint stock company.

40. OGDC has been the Executing Agency for two Bank-financed projects: the Oil and Gas Development Project and the Second Oil and Gas Development Project. These two projects were subjected to delays but are ongoing.

3. Pirkoh Gas Company Limited

41. In 1981, the Bank provided a loan to assist OGDC in the development of the Pirkoh gas field.[1] At that time, the Bank indicated that the field should be financially and economically viable without Government budgetary support. In view of the weaknesses in OGDC's financial position, the Bank required that OGDC establish a new subsidiary company to operate the Pirkoh field and implement the Bank's Project. This company, PGCL, was established in February 1982. However, PGCL had little independence and continued to function as an arm of OGDC. The PPAR for the Second Pirkoh Gas Development Project found that, although PGCL had been functioning as a separate legal entity, it had in practice continued to be dependent on OGDC for all technical matters, including drilling, production engineering, and geophysics. Further, PGCL's institutional constraints remained unchanged.[2]

42. In 1985, in conjunction with the Second Pirkoh Gas Development Project,[3] the Bank provided TA to prepare an operational strategy study for PGCL.[4] The main objective of the TA was to examine ways to rationalize the operational relationship between PGCL and OGDC. The study was expected to assess the merits, practicality, and timing of restructuring PGCL and the possibility of transferring it to the private sector.

43. However, following the Government's decision to stop providing financial support (see para. 39), OGDC requested that PGCL be reabsorbed. The findings of the Bank's operational strategy study supported this. Although the proposal was agreed to by the Government and the Bank, the merger has not taken place and is no longer contemplated. The Government is, however, considering commercialization and/or privatization of these two organizations individually.

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1 Loan No. 565-PAK: *Pirkoh Gas Development*, for $55 million, approved on 22 December 1981.

2 PPA:PAK 19074: *Second Pirkoh Gas Development Project*, August 1990.

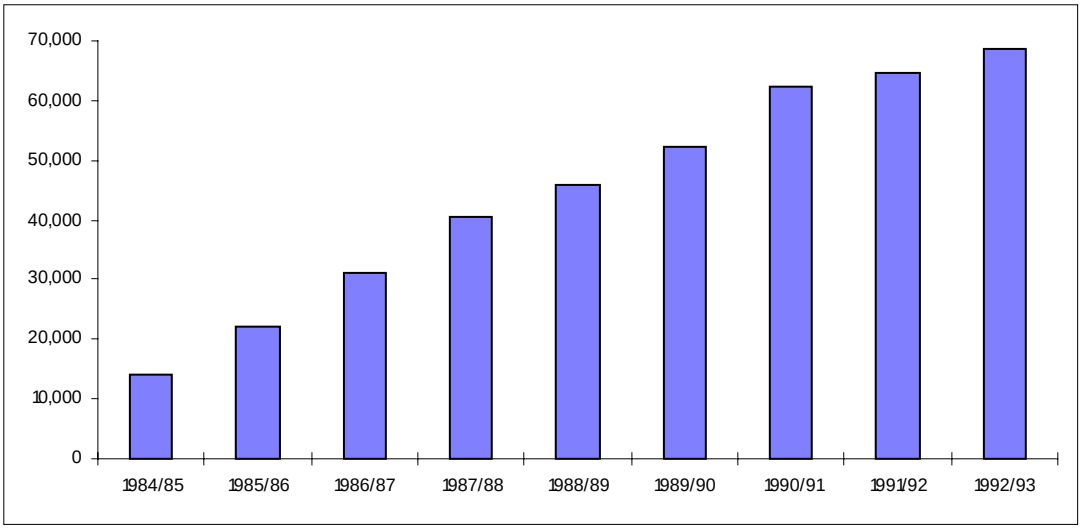
3 Loan No. 770-PAK: *Second Pirkoh Gas Development Project*, for $42 million, approved on 12 December 1985.

4 TA No. 763-PAK: *Operational Strategy Study of PGCL*, for $250,000, approved on 12 December 1985.

44. As with SSGC, there are problems in identifying appropriate performance indicators for PGCL (or OGDC). Again, PGCL's financial position largely reflects Government directives on such matters as prices, gas allocations, and employment rather than providing an accurate indication of the efficiency of the company's operations. One indicator of the performance of the company is that it has drilled 53 wells in the Pirkoh gas field without any major technical problems. As a result, the Pirkoh field has developed into one of the major sources of natural gas in the country. This has occurred quite rapidly. The Pirkoh field started commercial production in 1984/85 when 14,166 MMCF were sold to SGTC. In 1994/95 PGCL sold 69,809 MMCF (see Figure 1) of which 34,754 MMCF were sold to SSGC and 35,055 MMCF to SNGPL. This represents a more than 20 percent annual average increase in sales.

45. There have been and continue to be major problems in the development and operation of the field, but these are related to the complex characteristics of Pirkoh. The Bank has been helpful in resolving these problems, and its important role in the development of the field is widely recognized. As indicated above, it is probable that other funding would have emerged had the Bank not participated in the development of this field; nevertheless, the Bank credit can take for its involvement at a critical time.

Figure 1: Production from Pirkoh Gas Field2



4. Ministry of Petroleum and Natural Resources

46. MPNR is responsible for, among other things, all matters relating to gas at the national and international levels, including export and pricing of gas, gas undertakings wholly or partly owned by the Government (e.g., SSGC and OGDC), and energy policy. Within the Ministry is the Directorate General, Gas (DGG), which is responsible for overseeing all operational activities in the gas sector, including

(i) licensing and supervising the operations of gas transmission and distribution companies;

(ii) handling all matters related to gas purification plants and their expansion;

(iii) developing rules and procedures for distributing gas in accordance with priorities established by Cabinet Committee on Energy;

(iv) fixing tariffs for gas production, transmission, and distribution companies;

(v) preparing proposals for adjusting the level and structure of consumer gas prices for consideration and approval by the Energy Review Group and Cabinet Committee on Energy; and

(vi) regulating the operations of private companies involved in the marketing and distribution of LPG.

47. The Bank has provided TA to DGG to assist in setting up a management information system for monitoring the operations and financial performance of the gas and LPG companies.[1] The TA was expected to assist DGG work in (i) analyzing data and information on gas reserves and LPG; (ii) recommending the setting of policies on gas development and utilization; (iii) coordinating and monitoring the production treatment, transmission, distribution, utilization, and sale of natural gas and LPG throughout the country; (iv) making recommendations on the setting of appropriate prices for the end users and operating margins for the gas and LPG companies; and (v) assessing the impact of any decision taken by the Government on the activities of the gas and LPG companies. The PPAR for the Indus Right Bank Pipeline Capacity Expansion Project reported that the recommendations of this TA were accepted and were largely implemented.[2] However, it is understood that the World Bank has financed a study to upgrade the regulatory capabilities of DGG.

48. In 1991, the Bank provided further TA to assist the Government in

(i) the development and implementation of concrete measures and actions required to make the new Petroleum Policy effective; and

(ii) carrying out in-depth studies to promote the development of the hydrocarbon sector in the longer term, to identify areas where further policy improvements need to be introduced for this purpose, and to formulate a strategy to sustain private sector operations.[3]

49. In view of the need for further TA, there may be some doubts about the impact of the earlier TA. However, it appears that the most recent TA has played an important part in the Government's deliberations in formulating the most recently announced Petroleum Policy.

C. Beneficiaries

1. Industry and Power

50. The power sector has consistently been the largest consumer of natural gas. In 1992/93, it accounted for more than 45 percent of total sales of gas by SSGC, compared with

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1 TA No. 894-PAK: *Technical Services for the Office of the Directorate General,Gas*, for $266,000, approved on 25 August 1987.

2 PPA:PAK 19142*: Indus Right Bank Pipeline Capacity Expansion Project*, October 1993.

3 TA No. 1618-PAK: *Hydrocarbon Sector Strategy Study*, for $600,000, approved on 20 November 1991.

20 percent for general industry (excluding power, cement, and steel) and 18 percent for the household sector.

51. Following the initial discovery of gas in commercial quantities in Pakistan in 1955, the development of the industry was rapid. However, even at that time, gas prices were controlled by the Government. The gas companies, which were privately owned and whose investment decisions were made according to commercial principles, supplied the bulk of gas to the power stations.

52. The price of gas to the power stations was the same as that paid by industrial users or about 26 percent of that paid by domestic consumers (see Appendix 9). These differences probably reflected the high cost of distribution to domestic consumers. By the time of nationalization, however, the relativities had changed. The price of industrial gas had risen, but the price for domestic consumers had fallen and industrial users were paying about 50 percent of the price of domestic users.

53. Following nationalization, the Government through MPNR not only controlled the purchase and sales prices of gas, but also set targets for expansion based on socioeconomic considerations. Prices no longer reflected scarcities and the Government was obliged to introduce a system of priorities for allocating natural gas.

54. The Karachi Electric Supply Corporation Limited (KESC) has indicated that despite the relatively high price for gas, it is still the most economic fuel and, given its availability, KESC would produce most of its electricity using natural gas. This would involve a fourfold increase in consumption and would be greater than the current supply capability of SSGC. However, KESC is precluded from increasing its use of natural gas because of the Government's allocation policies. Indeed, a current policy reduces the availability of gas to KESC for power generation. KESC is required to use more oil because of its proximity to the coast and imported fuel oil. The available supplies of natural gas should be used in areas further from the coast, i.e., northern areas. This policy is reflected in the fall in the consumption of gas by the power sector in both absolute and relative terms in 1993/94.

55. The reevaluation study of the Pipri I and II Thermal Generation Projects found that the performance of these Projects had been adversely affected by the Government's gas allocation policies.[1] The units, provided under Bank-financed projects in 1978 and 1981, were designed to run on natural gas for which a pipeline was to be constructed to connect with the main Sui-Karachi pipeline. After the loan agreement, however, the Government placed limits on the availability of gas for power generation. KESC's quota was reduced to 60 MMCF per day and no gas was provided for the Pipri power station. This affected the economic and financial performance of the projects.

56. Within SSGC's supply area, another important industrial consumer is the Pakistan Steel Mill at Port Qasim. In 1980/81, the steel mill accounted for about 1 percent of SSGC's total sales. Even though steel production apparently has a low ranking in the order of allocation of gas supplies, the use of gas by Pakistan Steel has been increasing and, by 1993/94, sales to the mill accounted for almost 8 percent of SSGC's total sales. Reviews of Pakistan industry have commented on the inefficiencies of the Pakistan Steel Mill and its privileged position within the

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[1] SST:PAK 90024, *A Re-evaluation Study of Pipri I and II Thermal Generation Projects*, December 1990.

economy. In view of this, there is no justification for allowing the use of natural gas in this area when other users (e.g., power) are being denied gas.

57. The cement industry has also been a major user of gas in SSGC's supply area. In 1981/82, the cement sector accounted for more than 17 percent of sales by SSGC. However, with increasing difficulties in meeting the demand for gas, cement plants, which were all government-owned, were required to switch to oil.

58. In recent years, however, consumption by the cement industry (in SSGC's supply area) has increased and in 1993/94 accounted for 5 percent of SSGC's sales. The industry has now largely been privatized. Allocations have been made to cement plants on an interruptible basis. This involves contracts that guarantee the supply of specific quantities of gas for nine months of the year. During the remaining three months, gas is supplied only when available. As with the power sector, cement companies are being used for "peak shaving" purposes, although in this case the agreement is a commercial proposition.

59. Another important use of natural gas has been in the production of fertilizer, for which natural gas has been used both as a raw material and as an energy source. Production of fertilizer has been encouraged over the years by the Government because of its importance to agriculture. For this reason, in determining the allocation of natural gas among users, fertilizer production has been given a high priority. In addition, fertilizer plants have received gas for feedstock at lower prices than any other class of user, including domestic users. The fertilizer sector has accounted for about 23 percent of total gas consumption in Pakistan. However, there have been no fertilizer plants connected to SSGC's distribution system.

2. Households

60. The household sector has been a major, if not the major, beneficiary of the Bank's field projects. The most direct impact has been in the SSGC service area where the Bank's projects have primarily been located. The evaluation of the impact on the household beneficiaries is based on the results of the Household Energy Strategy Study (HESS), Household Integrated Economic Survey, and the Sui Gas Market Potential Survey conducted in Karachi. HESS was designed in close collaboration with the Pakistan Integrated Household Survey of the Pakistan Federal Bureau of Statistics and conducted as part of that study. The surveys covered both urban and rural areas throughout Pakistan. The Sui Gas Market Potential Survey was conducted to determine SSGC's market potentials. A more detailed analysis of these surveys is given in Appendix 10.

61. The household sector accounts for approximately 54 percent of the total final energy consumption in Pakistan. Of the total household energy consumption, biofuels account for 86 percent with firewood accounting for 54 percent, dung for 18 percent, crop residues for 14 percent, natural gas for 7 percent, electricity for 4 percent, and kerosene and LPG for 3 percent.

62. Natural gas is the most important modern fuel, and is used mainly for cooking in urban areas, accordingly, women are the major beneficiaries from the provision of natural gas. In the domestic sector, natural gas is largely substituted for kerosene and, besides the convenience of natural gas, its availability has led to a reduction in the number of serious and often fatal accidents resulting from fire and explosion.

63. The urban/rural consumption patterns of fuels significantly differ. Biofuels account for 95 percent of energy consumed by households in rural areas, but the share drops to 56 percent in urban areas. About 71 percent of modern fuel use is concentrated in urban areas.

64. The use of natural gas is restricted to urban areas where it is principally used for cooking and also for space and water heating. There are no official natural gas connections to rural areas because of the high costs in providing the necessary infrastructure and the constrained production and distribution capacity in the country. The surveys found that the proportion of households using natural gas increased with income. The Karachi survey found that in the upper middle class, only 11 percent were nonusers; this increases to 35.7 percent in the middle class, and to 53.2 percent in the lower middle/lower classes. In some of the lower middle class and mostly in the lower class areas, gas pipelines are not available.

65. Lack of access to a connection is understandably the main reason why households remain without gas. However, of those unconnected urban households within 50 meters of a gas main line, 60 percent indicated that the high cost of connection was the reason they did not use natural gas, 29 percent pointed to the cost of appliances and installation of pipes, while 3 percent said that the fuel was not needed. In Karachi, almost 32 percent of the nonusers point to financial constraints as the reason for not having gas connection.

66. The average price paid for natural gas by households in the survey was PRs31.0/thousand cubic feet (MCF). This is low relative to long-run marginal cost for natural gas, which in 1993 was estimated at PRs111.0/MCF. This makes gas the cheapest cooking fuel in Pakistan. In terms of rupees per unit of useful delivered energy, the survey showed that the price of natural gas was only PRs0.05/megajoules (MJ) while its nearest substitutes for cooking, namely, LPG, kerosene, and firewood cost approximately PRs0.21/MJ, PRs0.47/MJ, PRs0.47/MJ, respectively. Electricity has an estimated price of PRs0.27/MJ of delivered energy.

67. A review of the results of HESS on other fuels indicated fuel shifts in Pakistan as household income improved, and urbanization and availability of modern fuels occurred.

68. Wood fuels in general and firewood in particular remain the most important fuels in the household sector in Pakistan. Firewood has various uses, although some 81 percent is used for cooking. The average market price of firewood at the time of the survey was PRs0.98/kilogram (kg). Firewood collection is a time-consuming activity. On average, collecting the firewood needs of a rural household requires 700 person-hours. Estimates of the opportunity costs of collecting versus purchasing firewood for households show that purchasing only becomes worthwhile when women's time is valued financially. Thus, until employment opportunities exist for rural women, responses to firewood scarcity are going to take the form of actions that do not involve large financial expenditures. In terms of alternative fuel, the majority of users switch to superior fuels such as natural gas, kerosene, and LPG as urbanization and income levels rise.

69. Dung is widely used as a household fuel, mainly for cooking. The survey showed that 56.3 percent of households use this fuel at an average daily consumption of 4 kg/household. Dung is a particularly important source of fuel in rural areas where 69.4 percent of households use dung cakes compared with 27.2 percent in urban areas. This is the cheapest form of fuel. The average market price of dung cake is PRs0.58/kg which, on a heat equivalent basis, is about 70 percent lower than the price of firewood. In terms of time and effort, collection is also easier than that of firewood. It takes an average rural household about 253 person-hours per year to collect its dung needs. As with firewood, the decision to collect rather than purchase dung depends on the monetary value attached to women's time. The male contribution in the collection effort was

estimated to be less than 7 percent. The survey showed that those who switched from dung chose firewood (46.6 percent), natural gas (25.2 percent), kerosene (18.8 percent), and LPG (8.3 percent).

70. The findings can be broadly summarized as follows:

(i) natural gas is currently restricted to urban areas and is predominantly used by middle and higher income households;

(ii) the poor have benefited least from the availability of natural gas in the country;

(iii) even at full economic cost, natural gas is the cheapest fuel in terms of cost per unit of useful delivered energy;

(iv) in terms of expenditure pattern, rural households spend proportionately more on energy than their urban counterparts; and

(v) the major reasons for not using natural gas are nonavailability of gas mainlines and, for the lower income group in urban areas, high connection charges.

D. Environmental Impact

71. The Bank-financed projects in Pakistan's natural gas subsector did not have any adverse environmental impact. The facilities for development of the Pirkoh field were all located in remote areas and there were few environmental or safety concerns in operating the projects' gas field, transmission pipelines, dehydration plants, and gas distribution networks. Environment protection controls and safety devices were included in the design of all the project facilities, and review missions have consistently found that these were maintained in good condition.

72. For projects involving transmission and distribution pipelines, most of the pipelines were installed underground. Exposed pipelines were coated, thus minimizing external corrosion. The pipelines complied with international standards and were all radiographically tested for leaks before commissioning. The recommended shutoff and isolation valves were installed in the system to allow safe pigging and decondensation operations.

73. As part of the Sui-Southern Gas Rehabilitation and Expansion Project, a new purification plant that will replace three existing plants is being installed to remove hydrogen sulfide and carbon dioxide from Sui gas. At present, the gases are discharged through three 50 meter-high stacks about 120 meters from the plants. The new plant will enable the discharge of gases through a stack of 80 meters and at a distance of 500 meters from the purification plant, ensuring that the discharge point is at an adequate distance from the processing plant. Moreover, since Sui is a sparsely populated desert area, the gas processing plants are remote from the residential areas. With proper operation and maintenance, there would be no significant concentration of hydrogen sulfide at ground level even on the plant premises. The liquid effluent from the gas purification and dehydration plants is small and accordingly has little impact on the environment. In addition, the French Government has extended, on a grant basis under the

French Technical Assistance Fund to be administered by the Bank, a TA for Environmental, Safety and Efficiency Improvements of SSGC's Operations.[1]

V. KEY ISSUES

74. A number of issues have been raised in the various PCRs and PPARs. However, most of these issues have been of a technical nature and are related to particular projects. The most important issues relate to the Government's involvement in the natural gas sector. As indicated earlier, the Government, through MPNR, has exercised control over many aspects of the gas industry. Prices have not provided an accurate indication of scarcities in the economy and their role in assisting decision making and allocating scarce resources has been constrained.

75. The Government has exercised control over both producers and users prices. Policies regarding these prices have changed over time. Until 1986, the price of nonassociated gas was set separately for each field to yield a 12 percent return. This price could only be determined after the discovery had been made, with the result that there was little incentive for exploration and, because it did not reflect the cost of alternative energy sources, did not indicate the true value of undertaking exploration. A report, prepared in connection with the Sui-Southern Gas System Rehabilitation and Expansion Project,[2] found that, historically, restraints on the price of gas at the wellhead had led to minimal exploration for new supplies of gas and widespread shortages.

76. In earlier loans, the Bank did include covenants concerning wellhead prices of gas in relevant loan documents. Initially, this appears to have been related more to concerns about the financial position of the Executing Agency, PGCL, than to considerations about efficient resource allocation. Thus, as a covenant of the Second Pirkoh Gas Development Project, the wellhead price was required to be maintained at a level

> "... as to ensure that sufficient revenues are generated to meet PGCL's debt-service requirements and operating expenses, to provide adequate contributions to its future capital development requirements and to provide sufficient incentive for additional capital investments from capital sources."[3]

77. However, by the time of the appraisal of the Second Oil and Gas Development Project,[4] it was clear that the Bank recognized the importance of prices as a means of encouraging the rapid and efficient development of gas resources. As a result, the Bank and other financiers have played a major role in persuading the Government to increase the wellhead price in certain remote areas almost to parity with fuel oil.

78. The Government also regulates consumer prices. Since nationalization prices have not reflected the cost of providing service to any particular group of customers but have apparently been regulated in pursuit of socioeconomic or political objectives. In the early 1980s, the price of gas for all consumer groups was below the prices for competitive fuels – kerosene in the case of domestic and commercial users and fuel oil in the case of industrial users (see

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1 This TA (1619-PAK), amounting to $680,000 was approved together with *the Sui-Southern Gas System Rehabilitation and Expansion Project* (Loan No. 1138-PAK) in December 1991. It is expected to be completed in December 1995.

2 Loan No. 1138-PAK: *Sui Southern Gas System Rehabilitation and Expansion Project.*

3 Loan No. 770-PAK: *Second Pirkoh Gas Develoment Project* (Loan Agreement, Schedule 6, para.11), for $42.00 million, approved on 12 December 1985.

4 Loan No. 1094-PAK: *Second Oil and Gas Development Project*, for $52 million, approved on 22 August 1991.

Appendix 9). Consumers were therefore effectively being subsidized by other sectors of the economy.

79. The Bank appears to have played little direct role in the determination of gas prices. However, in connection with World Bank assistance to the sector, the Government agreed to increase the residential price of gas to parity with the border price of fuel oil by the beginning of 1994 and to maintain parity with the domestic price of fuel oil for commercial, industrial, and power users from 1995. In line with these commitments, prices were increased during the 1980s and the ratio of industrial prices to fuel oil prices moved from 1:2.75 in 1980 to 1.2:1 in 1995. Domestic prices also increased both absolutely and relative to the price of kerosene. However, relative to gas for industrial use, domestic gas prices have continued to decline. In 1980, domestic prices were about 88 percent of the industrial gas price, but by 1995, they were less than 48 percent (see Figure 2).

80. The price policies followed by the Government resulted in shortages. This necessitated the Government's involvement in demand management programs and in establishing priorities. The priorities have changed over time. It appears that the changes have frequently been ad hoc lacking in any particular economic rationale. This has been unsettling for industries and has affected their approach to the use of gas.

81. In 1991, priority was in the following order: (i) the fertilizer sector, to ensure national self-reliance in fertilizers; (ii) the power sector, for use in the combustion turbine plant to replace diesel; (iii) the domestic sector, to replace kerosene used in cooking and heating; (iv) general industries (apart from steel and cement), to replace fuel oil; (v) the power sector, for use in steam turbine plants to replace fuel oil; and (vi) the cement and steel sectors, to replace fuel oil. The order of priority is now (i) domestic sector; (ii) fertilizer sector, as raw material; (iii) commerce and industry; and (iv) power.

82. The high priority given to the domestic sector has been reflected in the Government's policy of requiring the distribution companies, SSGC and SNGPL, to expand the distribution network to new areas. As a result, the two, recently, were involved in large-scale expansion of the distribution network and the number of new domestic connections. The areas to be connected are commonly determined by the Government or Members of the National Assembly on political grounds, and the capital costs of connection frequently exceed what could be justified by commercial considerations. In these cases, the costs must be borne by SSGC (or SNGPL) or by the Government. In either case, a subsidy is involved, which is in addition to the cross-subsidy that exists because the cost of gas to households is so much lower than the cost of gas to other users.

83. The low prices (subsidies) to domestic consumers are clearly not justified on grounds of efficiency. The ad hoc allocations among end users mean that gas is not being used in activities where it is most highly valued. The obligation to supply less profitable end uses makes it difficult to assess the performance of SSGC as a whole or of individual units within the company and thus causes managers' difficulties in making decisions. For this reason, SSGC and SNGPL have aptly been described as mere conduits for Government policies.

84. With support from the Bank and the World Bank, the Government is proposing to privatize SSGC and SNGPL. The current pricing and allocation arrangements and other forms of Government involvement in the sector will make these plans for privatization more difficult. This may partly explain why attempts to privatize are widely perceived as having been unsuccessful. It is unlikely that a private operator would find the current prices for households acceptable without

adequate compensation from the Government. Nonetheless, it is expected that the Government's plans to introduce a separate regulatory authority in accordance with proposals made by the Bank and World Bank will go some way in mitigating the concerns of potential private sector operators.

85. The subsidies to households have been justified on equity grounds. Although it is clear that there have been benefits to householders who previously relied on other fuel sources, the evidence is that the major beneficiaries have been the higher income groups. Studies have found that the incomes of residential consumers of gas are considerably higher than the median income for Pakistan. In areas where connections are available, it has been found that the poorer sections of the community are not connected because their income and savings levels are so low that it is not possible for them to incur the initial expenditure for gas connection. It has been suggested that this problem could be overcome by recovering new connection charges in installments. However, as SSGC has argued, it is not clear that this strategy would be successful. It is likely that any increase in the number of connections would be counterbalanced by an increase in the number of disconnections because there are doubts about the ability of the poorer population to pay installments and their bills.

86. The poorer segments of the community who are not connected because of lack of a distribution network or their inability to shoulder the costs of connection are obliged to use fuels such as LPG, dung, firewood, and kerosene, which are unsubsidized and the prices of which therefore reflect market realities. These prices are considerably higher than the prices of natural gas for residential uses.

VI. CONCLUSIONS AND RECOMMENDATIONS

87. Despite the distorted policy environment in the gas sector in Pakistan, the projects undertaken by the Bank have all been assessed as generally successful. The Bank's assistance in the development of the Pirkoh gas field has played a major role in the expansion of the gas sector in Pakistan. In addition, the Bank assistance has provided institutional support for PGCL, SSGC, MPNR, and to a lesser extent, OGDC.

88. Until recently, however, the Bank has placed little emphasis on the formulation of the policy environment in the gas sector. And, although the Bank's assistance has benefited gas consumers in the industrial and household sectors, it is not clear that the additional gas supplies have been used in the most effective way. Relatively low prices for gas at certain times and for certain users have encouraged overuse of gas and resulted in shortages.

89. This has led to the development of a regulatory environment in which prices have been determined on the basis of political considerations rather than according to market considerations. Because the role of the market has been usurped, the Government has been obliged to undertake the allocation of gas and this has frequently been done on an ad hoc basis, with political considerations again playing a major role. The evidence suggests that gas has not always been available to those areas of the economy where it is valued most highly. Thus, the regulatory environment has not been conducive to the most efficient use of available gas supplies and the large-scale expansion of domestic gas consumption in recent years has necessitated arbitrary reductions in supplies to industrial users.

90. Further, although low prices to domestic consumers have been justified on the basis that they benefit the poorest sectors of the community, the evidence is that this has not been the case and that within the household sector the major beneficiaries have been the

wealthier or higher income groups. The Bank's projects cannot therefore be said to have benefited the poor.

91. The findings of this Study suggest a number of lessons for Bank assistance.

(i) Financial covenants are of limited effectiveness without appropriate changes in Government policy.

(ii) The policy environment is important if the full potential of projects is to be realized. Distortions in the policy environment make it difficult for managers to make correct decisions and frequently inhibit investment.

(iii) Low prices are generally not an effective means of targeting assistance to the poor. Except in particular circumstances, the major beneficiaries of such low prices are likely to be higher income groups.