Undeveloped Oil and Gas Fields in the Industrializing World

A Description of Potential International Investment Projects for the Petroleum Industry

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ENERGY SECTOR MANAGEMENT ASSISTANCE PROGRAMME (ESMAP)

PURPOSE

The Joint UNDP/World Bank Energy Sector Management Assistance Programme (ESMAP) is a special global technical assistance program run as part of the World Bank's Energy, Mining and Telecommunications Department. ESMAP provides advice to governments on sustainable energy development. Established with the support of UNDP and bilateral official donors in 1983, it focuses on the role of energy in the development process with the objective of contributing to poverty alleviation, improving living conditions and preserving the environment in developing countries and transition economies. ESMAP centers its interventions on three priority areas: sector reform and restructuring; access to modern energy for the poorest; and promotion of sustainable energy practices.

GOVERNANCE AND OPERATIONS

ESMAP is governed by a Consultative Group (ESMAP CG) composed of representatives of the UNDP and World Bank, other donors, and development experts from regions benefiting from ESMAP's assistance. The ESMAP CG is chaired by a World Bank Vice President, and advised by a Technical Advisory Group (TAG) of four independent energy experts that reviews the Programme's strategic agenda, its work plan, and its achievements. ESMAP relies on a cadre of engineers, energy planners, and economists from the World Bank to conduct its activities under the guidance of the Manager of ESMAP, responsible for administering the Programme.

FUNDING

ESMAP is a cooperative effort supported over the years by the World Bank, the UNDP and other United Nations agencies, the European Union, the Organization of American States (OAS), the Latin American Energy Organization (OLADE), and public and private donors from countries including Australia, Belgium, Canada, Denmark, Germany, Finland, France, Iceland, Ireland, Italy, Japan, the Netherlands, New Zealand, Norway, Portugal, Sweden, Switzerland, the United Kingdom, and the United States of America.

FURTHER INFORMATION

An up-to-date listing of completed ESMAP projects is appended to this report. For further information, a copy of the ESMAP Annual Report, or copies of project reports, contact:

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(ESMAP)

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ESMAP Reports are published to communicate the results of the ESMAP's work to the development community with the least possible delay. The typescript of the paper therefore has not been prepared in accordance with the procedures appropriate to formal documents. Some sources cited in this paper may be informal documents that are not readily available.

Contents

Acknowledgments and Caveats

This document was prepared for the Energy Sector Management Assistance Program [ESMAP] Unit of the World Bank, and represents the views of the author, Mr. Thomas E. O'Connor (formerly Principal Petroleum Engineer, IENOG; now retired). He was assisted by Dr. Theodore Gorton (Consultant) and Mrs. Tove Dalsgaard (Consultant) during the compilation and early writing stages of the document. Although the Energy Sector Managers and the staffs of the MENA, AFRICA, ECA and SA Regions undertook formal internal peer reviews of the relevant draft sections of this document, the conclusions presented herein do not necessarily represent their views.

In similar fashion, the project's industrial partners, Robertson Research, of the UK, and Petroconsultants SA, of the UK and Switzerland, made early technical reviews of the document. Their inputs are gratefully acknowledged. The views expressed in this report however, do not necessarily represent the views of these two commercial partners. In addition, it should be noted that although information regarding economic and contractual terms for each country, as well as the location maps, were originally provided by Petroconsultants, the information and maps are now dated. Should more up-to-date information be required, IHS-Energy (successor to Petroconsultants) should be consulted on a commercial basis.

Last, the tabular data regarding country-specific discovered-but-undeveloped wells were provided by Petroconsultants and are dated as of 1998. These files have been reformatted and are presented in two software formats for each country as a service to the reader. The Microsoft Word® format allows for an easy printout capability, but no data manipulation. The Microsoft Excel® format allows the reader to manipulate and rearrange the data to suit his or her requirements, but is difficult to printout.

Global Oil and Gas Investment Promotion Project

Introduction

Overview

As a result of intensive exploration for oil and gas around the world for the past three decades or more, many discovered fields are considered non-commercial and have not been developed for a variety of reasons. This is true particularly of gas. Yet these fields if developed could have a significant positive impact on the economies of a number of the World Bank's borrowing countries.

A list of these "orphaned" or "stranded" fields has been provided by Petroconsultants (now IHS Energy Group, of Houston, Geneva and Epsom, UK) through a partnership agreement with the Bank. The list was derived from the Petroconsultants study, "*Discovery Opportunities, 1996 – Oil and Gas in over 5000 wells,*" updated in 1998. The list was formatted initially in Microsoft Access. It is presented as an appendix to this document in both MS Excel and MS Word. This document explores the commercial potential of orphaned or stranded fields that are located within the Bank's borrowing countries.

In many cases, it is clear that some undeveloped oil and gas fields are indeed non-commercial; that is, they are too small to warrant investment in the infrastructure required to bring them into commercial production. Such fields have been removed from further consideration through a partnership with Roberston Research (Llandudno, North Wales, UK). The company's petroleum expertise and deep knowledge of sedimentary basin evaluation around the world are well known and respected throughout the petroleum industry.

In some cases, however, the reasons for non-development are not so clear. Contributing factors include lack of market – particularly in the case of gas discoveries – inappropriate commercial contract conditions, political instability, and other non-technical reasons. Whatever the factor, the discovering company has either not developed the field to date, but retained it within a long-term concession agreement, or has relinquished the field back to the government. In the latter alternative, the government, lacking sufficient resources of its own, has left the field in an undeveloped state, to the detriment of its national economy.

Regarding this last category of undeveloped fields, the commercial potential and contractual conditions under which these fields were discovered has been evaluated by the Bank through a partnership with Petroconsultants. The firm's expertise and commercially-available software on this subject are widely recognized and utilized throughout the international petroleum industry.

Original project objective

The Bank's objective in this project is to increase economic growth in client countries by encouraging maxim development of their petroleum resource bases. Thus this document undertakes to promote a list of neglected, but potentially commercial oil and gas fields.

To ensure that the list represents commercially-realistic prospects, the Bank asked Robertson Research to evaluate the sedimentary basins. Robertson also conducted a focused market survey among its client base to ensure that the evaluation was conceptually correct and contained no fundamental industrial flaws. Petroconsultants assessed the commercial terms and contract conditions, project economics and related topics. The Bank included its deep knowledge of economic and political issues in the relevant countries. As a result, the Bank can assert that the enclosed information is industrially acceptable; that is, it has been compiled to the required technical standards via what amounts to an external peer-review body.

This document provides country-specific proposed changes that would, if implemented, ensure the commercial development of these otherwise marginal fields. It is obvious, however, that only private sector-oil companies can undertake commercial development. In order for this to happen, not only must the fields be advertised, but the industry must also be assured that the fields are economically as well as technically sound. This document is intended to indicate what assurances are likely to be required, so that the industry will be attracted to these stranded fields and reconsider them for development investment.

One subject area is excluded: technical evaluation of each field's potential for commercial development. It falls outside the Bank's area of competency and is therefore left to interested companies to undertake such an evaluation on their own behalf. However, encouraging *economic* conditions under which potential development may occur falls well within the Bank's expertise. Where field development requires changes, either in the enabling envelope or in governmental policy, to attract private sector investments, the Bank will work proactively with the sponsoring company to advance the desired changes where possible.

Methodology

This document has been developed and designed by the World Bank as part of its Energy Sector Management Assistance Program (ESMAP). Two internationally-respected private sector consulting partners were brought into the project to ensure technical and commercial competency.

Petroconsultants provided the list of discovered-but-undeveloped oil and gas fields in the MS Excel spreadsheet format. The Bank converted the 6155 undeveloped discoveries into Microsoft Access format to enable data sorting. Discoveries not in the Bank's borrowing countries were removed. The remaining undeveloped discoveries were sorted by country among the Bank's regions. Within each country, additional sorting was done where possible by sedimentary basin.

The two consulting partners reviewed the resulting basinal listings, at first individually and subsequently in a joint review by both partners and the Bank at Robertson's offices in Llandudno. Sedimentary basins that appeared to lack sufficient commercial potential were deleted.

The international petroleum industry's possible interest in the remaining undeveloped fields was evaluated on a country-by-country basis. At first, countries where the industry is already heavily involved were dropped from further consideration. It was thought that promoting these fields was not necessary, because the industry already would have had an opportunity to consider developing them on its own, without further encouragement from the Bank. Upon further reflection, however, it was determined that in many active exploration areas, such as Russia, West Africa, and even the Middle East, the industry's present exploration strategy – e.g. deepwater drilling – might result in its ignoring some of the stranded fields.

An economic analysis for each of the remaining countries was conducted utilizing known contractual terms. The analysis included the most likely reasons why each country's stranded fields have not been developed or why these prospective areas have not been explored to date. The fields were then listed in order of greatest potential for private sector investments.

Problems encountered

The 1998 industrial climate of very low oil prices and resulting industrial consolidation created enormous operational problems for the Bank's two private sector partners.

Petroconsultants. Even before this project began, Petroconsultants had already been purchased by IHS Energy, but its international information business corporate structure and internal reporting lines had remained intact. By the end of the summer of 1998, however, continued acquisitions by IHS within the international petroleum information sector fundamentally changed Petroconsultants in terms of reporting relationships, personnel and internal structure. The inevitable result was a greatly diminished level of collaboration, compared with what originally had been envisioned by both the Bank and Petroconsultants.

Robertson Research. The company had undergone a management buyout shortly before the project started. The resulting management-owned company had developed an array of aggressive, technology-based, well-funded, competent clients who looked to Robertson for suggestions for economic development prospects. Unfortunately, the economic downturn in the petroleum industry caused by the sustained fall in oil prices severely impacted that client base.

The loss of its new-venture-seeking clients effectively caused Robertson to focus on development of projects with short-term cash flow potential. At the same time, the company was forced to focus its attention on meeting its own payroll and to withdraw from speculative projects such as this one.

Revised project objective

The loss of this external professional expertise caused the Bank to revise its original project objective, focusing instead on the Bank's strengths in country-specific economic evaluations. Emphasis was placed on those countries containing a number of undeveloped fields lying within sedimentary basins already supporting other producing fields. The logic was that since the petroleum habitat within these basins was clearly functioning, the source rocks ought to be able to generate commercial amounts of petroleum from the undeveloped fields.

There may be other, non-technical issues that have prevented development of the fields in question. Possibilities include:

- Poor enabling environments resulting in economically unattractive terms for development;
- Lack of market for the produced petroleum, particularly gas; or
- A general lack of information available to the industry on the potential of these discoveries.

The Bank has a number of tools at its disposal that can address all three of these areas and assist the development of the stranded fields.

Revised project methodology

1) Data manipulation. The revised methodology takes into account the Bank's strengths in identifying country-specific economic issues that may have impacted or prevented the development of stranded oil and gas fields. This project has extracted, from Petroconsultants' existing master list of discoveries, the stranded fields located within the Bank's borrowing countries. Within those countries, the Bank has the ability to work with the respective governments on the issues enumerated above. There are several borrowing countries that otherwise would be among the candidates, but which are not likely to respond to Bank intervention. These were originally removed from the list. They fall into two classes:

   a) Countries with economies large enough that 1) Bank intervention would likely be ineffective in causing the necessary changes, or 2) Bank intervention is precluded by national political requirements. Examples of the former include the Russian Federation, India and China; Mexico falls into the latter category because its constitution currently precludes private sector involvement in petroleum development.

   b) The remaining short list of countries was reviewed by both Robertson and Petroconsultants for technical feasibility prior to their effective withdrawal from the project. As a result of their review, twelve countries were selected for further study. This list was then expanded to include most of West Africa, as well as some additional countries in South and East Asia and the Pacific Rim, as a result of internal Bank peer reviews.

Within the selected countries, the sedimentary basins were evaluated to determine whether they contain producing fields or discoveries under development, in addition to the stranded fields. Reserve figures were given little weight, however. Instead, emphasis was placed on the location of the stranded fields within the basin, relative to other producing fields.

There are no technical evaluations of the stranded fields regarding their feasibility for development because that task falls outside of the Bank's capabilities. Interested parties must conduct a full technical evaluation on their own of all available geologic, geophysical and production-testing data before pursuing any potential investment opportunity.

2) Maturation of identified projects. For each of the selected countries, a search has been undertaken of all available literature, periodical and Bank files as a means of providing background on both the undeveloped fields and the Bank's previous experience with the national petroleum sector. Preliminary search results were forwarded to the relevant Bank regions and followed up by detailed discussions with the Regional Energy Sector leaders and staff. The revised results were then circulated to the International Finance Corporation's (IFC) Oil and Gas Division for their views. The results of those reviews were finally circulated among the staff of the Bank's Oil and Gas Division for comment and further information. This proceeded as an interactive process, the object being to obtain additional ideas from individual staff members regarding future Bank work within the petroleum sector of each country.

The results of the Bank's data base search and interview efforts were compared with the results emerging from other parallel Bank studies, specifically:

- Comparative study of World Wide Petroleum Contract Terms,
- African Gas Initiative,
- Gas Flare Reduction Project, and
- IFC's Potential African Carbon Trading projects.

From this comparison, the potential projects were sorted by country within each of the Bank's regions, as well as by the Bank's previous experiences in the countries' energy sectors.

3) Preparation for project marketing. The maturation stage produced a list of countries, within each is included the undeveloped fields, apparent non-technical reasons for their non-development, and the potential for positive Bank intervention in the business practices of the country. It is likely that this combination will enable the stranded fields to be developed on commercial terms by private sector investing companies. The type of Bank intervention is likely to vary from one country to another, in response to the problems that are apparently preventing development. This is equally true regarding members of the Bank staff who will undertake the interventions. The Bank will likely undertake changes either in the enabling envelope or in funding the required infrastructure. Equity participation in the project by private IOCs may be enhanced by

the participation of IFC as a means of offsetting perceived political risk. Last, non-commercial risk insurance by MIGA may be useful in some cases.

4) Project implementation or next steps. The next steps, which are beyond the scope of this document, will be taken in parallel. The appropriate members of the Bank will approach the governments in question, proposing the desired projects as a means of furthering the country's economic development.

At the same time, the international petroleum industry will be canvassed, focusing on the medium sized companies, to determine interest in participating in these projects. The results will be distributed to the industry through a variety of mechanisms, the design of which is still under review. The Bank's intention however, is to distribute the information widely through its conventional publication system, as well as more proactively through an outreach program to the industry. The objective is to ensure the wide dissemination of potentially economic development projects, both within the Bank's management responsibilities and throughout the industry.

With the recent sustained increase in oil prices due to voluntary production constraints by the world's major producing countries, it is likely that both Robertson and IHS Energy Group (previously Petroconsultants) will once again be interested in participating in subsequent phases of this project.

Commercial Analysis

Most of the development opportunities listed in this document are largely, but not exclusively:

- Gas prone; and
- Industrially marginal

As a result, it is likely that the list of stranded fields will be perceived as attractive properties for:

- Small to medium oil companies with limited international experience, but
- with a desire to move beyond of their normal areas of exploration and production.

The fields may be attractive because they have minimal technical risk of exploration failure. Given the gas-prone nature of the fields on the list, however, they may also be of interest to smaller:

- Gas pipeline companies, and
- Power generating companies

Both Robertson and IHS Energy Group have a number of existing clients who look to these companies for advice to direct them towards similar types of new ventures. Through

appropriate packaging by Robertson and Petroconsultants or other consulting firms, the stranded fields on this list should attract many of the companies required as project developers.

This is particularly true for the gas-prone projects. Many of Robertson's and IHS Energy Group's small and mid-sized clients are drawn to the gas market because of its fiscal nature. Gas tends to be country and market specific, in contrast to crude oil. It thus has a higher potential for stable pricing than the volatile oil markets. Both consulting companies have extensive experience in this type of activity. Their client companies may serve as effective industrial advisers to the Bank in proposing economic and policy changes to the host governments that may enhance development of these fields.

Conclusions

There are sufficient discovered-but-undeveloped oil and gas fields in a number of the Bank's borrowing countries to improve their economies in a significant way. The major purpose of this document is to move upstream from the existing Bank Energy Sector Strategies, and to provide new indigenous sources of fuel for the power plants of the developing world by bringing these stranded fields into development.

To date, these fields have not been developed for a variety of reasons, including the regressive nature of most of the countries' petroleum contracts and regulations, or the lack of domestic markets. There is a strong possibility that the fields can be developed by reforming the regressive clauses, developing domestic markets and advertising changed circumstances to the international petroleum industry.

This is an area in which the Bank can do much, because at present the upstream petroleum sector is almost totally ignored, to the detriment of the borrowing countries who look to the Bank for development assistance.

In its quest for the alleviation of poverty, the Bank rightly focuses on the soft economic sectors in the developing world: education, roads, schools, water and sanitation, health, women in development, etc. At present, almost all Bank Energy Sector strategies deal with power generation efficiency, privatization of state power companies, transmission efficiency and distribution improvement, collections, rural access to power and so forth. Nowhere do these policy initiatives say where the source of this power is located. It seems a natural progression to move upstream from existing Energy Sector strategies to provide indigenous sources of fuel for those power plants.

Detailed conclusions are still to be developed. It will be necessary to go through each country described in this report and extract from the "Next Steps" section the country-specific conclusions. They must then be listed by type of Bank intervention:

- Economic sector work
- Developed as part of a larger energy project

- Exploration promotion program
- Gas market development
- Technical assistance

The list would likely be cross-referenced by Bank/IFC/MIGA as well as by Region.

Implementation of almost all of these conclusions will be driven by the Bank's regions and will be introduced through normal Bank dialogue with the governments in question. The difficult part will be to bring the regions on board with this program.

Detailed Country-Specific Analyses

The specific results of this study are included in the following pages, with appendices, listed by Bank Region grouping.

The following text will allow the general reader to obtain a quick overview of each of the 42 countries that have been selected for review in this study. The countries are listed by Bank Region: Eastern Europe and Central Asia (ECA), Middle East and North Africa (MENA), South Asia (SA), East Asia and the Pacific (EAP) and Africa (AFR). In the case of ECA, MENA and SA, those countries believed to represent the best investment possibilities are listed first, followed by descriptions of the other countries in the region. With respect to EAP and AFR, only those countries believed to have serious investment potential are listed. There are no listings for Latin America and the Caribbean (LAC), inasmuch as the countries in that region require little, if any, external assistance from the Bank to encourage additional investment by the international petroleum industry.

Within each country, the following categories are described:

- Petroleum sector overview,
- Present status,
- Bank position, and
- Next steps.

This format was utilized as a means to introduce both the general and the technical reader to the petroleum history of each country, what is happening in the petroleum sector at the present time, what the Bank is doing in the petroleum sector, and what are believed to be the next logical moves. The last category evaluates the potential investment situation for either the Bank or individual petroleum companies that might be interested in the country in question.

Where appropriate, the text enumerates specific problems known to exist, as well as obvious projects that require investment in order to bring the undeveloped fields into commercial development. In many cases, such investment may fall outside the core competency of most oil companies. If so, the text suggests the formation of strategic alliances or partnerships between the interested oil company and other specialized companies, such as those whose

main businesses lie in pipeline construction and operation, or power plant construction and operation.

Often, there is potential for Bank support for these investments through a collaborative effort initiated by the interested oil company. In such cases, the company should take it upon itself to make contact with the relevant region or Bank representative (IBRD, IFC or MIGA) and make its proposal. To be most effective, contact the appropriate national Executive Director of the Bank initially for assistance on how best to present a proposal.

As a convenience to readers who are interested in the technical details of specific countries, the following text is repeated in the attached CD-ROM. The order of listing is the same as it is in hardcopy. In addition to the text for each country, there is in most cases:

- An annex of additional information obtained from Bank documents and various information sites taken from the World Wide Web,
- A tabular annex listing the known discovered-but-undeveloped oil and gas fields, listed by sedimentary basin, provided by Petroconsultants and updated as of 1998. This annex is provided in both Microsoft Word®, for ease in printing and Microsoft Excel®, which allows data manipulation but is difficult to printout.
- A copy of Petroconsultants' contractual and economic data sheets for the country under discussion, dated 1995, and
- A map provided by Petroconsultants, dated 1996 and showing where the existing fields are located as well as the location of major oil and gas pipelines.

Should additional, more up-to-date information be required, readers should make direct contact with either IHS-Energy (previously Petroconsultants) or Robertson Research, under normal commercial conditions. This type of information can, of course, also be provided by a number of other specialized international consulting companies. For additional information regarding current Bank activities in countries of interest, please visit the Bank Web site (www.worldbank.org).

Primary Eastern European and Central Asian Countries
(Candidates for potential investment projects)

1. Romania

Petroleum sector overview. Along with Azerbaijan and the United States, Romania was one of the first commercial petroleum producing countries in the world. As a result, the country has a large, highly-skilled work force, a well-developed petroleum industrial manufacturing base, and a massive infrastructure of gas, crude and petroleum product pipelines already installed. As part of its centrally-planned economy and close economic alliance with the Former Soviet Union, Romania became the frontline contact point with the capitalistic West within its petroleum sector. The result is excessive refinery capacity, which was used by the Soviets to refine Russian crude and distribute the resulting products to the other Bloc countries as well as for sales to the west for hard currency. In similar fashion, inappropriate use was made of Romania's large gas reserve base as industrial fuel and raw material for a large number of developed gas-based fertilizer plants for domestic and export purposes.

The end result of these Soviet-style policies has been a largely-depleted series of gas fields and poorly-exploited oil fields that contain much bypassed oil, accompanied by varying amounts of surface pollution. On the plus side, there remains an exceptionally well-developed network of trunk lines and gas-distribution systems as well as crude and product lines. In addition, many of the gas fields lend themselves to secondary recovery of the tail gas and/or use of the depleted fields as seasonal gas storage facilities. Therefore, in contrast to most of the other countries in this study, the required infrastructure is already in place to develop new or undeveloped existing discoveries of both oil and gas. Major investment in infrastructure construction is not needed.

Present status. A modern petroleum law has been passed, a regulatory body created and a national database has been installed. Gas pricing has been tied to international fuel oil prices at fuel oil point of entry into Romania. The two National Companies, Petrom and Romgaz have been converted to government-owned shareholding corporations as a first step toward privatization. Their existing production properties have been put under Production Licenses and selected areas have been granted as Petroleum Exploration Licenses under the new law. The remaining potential areas have been made available for licensing by the National Companies or by the International Oil Industry.

Despite these advances, an over-legalistic approach to applying the new laws has rendered the negotiations for new licenses time-consuming and trying. Many regulations still remain to be put into place and, despite the presence of the national database, access to meaningful data is still difficult. These are relics of previous business procedures. Over time, they will likely lessen in their severity. In similar fashion, the marked nationalistic and somewhat xenophobic attitude of political officials, petroleum managers and technical specialists, is also likely to be reduced. For the present, however, these attitudes toward foreign involvement in Romania's

petroleum sector make initial contacts and discussions tedious and cause Romania to be generally regarded as a difficult place in which to do business.

Reduced cash flow to both National Companies due to lack of subsidies, declining production and common non-payment for delivered crude, gas and products continues to plague operations. The result is that development of many discoveries that lie within their newly-granted production licenses remain unrealized.

The national economy, which is heavily dependent on petroleum consumption, is increasingly dependent on imported crude oil and natural gas to meet domestic needs. It is quite likely there are large, yet-to-be-discovered reserves. Finding those reserves, and bringing into production existing discoveries would substantially benefit the nation's economy by reducing the foreign exchange required to purchase imports. As a further impetus to reduce state expenditures in the upstream petroleum sector, it would be useful for the National Companies to attract foreign interest in the development of the remaining fields. The infusion of foreign development capital, as well as the payment of taxes and royalties by foreign companies, would have major positive impacts on Romania's domestic petroleum sector.

As part of the World Bank's Petroleum Rehabilitation Loan, two major studies were made of Romania's petroleum base. Intera undertook a detailed study of existing fields, and Harms and Brady produced a study of the remaining petroleum potential in the country. These two studies form the foundations for a series of field and prospect studies of some 200 undeveloped discoveries. These more detailed studies would need to be undertaken prior to serious negotiations by individual companies for development rights of selected fields.

Bank position. Of the five proposed countries within the Eastern European and Central Asian Region of the World Bank, Romania has the greatest potential for new project lending due to the ongoing nature of existing sector work. In general, the Romanian government is inclined to take Bank advice, although it has displayed considerable resistance below the rank of Minister. Nevertheless, with consistency and persistence, Bank Group objectives probably could be achieved. Remaining work to be undertaken, in which the Government has expressed interest in moving forward, largely falls within the following areas:

- Natural gas distribution and reticulation
- Access to external sources of supply of natural gas to augment dwindling domestic supplies
- Continuing exploration/exploitation and promotion efforts
- Environmental remediation liabilities, including potential separation of the liabilities from the development and exploitation of underlying petroleum reserves
- Social migration resulting from abandoning of no-longer-economic oil and gas fields

Petroleum is one of Romania's major economic sectors and its return to robust economic health would provide a major assist to the nation's aspirations to achieve the economic status of most of the other European countries. Toward this end, there is a clear role for the Bank to further the participation of private sector development, and to encourage Foreign Direct Investment within the petroleum sector. It is quite likely that much of this can be accomplished in partnership with medium-sized international oil companies (IOCs). Those companies could provide the capital, technical and managerial experience. The Bank would, in conjunction with the government, assist in improving the enabling envelope, rehabilitating and developing the infrastructure, remediating the environment and retraining displaced oil field workers. It is also likely that IFC would become involved as an equity holder in several of the development projects, and MIGA may be used for non-commercial risk insurance for companies that are concerned about unilateral renegotiation or repatriation of invested capital and dividends.

Next steps. Despite the problems outlined above, the potential for further development and the need for foreign direct investment are sufficiently strong that Romania should be regarded by both the Bank and the international oil industry as a prime candidate for further investment and development. Next steps by the Bank would be to discuss these views with the regional sector management of the Bank and with the Oil and Gas Division of IFC. Simultaneously, the oil industry would be canvassed to determine 1) the level of interest in the development of discovered fields and 2) current disincentives that remain to be corrected through Bank intervention. From this point, an ongoing dialogue between the Bank, the interested companies and the government would naturally develop.

2. Azerbaijan

Petroleum sector overview. Along with Romania and the United States, Azerbaijan was among the world's first commercial producers of petroleum. Until World War I, it remained one of the world's principal sources of petroleum. During World War II, the battle of Stalingrad was fought over Hitler's efforts to access Azerbaijan's supplies of petroleum as a means of continuing the war effort on the one hand, and the Soviet Union's efforts, which were ultimately successful, to prevent this. Many of these old fields, some of which were developed by the Nobel Brothers and the Rothchilds at the turn of the last century, are still producing, and today lie within the suburban ring surrounding the city of Baku.

During the late 1940's the Soviets developed the world's first true offshore oil fields (Oily Rocks) to the east of the Apsheron Peninsula, utilizing onshore technology installed on a vast system of offshore platforms and causeways (estracadas). These estracadas at Oily Rocks and other older offshore fields, although now well beyond their design life and badly damaged by age, corrosion and the depredations of occasional violent winter storms, are still active and functioning. Due to its geographical configuration – largely landlocked and isolated from the offshore and maritime areas by the presence of other countries and lack of access due to significant winter ice – the Soviet petroleum industry never developed an efficient offshore exploration and production capability. As a result, exploration of the Caspian Sea and other potentially-productive marine areas was largely confined to shallow water coastal areas that

could be serviced through the use of the estracada system. The huge potential of the largely ice-free Caspian Sea thus remains unexplored.

In parallel with this history was the development of a sophisticated oil field manufacturing and service industry in and around Baku. These plants at one time supplied some 60% of the world's petroleum equipment, services and technology, with a client base located throughout the Soviet Union, the Eastern Bloc and much of the Non-aligned world.

Following recovery from the depredations of World War II, the Soviet Ministries of Geology and Petroleum began an organized search for petroleum resources in other parts of the Soviet Union. Major successes were made in the lower Volga Basin (the "Second Baku"), followed by the vast West Siberian Basin (the "Third Baku"). Other significant discoveries were made in the northern European portion of Russia (Timon Petchora) and Sakhalin Island in the Far East.

With each of these major discoveries, resources were moved from Baku to the new discoveries in succession, thus leaving the major but aging fields and the infrastructure in and around Baku to their own, under-funded devices. As a result, for the last three to four decades, these facilities and fields have suffered from under-funding and deferred maintenance. This has been accompanied by severe amounts of environmental pollution due to the continued use of inappropriate oil field production practices. In addition, being largely cut off from petroleum developments in the West, field exploitation has suffered from the lack of application of modern oil field technology and, in particular, computerized reservoir modeling.

Present status. The international oil industry has shown great interest in access to the virtually unexplored offshore areas of Azerbaijan. To date, a significant number of exploration and development contracts have been signed by the State Oil Company of Azerbaijan (SOCAR) with foreign oil companies. Several billion dollars have already been invested in exploration, development and required infrastructure work.

Major problems, which are currently under resolution, deal with export access to the international petroleum markets. In addition, there is no petroleum law in Azerbaijan. Therefore contracts are negotiated directly with SOCAR and subsequently ratified by Parliament. This form of direct negotiation without a proper legal framework opens the possibility for corruption. There is a considerable body of petroleum and environmental protection regulations in place, but regulatory compliance instruments are very poor. Last, due to the poor state of existing gas treatment and transmission facilities, most excess associated gas is either vented or flared, rather than utilized.

SOCAR was formed shortly after Azerbaijan's separation from the Former Soviet Union (FSU) through the combining of the previously separate Offshore and Onshore Production Companies. The resulting integration has proved to be incomplete and only partially effective. Moreover, the previous management of the former Production Companies was largely Russian, and those personnel have returned to the Russian Federation, leaving SOCAR

without an experienced management structure. This has made much of SOCAR's present work difficult and only partially effective.

Most of SOCAR's past and present activities are correctly focused on its dealings with the IOCs and the development of the nation's very large offshore potential. Largely left behind is the administration of the older offshore fields and onshore field development. Both sets of fields are aging, their infrastructure is crumbling, production practices are inefficient and their existing producing horizons are experiencing depletion with development of excess associated gas, severe loss of reservoir pressure and severe loss of productivity.

Modern field studies have been undertaken of selected onshore fields by Geoquest. These studies have been actively marketed by SOCAR with over a dozen copies being sold, but with no effective response for production rights from any of the purchasing companies. In similar fashion, Edinburgh Petroleum Services/MAI has undertaken field studies of most of the older offshore fields, but only two copies have been sold and no expressions of redevelopment interest have been received. Reasons for this lack of response are uncertain, but appear to correlate with the recent low international price of crude oil, lack of clear-cut regulations, the presence of significant environmental problems, especially with the onshore fields, coupled with the ambient level of political uncertainty in the Caucasus Region.

With the exception of the older fields, offshore exploration and development of Azerbaijan's resource endowment appears to be developing moderately well through the active intervention of the international oil industry. The remaining areas, particularly the onshore fields, have been left largely unattended. They offer considerable potential for redevelopment.

Collectively, within the approximately 40 onshore fields, there are about two-billion barrels of reserves yet to be produced. The technical risks involved in producing these remaining reserves appear to be amenable to modern production practices that are in routine use in the West. The political and economic impediments to this work are numerous, however. These include potential liability for existing environmental degradation, a general lack of foreign exchange to pay for the produced oil – which would likely be sold domestically – and the economics of field redevelopment utilizing imported goods and services. In addition, there are several social issues regarding disposition of excess field personnel and land utilization, since many of the larger fields are within or adjacent to the city limits of Baku.

There are potential solutions to all of these problems, but their implementation falls largely outside the core business of most oil companies and thus are regarded as impediments to market entry by these companies. Resolution of these problems will need to be undertaken in conjunction with both an oil producing company and an outside development agency, such as the World Bank.

Bank position. The Bank's presence, particularly in upstream oil and gas projects, has been limited due to the Bank's (perhaps wrong) assumption that the IOCs will take over and manage the sector efficiently; that oil development is moving well and that further Bank work is neither needed nor wanted in the energy sector. As the price of oil remains low, and the

disappointing results of initial exploration drilling for new oil fields continue to come in, however, a change in perspective is beginning to express itself within this country's thinking. This is particularly true with respect to the rate of change that may be expected through intervention of the international oil industry. It is clearly going to take longer than was envisioned several years ago, however. Industry interest has not been universally applied throughout the country, but rather has been sharply focused on exploitation of known or suspected offshore fields.

Most of the environmental and social issues within the Azeri oil and gas sector reside in the onshore area, in which the more responsible segments of the industry have shown themselves reluctant to become involved. In these areas, items of potential Bank interest may be as follows:

- Development of a modern petroleum law, which does not yet exist
- Development of an effective regulatory agency
- Environmental remediation,
- Revival of the domestic oil field goods and services industry
- Separation of environmental liability from future contracted development work
- Introduction of generally accepted modern oil field practices to Azerbaijan's aging "stripper well" production
- Remediaton of social issues associated with downsizing of onshore NGDU production companies
- Gas related issues
    - Reliable supply
    - District heating
    - Gas treatment/transportation
- Elimination of gas venting
- Historical preservation of areas of significant interest through the introduction of the concept of industrial museums involving renovated, but still producing older oil fields

Many of these issues fit well within the Bank's mainstream objectives of environmental remediation and preservation, and the alleviation of poverty. They would likely be seen as desirable projects to have inserted in the Bank's project pipeline. Others fit well within defined areas of investment priorities of other financing bodies, such as IFC and the Japanese investment agencies. It is quite likely that with considerable effort, one or more potential projects can be put together that fulfill these objectives.

There are several factors working against these potential efforts, however:

- Lack of knowledgeable gas counterparts within SOCAR to become involved in these issues which, although important to the Azeri population, are peripheral to the main objectives of SOCAR; and
- Issues of domestic gas pricing

In addition, there are the complications of partial risk guarantees, and negative pledges that must be overcome prior to launching any Bank-related project.

Next steps. A number of the listed potential areas for Bank intervention, such as the development of a petroleum law and a regulatory agency, should be undertaken as a first step in developing an enabling environment that is sympathetic to the international industry. Many of the others need to be taken in conjunction with the active participation of the international oil industry. Given that there is such an intimate relationship with the industry in the development of these projects, a likely first step is to open discussions with interested companies. The objective of these discussions would to develop joint efforts in which individual companies are active participants in potential Bank projects.

3. Ukraine

Petroleum sector overview. Although not spectacularly well endowed with hydrocarbons, Ukraine nevertheless does have significant reserves of oil and particularly of gas. These reserves are located within several basins, including the major Dnieper-Donetsk Graben in the central portion of the country, and the onshore-offshore area of the Sea of Azov, associated with the pre-Caucasian foredeep. Both basins extend into adjacent countries.

Development of Ukrainian oil and gas fields reached a peak in the early 1970s under the Soviets, but was never sufficient to meet domestic consumption requirements. Inasmuch as Ukraine was clearly not a major repository of hydrocarbons, it never received heavy investments in exploration, production and infrastructure, such as were made in West Siberian and Volga Basins. As a result, its considerable remaining hydrocarbon potential has never been adequately developed.

Present status. Ukraine's oil and gas production has steadily decreased during the past decade due to lack of investment. Now, domestic production meets only 20% of the country's oil and gas requirements, with the rest being imported, largely from Russia. In place of an active petroleum industry, the nation has become a transit country, across which the major Soviet export gas pipelines were constructed to connect the enormous gas fields in the Yamal area of northwest Siberia with the consuming centers of Western Europe. It also contains the Druzba oil export pipeline from Russia to the West. Transit fees are largely paid to the Ukrainian government in the form of gas for domestic usage by Gazprom, the giant Russian gas monopoly that owns both the trunk lines and the gas within them. The remaining domestic gas requirements are largely supplied by Gazprom on an accrued debt basis.

As a result of this stranglehold on the Ukrainian economy, Gazprom has become the virtual government of the country. This has had many adverse repercussions for economic and political development. To the foreign investor, for example, the situation represents major economic and political risks. In particular, there is a high degree of corruption within the country's gas sector, monopolistic domination of the domestic gas market, huge problems of non-payment for imported gas consumed domestically and Gazprom's blocking of potential export of Ukrainian produced gas for hard currency earnings.

On the positive side, under Soviet control and economic conditions, a viable oil and gas economic sub-sector was developed that included oil field related manufacturing facilities and the provision of related goods and services, as well as an adequate infrastructure to handle domestic production. It is quite likely that with the application of modern oil field technology, additional oil and gas fields will be discovered. These would be in addition to the nearly 150 existing undeveloped discoveries. If the enabling environment can be corrected, these discoveries may be economically developed for the benefit of the country.

Bank position. Currently, there are neither Bank nor IFC projects active in the petroleum sector of Ukraine, although the Bank has a few energy sector projects in the form of district heating, electricity and hydropower rehabilitation. There have been discussions between the Bank and the Ukrainian government on the subject of reforming the natural gas sector, but to date no agreement has been realized. The national economy has had a negative annual growth over much of the past decade, due largely to the slowness of the country's transition from central planning to a market economy. This, coupled with internal disagreements over the desired direction and rate of change of the national economy, has jeopardized IMF-funded technical assistance programs, as well as programs of the Bank and other foreign development agencies.

With domestic oil and gas production continuing to decline, imports and their associated foreign debt continue to grow. There is thus a compelling reason for the Bank to intervene in the Ukrainian economy in general and the petroleum sector in particular.

At present, country issues overwhelm any areas of potential petroleum interest and therefore dominate the Bank's thinking and negotiating stance in its dialogue with the government. That said, there is the possibility of utilizing petroleum sector reform as a tool in making the country dialogue more effective. This could provide the Bank with enough leverage to effect the changes it has proposed to the government, and therefore the outlook for oil and gas exploration and development could be improved.

There are a number of potential projects that could be undertaken within the oil and gas sector, all of which are technically feasible, with the caveat that, at present, the Ukrainian government shows little interest in reform of any sort. Principal issues against progress include:

- Non-responsiveness of the government to Bank-sponsored reform programs
- High rate of corruption within the gas sector

- Huge problem of non-payment for gas consumed within the country
- Pricing of domestic gas in contrast to gas for export
- Monopolistic domination of the gas sector by Gazprom, which controls the domestic gas market
- Export marketing of domestically-produced gas blocked by Gazprom's control of both pricing and infrastructure
- An effective means to reassure foreign investors
- Lack of an effective regulatory environment

One possible project would involve rehabilitation of the transit pipelines, undertaken in conjunction with IFC, and modeled along the lines of the existing Chad/Cameroon Regional Pipeline Project. A much more difficult, macro-level project would be institutional reform and transparency within Ukraine's oil and gas sector. However, this would involve a very hard, high-level fight between the Bank and the government, which appears reluctant to undertake these types of reforms. If the government would acquiesce to such a project, however, it would be a major economic step forward for the country.

Next steps. Until government agreement is obtained and reforms are clearly underway, it is difficult to see how the Bank can approach the international oil industry with proposals to explore and develop Ukraine's potential and probable reserve base. Therefore, the initial steps need to be taken by the Bank in conjunction with the IMF, after which would be engagement of the oil industry as active investors.

4. Poland

Petroleum sector overview. Poland is only modestly endowed with oil and gas reserves that are located largely near the German border, with lesser amounts in the Baltic Basin to the north, and along the Carpathian foredeep in the southern part of the country. Poland produces only 2% of its petroleum needs from these reserves and 40% of its gas requirements. Most fields that comprise this domestic reserve base are of small-to-intermediate size and appear not to be economic to develop further under present conditions. Much of the domestic gas reserves have a high nitrogen content and hence low heating value.

The remainder of Poland's oil and gas requirements is imported, largely from Russia, but with increasing amounts being imported from the countries around the North and Baltic Seas. Much of the Russian gas is paid for through barter arrangements with the Polish government, paying Gazprom with a combination of Polish goods and services, and through the construction of the Polish portion of Gazprom's new Yamal-European gas transportation trunk line.

Due to Poland's modest oil and gas endowment, the country's energy base has been built around its abundant coal reserves that are used for power generation, district heating and

industrial purposes. These uses result in large amounts of air pollution that must be remediated when Poland joins the European Union.

Its National Oil Company, PGNiG, created in 1982 as a utility enterprise, dominates Poland's oil and gas industry. It is vertically integrated including exploration, production, transmission, storage and distribution of gas as well as the manufacturing of petroleum machinery and equipment. The NOC is highly competent, but it is in need of restructuring and downsizing. Preventing this is its workforce, which resists the spinning off of peripheral portions of the NOC, thus reducing its size and hence its value. This is a major issue of importance to the workforce which, by law, has a right to share in the ownership of the company, should it be privatized. The workers' view is that it is better to have share holdings in a large multifaceted company rather than a smaller, more efficient company. The Polish government appears unwilling to force this issue.

Present status. Although the NOC does not hold a monopoly position within the oil and gas exploration and production subsector, it does hold title to all of the areas thought to be favorable for further exploration. Moreover, it appears to be reluctant to negotiate with the IOCs that are interested in participating in this economic sector.

A number of both large and small western oil companies have negotiated exploration and production contracts in Poland, but despite signatures and agreed-upon work programs, little has resulted from this effort. There are a number of reasons for this. The simplest involves difficulties in surface rights access and data availability, which are held confidential by PGNiG in its areas of active interest. Of perhaps greater importance is the apparent reluctance of PGNiG to negotiate joint ventures with foreign oil companies, in which PGNiG would provide exploration acreage or the discovered field, and the foreign company would provide capital, advanced technology and managerial capability. This reluctance is unfortunate, because joint ventures would allow PGNiG to focus its attention on producing its core fields, thus greatly improving its performance and financial standing, but making a significant portion of its staff redundant.

This is an important consideration inasmuch as there are more than 100 discovered, but undeveloped fields in Poland, in addition to the smaller, more marginal fields currently under production. These are in addition to the considerable exploration potential retained by PGNiG, which does not have the funding to maintain an effective, ongoing exploration program.

Petroleum licenses are of the concession type and are granted under the 1994 Polish Geological and Mining Law. The structure of this law, with its fixed fee and royalty basis, is such that the development of smaller fields is often uneconomic. Revisions are under consideration, however, since the law was structured principally for mining operations and discourages foreign participation in the petroleum sector.

Robertson Research has held two Exploration Licensing Rounds that were quite successful. The country is generally regarded as a good place to do business and non-confidential data is abundant and freely available.

On the demand side, Poland consumes two to three times as much energy per unit of GDP as Western European countries. In addition, the domestic markets for gas and particularly for oil are captive and currently being supplied by expensive imports ($2.70/MMBTU), mostly from the Russian Federation. Both market availability and pricing are assured, thus greatly reducing the commercial risk attendant with most new venture market development. In addition, a well developed oil and gas distribution infrastructure is in place, which largely eliminates the need for the major up-front capital investments that otherwise would be required to bring a discovery into market.

Bank position. The Bank has completed its 1990 Polish Energy Resource Development Project loan to PGNiG for $250 million. The loan was largely designed to increase the production efficiency of Poland's oil and gas resource base through technical assistance and funds for equipment and technology purchases. In addition, an ESMAP study on Poland's Natural Gas Upstream Policies has been completed and the most recent Country Assistance Strategy document was agreed upon with the Polish government in April 1997. IFC has one ongoing project in mining and the extraction of fuel minerals.

The government is reluctant to undertake further Bank borrowing in a sector in which its NOC is highly competent, the private sector is interested, and where, if required, financing could be arranged from commercial banks under less onerous conditions than would be those accompanying a World Bank loan.

Next steps. Although the country's commercial risk is of investment grade, there is some potential in Poland for very large Bank involvement in future work on gas and oil transit pipeline projects. The objective in such projects would be to provide commercial confidence through political risk mitigation, particularly in neighboring countries such as Belarus. A further role of the Bank in Poland would be to explore with the government as to why the IOCs have not progressed with their negotiations and why it has proved so difficult to restructure PGNiG. It is therefore possible that Poland might present itself as the subject of a macroeconomic or sectorial policy discussion, the outcome of which may be Bank assistance with the provision of counter-guarantees, rather than lending.

IFC project participation and/or MIGA insurance policies may also provide further offset to perceived economic and political risks. Useful preparation for these types of projects would be to interview those companies that were initially attracted to Polish upstream projects, but which failed to come to closure. The objective of the interviews would be to determine what impediments to closure would need to be changed if further foreign direct investment is to be realized.

The likely oil company participants in the subsequent project design and implementation of exploration and production projects would be the mid-sized to small oil companies, as a result of the relatively small field sizes that are present or are expected to be discovered. Both incurred costs and likely benefits resulting from a successful outcome are commensurate with the resources and expectations of these types of companies, rather than the major IOCs.

Regarding the latter, their administrative costs are sufficiently large that the results would not materially effect their balance sheets and therefore would be of lesser interest.

5. Hungary

Petroleum sector overview. Hungary's modest oil and mostly gas endowment is well developed, particularly since the end of World War II. The gas fields are located principally in the Panonian Back Arc Basin, inside the loop of the Carpathian Mountains. These are shared with the Transylvanian portion of adjacent Romania. The fields are for the most part located within the Pliocene-aged grabens that accompanied the formation of the Alps-Carpathian Mountain chains and, particularly in the eastern portions, are both overlain and underlain by salt deposits, as they are in adjacent Romania. The result of both of these phenomena make exploration and field extension highly amenable to the application of western technology, which has only recently come to Hungary. In addition, the general shallowness and young age of the deposits (generally less than 3,000 meters) result in relatively low volumes of gas per volume of reservoir, thus making their development cost intensive on a unit production basis.

Other producing areas are in the southwest of the country in the Croatian Basin, which is shared equally with Croatia. There is a high degree of cooperation with the Croatian National Petroleum Company and the basin has been largely explored and developed jointly, in much the same manner as the fields along the Central Graben of the northern North Sea, between the UK and Norway. Minor production is also present in the Alpine foredeep in northwest Hungary, which is shared with neighboring Austria, Slovakia and the Czech Republic.

Hungary produces less than 20% of its domestic oil consumption and approximately 36% of its natural gas requirements. The remaining oil requirements are supplied through a crude oil pipeline from the Adriatic and a gas pipeline connection to the major Russian export lines. In addition, Hungary has a limited endowment of high-ash, high-sulfur coal deposits, which it uses principally for power generation.

Hungary's oil and gas industry is highly developed and technically competent. Its Geological Survey is one of the finest in the world and has served as a model for other younger surveys elsewhere. It contains records and samples dating back to the 1600s. Similar remarks may be made of the cutting edge technology that has evolved from Hungarian universities. These in particular involve the theory and practical implementation of gravity surveying, which were developed in the early years of this century and have since enjoyed worldwide utilization. This high level of thinking and writing is still forthcoming from these institutions. Oil and gas transport and distribution infrastructure is equally highly developed.

Present status. A modern petroleum law and licensing agreement system was put in place in 1993, although the nature of the economic terms are such that most field development is uneconomic for small discoveries and low oil prices. Several medium-to-small international companies have undertaken agreements, although without significant success.

The government has successfully privatized most of its power, gas and oil sectors. The virtual absence of active participation of the international oil industry within the country, however,

suggests that despite privatization, the National Oil Company has retained most of the prospective areas for its own utilization. As a result, there have been very few new discoveries and both production and the national reserve-to-production ratio are rapidly declining. In spite of this, there are approximately 75 discovered-but-undeveloped gas and oil fields, suggesting that the National Oil Company lacks development funds, is unwilling to subcontract their development to the international industry or the economic terms currently in force preclude their economic development.

Bank position. Since 1983, the Bank has made eight energy-related loans to Hungary, including two in the petroleum sector. The government however, wishes to graduate from the status of Bank-borrower to that of Bank-donor, and is not interested in providing the required counter guarantees, nor is it interested in further borrowing. Instead, the government desires strongly to integrate quickly into the European Union. As a result, it has developed deeper ties with European institutions such as EIB and EBRD, both of which are very active in infrastructure areas. Thus the Bank's role remains relatively modest and complementary to the European investment institutions. In addition, Hungary's very high debt burden, rapid macroeconomic deterioration and slowdown of structural reforms have prevented the Bank from pursuing a strong program of financial assistance within the country.

Next steps. The lack of international oil company activity in Hungary, given the location of the country with respect to infrastructure, and the likelihood of a number of future small discoveries, is an indicator that additional reform is still required within the enabling envelope if Hungary is to realize its full natural resource potential. Therefore, within the course of Bank-country dialogue, the issue should be raised of a small technical assistance project to undertake a policy review of Hungary's enabling envelope. Such a project would be useful to the country. The objective would be to review the ability of the National Oil Company to effectively explore and exploit the oil and gas resources that it has under license, with respect to its budget allocations.

The likely result of such a policy review would be to reduce the NOC's license holdings to a level more commensurate with its financial and technical abilities. A second objective would be a revision of the enabling envelope to allow smaller fields to be commercially developed and to encourage joint ventures and other forms of subcontracting of the NOC's non-core holdings to smaller foreign oil companies.

Toward this end, it would be useful to interview companies that have held negotiations with the Hungarian government for exploration or development licenses to determine what disincentives exist. This external perspective would be useful in helping the Bank focus its viewpoint in future efforts to restructure the enabling envelope. A likely outgrowth of these discussions would be to develop a roster of companies interested in participating in Hungary's petroleum development following changes in the economic structure of its petroleum contracts and regulations. These companies would likely be smaller European and North American oil companies, rather than the larger international companies that would regard the potential returns on development of smaller fields not commensurate with the effort and expense involved.

6. Russian Federation

Russia has been specifically excluded from this study due to the complexity of its problems, the size of its economy relative to any possible Bank sector lending and the active interest of the international oil industry in participating in exploration and production activities there. It is quite true that the country has enormous potential for future sector development that can be fully realized through an open, transparent licensing environment. The present distrust of the international industry, the inward-looking Parliament and the depth of the country's other economic problems, however, all combine to place energy sector reform into a secondary position relative to macroeconomic reform.

Nevertheless, the effect of this impasse on Russia's macroeconomic balance sheet is enormous and continues to grow. At its peak, shortly before the breakup of the Former Soviet Union, the country produced nearly 12 million barrels of oil equivalent/day. This has declined during the intervening decade to the current level of about 7 mmbd.

To put the magnitude of this decline into perspective, it represents 20% of OPEC's current total daily output quota. It is true that some of this decline is due to loss of production from the republics that subsequently withdrew from the FSU, but the resulting lost volumes of liquid production were small in comparison. The true reasons for the decline are deferred maintenance, lack of investment in the required infrastructure and curtailed exploration required to replace consumed volumes. As a result of these curtailed investments, there are approximately 1,050 discovered-but-undeveloped oil and gas fields within the Russian Federation. This represents nearly 20% of the 6,500 undeveloped fields in the entire world.

This loss of production is subtracted directly from crude oil exports, which form the major basis of Russia's access to foreign exchange. Moreover, the decrease in Russia's domestic consumption of petroleum appears to have bottomed out, and will likely grow slowly in the future as economic growth begins to take hold. Depending on the rate of production decline and future growth in domestic demand, the petroleum supply and demand curves will cross within the next decade or two, thus making Russia a net importer of petroleum. This is an inconceivable situation and is not likely to be tolerated by the government. The question is what will be the nature of intervention by the government?

A strong case can be made for the Bank to open a major dialogue with the Russian government regarding the macroeconomic cost of not allowing a free inflow of foreign direct investment within the petroleum sector. Such an inflow of foreign capital, technology and managerial expertise would have major macroeconomic repercussions on the nation's economic development. To not table these issues as part of the Bank's ongoing country dialogue would be irresponsible. Although it is unlikely that these proposals would be well-received by the government, it is nevertheless incumbent on the Bank to do so. As a means of buttressing its arguments prior to placing this issue on the country dialogue agenda, it would be useful as part of its economic sector work to study these likely results, utilizing information generally and currently available in the specialized trade press.

Other Bank Borrowing Countries Within Eastern Europe and Central Asia

7. Kazakhstan

This country is relatively open to foreign exploration and production, and therefore the IOCs are highly attracted to Kazakhstan for these purposes. There remain a number of structural problems within the enabling envelope, as well as access-to-market issues that are still unresolved. It is possible that an effective Bank technical assistance credit would be useful in bringing these issues to closure, although past lending experience has shown considerable resistance to change. In the meantime, lack of active Bank participation within the energy sector does not appear to be an impediment to ongoing foreign direct investment.

8. Uzbekistan

Of the Central Asian Republics that separated from the Former Soviet Union, Uzbekistan appears to be the most competent and well-organized within its energy sector. In past Bank projects, the Uzbek government has been disinterested in Bank loans due to requirements for transparency of process, international competitive tendering and economic return on investment. As a result, the government has generally elected to proceed as it has in the past, using traditional suppliers, hiring external assistance when needed and paying for it from its own resources or through the use of Export/Import Bank guarantees. For these reasons, there is very little international oil company activity within the country.

9. Turkmenistan

There is a high degree of international oil industry interest in Turkmenistan because of its abundant endowment, particularly of gas; a number of projects have been signed. The most notable of these has been UnoCal's proposal to develop one of the very large gas fields in the south of the country and pipeline the gas across Afghanistan to Pakistan. As has been well reported in the trade press, this project has been allowed to lapse for reasons of political and economic risk in the pipeline portion of the project.

Both small and medium-sized foreign companies have entered into agreements to develop the oil fields in and adjacent to the Caspian Sea, but have experienced many problems and one major lawsuit. The government has unilaterally renegotiated several contracts, contending that when they were signed, the government was not sufficiently aware of what it was signing and therefore wished to rebalance the contract terms. Other problems involve market access, either through Russia, Afghanistan, Iran or across the Caspian to Azerbaijan and from there on to market access in Turkey. In time these difficulties may be resolved and there is the possibility that Bank intervention may be of use in these efforts.

To date, the Turkmeni government has been unwilling to conform to Bank procurement requirements and other Bank economic requirements. Several exploration promotions have been held with considerable success, but with no measurable follow-up.

10. Kyrgyzstan

The country contains ten sedimentary basins, all of the intermontaine rift type, all of which appear to have some potential, although only three have had drilling undertaken. Of these, the Kyrgyz portion of the Fergana Basin, which is shared with Uzbekistan and Tajikistan, produces minor amounts of oil and gas. A number of problems exist with respect to the National Oil Company, data access, the small size of the basins and their unexplored frontier characteristics. The ability of the government to pay for the production that it needs for domestic consumption is poor and access to the international market place is problematic.

Several of the basins border with or are close to China and there is potential pipeline route access to the Tarim Basin of China, in which there is considerable oil activity and related infrastructure as well as a ready market and access to foreign exchange. The distances are such, however, that major capital investments would need to be made in order to bring production of oil or gas to market.

There is currently a Bank energy sector credit under implementation that contains an upstream petroleum component. The history of cooperation of the Kyrgyz government in this portion of the credit has been poor. An active discussion is currently underway with the government regarding whether to cancel or implement the proposed exploration promotion component.

11. Tajikistan

There is thought to be very little petroleum potential in this mountain republic. Until the current active civil war ceases, there will be very little Bank lending of any type.

12. Belarus

The technical prospectivity of the country is good. The Donnetz-Dnieper Basin continues northward from Ukraine into Belarus, becoming more oil- and less gas-prone in the process. Unfortunately, the prospective area largely underlies the area of radioactive contamination resulting from the Chernobyl nuclear reactor meltdown. There is little that any Bank project can undertake that would significantly alter this disincentive to foreign direct investment.

13. Moldavia

There is little prospectivity for oil and gas in the country and therefore little reason for the Bank to participate in the upstream portion of the energy sector. There are, however, considerable issues of gas pipeline transit rights, gas offtake rights from the transiting trunkline from Russia to Romania and beyond, as well as gas distribution and power sector reform issues that need to be addressed. All fall outside the scope of this project.

14. The Baltic States

There is very little prospectivity in any of these three countries for conventional oil and gas exploration and production, although there are considerable oil shale deposits that have been exploited for years as an economic resource. Moreover, two of the countries are preparing for

entry into the European Union. Should this occur, it is presumed that they would no longer be eligible for Bank borrowing.

15. Bulgaria

Bulgaria has a very well-developed gas infrastructure in place as a result of internal gas distribution from the Russia-Turkey gas trunk line that traverses Bulgaria from north to south along the Black Sea margin. There is, however very little oil or gas production in the country and few prospects of significant future discoveries. Existing prospective areas are in the northern margins of the country where it shares the Moesian Platform with neighboring Romania, and the northern portions of its sector of the Black Sea. There are some ten discovered-but-undeveloped fields in these two areas, but little interest has been shown in their development due to the nature of the existing fiscal regime. Discussions have been undertaken between the Bank and the government regarding sectorial reform and a draft petroleum law and model contracts have been proposed. These have, however, not been implemented and further Bank intervention has been precluded due to the government's expressed disinterest in conforming to IMF-mandated economic reforms and market-oriented development.

16. Turkey

The country is only modestly endowed with petroleum potential. Turkey's existing oil production is concentrated in the southeastern area, which represents the distal remains of the prolific petroliferous basin of Iraq. The Thrace Basin, in the European portion of Turkey, there is modest gas production with little expectation of further significant exploration success. Between these two basins, there are 45 discovered-but-undeveloped fields. In the remaining areas of Turkey, there has been little exploration, although along the deep-water margins of the Black Sea and in the intermontaine basins of Eastern Turkey there is thought to be untested petroleum potential.

The National Oil Company is well organized and technically qualified. Both small independent IOCs and several of the major internationals have been active in the past, but lack of any significant success has caused interest in further work to lag. The government has shown little interest in Bank involvement in its petroleum sector, other than pipeline transportation, and there is little to indicate that the presence of the Bank would materially assist further success within this sector.

17. The Balkan States

There is modest petroleum potential in most but not all of the states of the Former Yugoslavia and Albania. Until the current civil strife ceases and reconstruction begins in earnest, however, there is little prospect of Bank intervention in the upstream petroleum sectors of these newly-independent countries. It is unlikely that many of the IOCs would be interested, either, until the conflicts cease, although a case can be made for offshore development in Croatia and Albania, in a fashion similar to what is ongoing in Angola. The risk/reward ratio, however, is quite different in these states than in Angola.

Croatia. Considerable petroleum exploration and development has occurred in the Croatian Basin, which is shared with Hungary. There has been lesser development of the gas discoveries near the centerline of the Adriatic Sea, which is shared with Italy to the west. Between these two sedimentary basins, more than 40 fields have been discovered but not developed.

Albania. A number of older, onshore fields would no doubt be amenable to redevelopment utilizing modern western technology, but the present and ongoing civil unrest precludes most industry activity there. Offshore, in the deep portions of the Adriatic Sea, the petroleum prospects are attractive and there is one discovered-but-undeveloped field in the deep waters (2300 feet) of this area.

Bosnia-Herzegovina. There are two discovered-but-undeveloped fields in the northern portion of this country and modest potential for additional discoveries. Discussions with the Bank have been undertaken by government representatives regarding a petroleum exploration promotion program for the country. Until the current civil strife ceases, however, there is no possibility of Bank intervention in this sector. There has been little interest expressed by the IOCs in participating in an area of such high political risk and relatively low prospectivity.

Macedonia and Slovenia. Similar comments may be made for these two Balkan states, although no discussions have been undertaken with the Bank.

Primary Middle Eastern and North African Countries

18. Yemen

Petroleum sector overview. The country has a very active and relatively new oil and gas sector, with oil production at approximately 440,000 b/d. The main production is from basins within the interior of the country, away from population centers and coastal areas. Exploration activity has increased significantly since 1997 after the civil war ended. Oil production has increased, but there is a need for more attractive contract terms to encourage more direct foreign investment. In addition, there is no utilization of the abundant associated and non-associated gas resources within the country.

Yemen's oil production presently accounts for 70% of government revenues and 87% of exports of goods and services. Production from existing fields is expected to slowly decline from the current level of 440,000 b/d until 2006, then fall to only one-third of that level by 2008, and one-sixth by 2011. The annual loss in export revenue, even if high oil prices persist, would be over $1.5 billion. Even if new discoveries are made soon, it will likely take a decade for them to reach full production.

Several consultant studies are nearing completion regarding potential next steps that Yemen needs to take with respect to its petroleum sector. Major issues under study include utilization of natural gas, power generation and LPG extraction. Related issues deal with the relative economics of pipelining gas to urban centers of power, demand for gas as power station fuel or, alternately, placing generating stations near the gas fields and transmitting electricity to the consuming centers.

A review of the upstream enabling environment also may be revisited. In addition to re-evaluating the legal and fiscal terms, the review may examine the potential for establishing a geological survey, complete with a data base management system, as part of the regulatory agency. There also may be a formal exploration promotion round to announce changes in the enabling environment as a mechanism for improving the declining rate of exploration.

Consideration might also be given to opening a dialogue with the government regarding effective utilization of petroleum-derived income. The rationale would be to avoid squandering the likely short-lived spike of petrodollars – i.e., avoidance of the Dutch Disease. Also beneficial would be parallel work, through the Ministry of Foreign Affairs, to attempt to resolve ongoing territorial issues with Saudi Arabia.

Present status. There is potential for improvement in electricity generation and transmission efficiency in view of 35% in current technical losses. Petroleum product pricing policy needs review, since Yemen's diesel price subsidy places diesel fuel for electricity generation at 50% of world price. Inasmuch as 70% of the population does not live in urban centers, studies now underway may lead to innovative off-grid rural electrification schemes.

Additional potential projects involve:

- Regional interconnections for both gas and electricity in the Yemen, Eritrea, Ethiopia, Djibouti and Somalia area
- Development of natural gas-fueled combined-cycle power generation in association with water desalination projects at Al Mocha, Hodeida and other areas
- Development of a national gas reserve policy, establishment of regulations regarding ownership and pricing of natural gas, encouragement of exploration for additional natural gas beyond the current 10 TCF of proved reserves and establishment of gas export policies for reserves above the ports along the coastal region, where both electricity and fresh water are very expensive
- Establishment of a national gas reserve level
- Evaluating the old, Soviet-style Aden refinery with a view to either updating it or decommissioning it

Should the last conclusion be reached, it should include development of transparent mechanisms for purchasing the required petroleum products on the international market through bidding practices.

Bank position. The Bank completed a year of country consultations with the Yemeni population in April 1999, the result of which was the development of a new country strategy for assistance. This strategy will focus directly on poverty reduction, public sector management, private sector development, water supply and basic education and health. Through 1999, the Bank has committed a total of $138 million for these economic areas. A further $550 million is envisioned over the next three years.

It is the view of both the Bank and the Government of Yemen that, rather than becoming involved in the petroleum sector, which appears to be a non-sustainable resource whose duration will only be another 20 years, attention should be focused on the non-oil sectors. The objective should be to diversify and increase the country's non-oil exports as well as to strengthen civil society as a means of replacing the decreasing petroleum revenues.

Next steps. The Yemeni government has shown itself to be open to Bank dialogue with respect to the type of technical assistance that the above potential projects imply. It is therefore quite possible that, with the currently improving Bank dialogue, some, if not all of the above projects may likely be undertaken in the mid-term, using Bank financing augmented by the use of Trust Funds.

19. Syria

Petroleum sector overview. Syria's hydrocarbon endowment is significant, but relatively poorly developed. The prolific production trend of the foreland fold belt in Iraq continues northwestward across the northeastern tip of Syria, ultimately dying out in southeastern

Turkey. In the Syrian portion of the fold belt, the structures, although large, are badly fractured and the reservoirs generally poorly developed, relatively shallow and containing moderately heavy oil with low gas/oil ratios. The result is that the simple primary production techniques used by the Syrian National Oil Company (SNOC) are able to produce only 5-10% of the oil in place. Modern production methods, including horizontal drilling and computer-based reservoir pressure maintenance and production rates would greatly improve these results.

Additional fields are in the central portion of the country, containing lighter oil and considerable amounts of natural gas. There appears to be an abundance of oil and gas within the country's borders (Proved oil reserves of 2.5 billion barrels and gas reserves of 8.3 TCF), but in order to develop and exploit these reserves effectively, the IOCs must be engaged.

Originally, the SNOC was highly competent, to a great extent trained by the Soviets and utilizing Soviet equipment. Since the breakup of the FSU, however, the government has isolated the SNOC from contact with western petroleum technology, resulting in a considerable drop in the level of technical competence. At present, the company is greatly overstaffed, poorly equipped and poorly paid. Accordingly, it is an inefficient vehicle for developing Syria's natural resource endowment.

The country is a natural transportation corridor from the Middle East-Northern Gulf area, through to the Mediterranean. Access of newly-developed production to its extensive pipeline transportation network does not represent a problem, thus greatly improving the probable developmental economics of any new discoveries. The existing pipeline infrastructure needs refurbishment and rationalization, however. There have been discussions of building a pipeline to bring Syrian gas to northern Lebanon, and southwards along its coast. The custody transfer point would be at the Syrian-Lebanese border, with the GOL serving as the merchant owner of the gas in the Lebanese portion of the pipeline, with the ability to sell it to small and mid-sized consumers within the country.

Present status. Syria currently produces about 570,000 barrels of oil per day that accounts for about 55-60% of the country's foreign exchange. Petroleum is thus a highly-important economic sector. In spite of this, production is rapidly declining and exploration activity has been very slow due to Syria's unattractive terms. No discoveries have been made since 1992. Without a significant turnaround in this scenario, Syria will be a net oil-importing nation by 2005.

Bank position. Syria has a massive current foreign debt ($24 billion) and, until recently, has refused to repay either the IMF or the Bank. The Government has recently started to gradually repay its Bank arrears and moreover has acknowledged that it needs to make payment. Accordingly, Bank missions are starting to revisit the country; a transportation mission has already returned, and an energy sector mission was scheduled for the summer of 1999 at the Government's request. The aim of the latter mission was to negotiate an energy sector strategy note and to determine if the government-Bank relationship will work at an operational level.

Next steps. In the event that this preliminary dialogue develops into a lending program, a likely result would be a technical assistance project that would revisit the legal and fiscal regimes, organization of a modern, efficient geological survey and an associated data base management system, a regulatory agency and probably a modern geological evaluation of the country's present hydrocarbon resources with an associated exploration promotion program to rekindle industry interest.

In addition, the power sub-sector is badly in need of rehabilitation and/or reconstruction to take advantage of the large volumes of natural gas reserves for power generation. The resulting substitution of natural gas for petroleum products would enable more crude oil to be exported for hard currency.

It seems in Syria's best economic interest to maximize the efficiency of its energy sector. How much of this gets done is dependent on both the Bank's approach to the government and the government's attitude toward accepting Bank assistance and Bank rules. Potential work would be useful in the following areas:

- Upstream enabling environment improvement,
- Establishment of a geological survey, a regulatory agency and an electronically stored data base systems
- Major extensions and/or rehabilitation of the national oil and gas pipeline network
- Strategic planning for the future of the country's existing, but antiquated refineries
- Export of natural gas and electricity to neighboring countries

Thus there is an abundance of potential for both technical assistance and investment lending within the petroleum sector.

20. Algeria

Petroleum sector overview. Algeria is the second largest country in Africa, after Sudan. Its complex geology contains prolific petroleum reserves, of which gas is significantly in abundance. In this regard, Algeria is believed to be among one of the five largest gas reserve countries in the world. The size of Algeria's gas reserves and its proximity to European markets resulted in its decision to initially build LNG plants for natural gas export as early as 1964, to be followed by two trans-Mediterranean gas pipelines.

Algeria's current production is above 12.5 bcf/day, half of which is reinjected for pressure maintenance. Of the remainder, some 25% is consumed domestically and 75% is exported, nearly equally divided between pipeline gas and LNG. By 2020 the European Commission forecasts that Algeria will supply 25% of the European gas market.

Algeria's crude oil production is close to 900,000 b/d, which is slightly above its OPEC quota, plus some 400,000 b/d of condensate and 150,000 b/d of LPG, both of which are not counted as part of the country's OPEC quota. The economic output of this activity accounts for nearly 95% of Algeria's foreign exchange earnings, thus making it the most important component of the country's economy.

Present status. As a result of this productive capacity, the country has a very well-developed petroleum infrastructure and a technically competent, well-managed national oil company in Sonatrach. However, Sonatrach until recently chose to isolate itself from the rest of the international petroleum world through its insistence on near total ownership and control of the nation's petroleum reserves and infrastructure. As a result, the computer revolution that has so radically changed the manner in which western oil companies find and produce petroleum reserves was missed entirely. Sonatrach's capability to explore and produce fell steadily behind the rest of the industry. This was coupled with internal political and economic problems during the 1970s and 80s, which constrained the amount of financial resources available for Algeria's petroleum sector.

This has caused a very asymmetric development of the country's petroleum potential. The bulk of the developed reserves are in the southeastern portion of the country, with nearly a dozen sedimentary basins located in the deep south and west of the country remaining virtually unexplored and without the required infrastructure. As a means to develop the remaining potential in the productive basins, and to explore the remaining petroleum potential of the country, the government changed its enabling economic envelope significantly through a series of several steps. These changes have opened up the country to exploration and development by foreign IOCs, who have since arrived in large numbers and subsequently have made a number of significant discoveries. Sonatrach remains active in both exploration and production, but now has the advantage of leveraging its efforts through accessing the capital, technology and managerial skills of the international industry.

Bank position. Following a great deal of discussion, Sonatrach, through the government, asked for a $100 million loan from the Bank that would allow it to purchase the required new technology under conditions that it could control. This was supposed to be the first of a series of ongoing loans allowing the company to continue to upgrade its capabilities. The main point of contention between the Algerian government and Sonatrach management was why sovereign debt needed to be increased for this purpose when Sonatrach had sufficient cash flow to fund the assistance itself. Sonatrach eventually elected not to continue the program of ongoing lending with the Bank. There have been no further Bank loans in the petroleum sector.

Next steps. There are approximately 175 discovered-but-undeveloped fields in Algeria. Many of these could be developed economically by smaller IOCs who have the technology and capital to do so, but with lower operating expenses than Sonatrach. In addition, Sonatrach operates a large number of fields that are outside its core producing properties. From a producing property management point of view, it would be appropriate for Sonatrach to subcontract these properties out for continued development to smaller IOCs on a bidding

basis. This would free up Sonatrach's capital and management resources for application within its core properties that produce the greatest return on invested capital, thereby benefiting both Sonatrach and the Algerian economy.

Other Middle Eastern and North African Countries

21. Egypt

Egypt has a very sophisticated petroleum sector that includes significant participation by the international petroleum industry for nearly the past forty years. The nearly 100 discovered-but-undeveloped fields are located in three major producing basins – the the Western Desert, Gulf of Suez and on- and offshore the Nile Delta. Many of these fields have been undeveloped due to gas ownership problems in the older production sharing contracts. These issues have been subsequently resolved, and it is likely that over time, these fields will be developed either by their original operators or, for those that have been returned to the government, by other companies through the process of international competitive bidding, which is currently well established in Egypt.

There appears to be no added advantage to proposing Bank involvement in this sector of Egypt's economy.

22. Tunisia

For years, Tunisia has had an active, albeit relatively modest petroleum exploration and production sector. Significant oil discoveries have been made in the country's deep south and in offshore areas close to the Libyan border. A number of smaller fields have been discovered onshore in Tunisia's rather complicated geology, and several of these have been begun producing. The remaining 35 discovered-but-undeveloped fields appear to be too small to be profitable under the existing economic conditions. In addition, the country serves as a transportation corridor for crude and natural gas pipelines from Algeria to trans-shipment points to Europe.

The economic conditions surrounding the petroleum sector are conducive to exploration and field development, and it would appear that there is no underlying reason for any proposed Bank involvement in the sector.

23. Morocco

For years Morocco has produced small amounts of oil and gas from its complicated geology, yet despite significant efforts by both the IOCs and the National Oil Company, nothing of commercial significance has been discovered. In place of economic hydrocarbon production, the well-exposed geology of the country has served as a very well-known, well-visited outdoor laboratory for studying the processes of continental drift and collision by both universities and oil companies.

The eight discovered-but-undeveloped fields probably do not contain sufficient reserves to be commercial, since sufficient data are available for industry research and the commercial terms of development are encouraging.

24. Jordan

The geology of Jordan has shown itself over the years to be poorly prospective for conventional commercial hydrocarbon reserves, despite ongoing efforts by the National Oil Company and occasionally by small IOCs. There are some 12 discovered-but-undeveloped fields in the center and far east of the country, as well as significant deposits of oil shale that may be of commercial importance. The government has recently attempted, via an international bidding process, to have the shale deposits studied for possible commercial development.

It is possible that a professional study of the hydrocarbon potential of the country, as well as a review of its petroleum legislation, contracts and regulations would be useful preparation for an international exploration promotional program. The Bank may propose such a program in the context of its ongoing dialogue with the government. If the response is positive, this might serve as a useful future Bank project, either stand-alone, or as a component of a larger energy sector effort.

25. Iran

Without question, Iran is one of the most prolific oil and gas producing countries in the world, with enormous remaining untested potential. In recent years, the government has restarted an outreach program to the IOCs. The aim is to encourage the industry to re-enter the country to help redevelop Iran's depleting fields, rebuild its degraded petroleum infrastructure and undertake development of new fields and further exploration. These efforts have been successful with a number of European companies, but until the US government lifts its economic sanctions on Iran, there will be no significant movement in the direction desired by the Iranian government.

Primary South Asian Countries

26. Pakistan

Petroleum sector overview. Pakistan enjoys a number of petroliferous basins, each with a range of sedimentary and structural variations that allow a vast number of exploration plays to be undertaken by the oil industry. The Potwar Basin in the north, near Islamabad, is largely oil-producing, but most fields are small, with reserves generally under 50 million barrels. In the last decade, considerable oil has been discovered in the southeast of the country, adjacent to the Indian border. The Sindh Basin in the lower Indus valley has proved to be a major gas producing area.

Basinal areas of major potential, yet to date poorly explored, exist both on- and offshore the Indus Delta and in Baluchastan, in the far southwest of the country. Most deltas around the world have proven to be highly prospective for petroleum, as evidenced by the Mississippi Delta in the US, the Niger Delta in Nigeria, and the Mahakam Delta in Indonesia. Drilling evidence to date suggests that the Irrawaddi Delta in Myanmar and the Ghanges Delta in Bangladesh will likewise prove to be prolific producers. The Indus Delta of Pakistan, however, has been only poorly explored due to the current economic and political conditions within the country.

With respect to Baluchastan, which is believed to contain major gas reserves similar to those found in adjacent Iran, the Baluchi tribesmen have prevented IOC access to exploration areas through armed intervention and kidnapping. The Pakistani government has little control over the tribesmen, who want large access payments in return for permission to explore their tribal lands as compensation for their lack of other resources. Neither the government nor the oil companies are willing to make these payments. As a result, these companies have declared *force majeure* and all work has stopped until some sort of resolution can be obtained.

Pakistan's national oil company, the Oil and Gas Development Company (OGDC) is neither well trained, adequately financed, technically competent, nor well managed. Despite these obstacles, OGDC remains in control of the nation's hydrocarbon development, subcontracting out areas for exploration and development to the foreign IOCs who are attracted to the country's potential. The line between state and private resource development activity is thus rather poorly drawn, to the detriment of national economic development. This line moves back and forth as a function of the political party in power, thus creating peaks and troughs of foreign petroleum activity. Because of this, most of the IOCs in the country tend to be smaller companies, rather than the majors.

A moderately well-developed gas trunk line and distribution network exists within the country, connecting the major gas fields in the Lower Sindh Basin with the centers of population around Islamabad to the north and around Karachi to the south. Small, fairly inefficient refineries are located near Islamabad, in proximity to the oil fields of the Potwar Basin and around Karachi, to refine imported crude oil.

Thermal generation replaced hydropower as Pakistan's main source of electricity in 1993. Given the disparity between oil and gas reserves, many of the existing thermal power plants are being converted to natural gas as a fuel and new power plants are being designed with gas as the fuel of choice. Existing power shortages have served as a major brake on economic development. In 1994, the government announced it would purchase power from private producers at agreed-upon rates as a means of promoting power generation expansion. In mid-1996, the government began privatizing its national power companies through a share sale to foreign private power companies. This has been delayed by an investigation of charges of corruption involving the purchase agreement.

To date, some 19 private power projects, all thermal-powered, have reached financial closure. However, with the change of the Bhutto government, charges of bribery and corruption in the negotiations of these contracts were made and the power purchase contracts were canceled. Many of the companies involved are attempting to negotiate new terms and conditions. The overall effect has been to stall development of new power generation plants. It remains to be seen what the new military government will do with these charges and investigations.

Present status. The country's small hydrocarbon reserve base, particularly with respect to oil, is a major constraint to economic development. The country produces only 17% of its crude oil requirements. The remainder must be purchased abroad for hard currency that is in short supply. These purchases represent 19% of Pakistan's total import bill. With no infrastructure yet in place to import natural gas, Pakistan's gas consumption is constrained by the 700 bcf/year that its developed fields can produce.

To alleviate this constraint, the government has made strenuous efforts to import up to 7 bcf/day of gas into Pakistan, nearly four times its current gas production. In this effort, the government has encountered formidable economic and political constraints. Gas purchases from Qatar are constrained by the Qatari perception that Pakistan does not want to pay commercial rates for the purchased gas due to its lack of sufficient foreign currency reserves. The construction of a pipeline to bring abundant Iranian gas into Pakistan has encountered financing investment difficulties due to US constraints on investments in Iran. Gas production from southern Turkmenistan would have to be piped across Afghanistan, where the ongoing civil war shows no sign of diminishing. The two governments want very much for the project to move forward, but private sector companies who would develop the field, construct and operate the pipeline and sell the gas to Pakistan are not willing to take the political risk of Afghani rebel interference.

Regarding domestic exploration and production, the government is offering incentives to foreign investors to explore and develop its potential reserves, particularly those in the offshore areas. Due to ongoing political instability, however, there has been little meaningful response from the industry. Similar offers have been made to the IOCs to expand and upgrade Pakistan's existing refinery network, but with poor results.

Bank position. Both the IMF's and the Bank's relationships with the Pakistani government remain complicated by civil unrest and the government's reactions to private sector industrial activity. These complications apply to both the power and the oil and gas sub-sectors.

The Bank has had considerable petroleum-related lending and institutional-building lending activity in the country in the past, comprising 17 loans within the petroleum sector, including exploration and production assistance. The last two of these loans closed in 1998 and there is no current lending activity with the government.

The major policy reforms, which are the focus of current Bank and IMF activity, are in the area of reduction of corruption and in regularization of regional issues of autonomy, particularly with reference to Baluchistan. The government has experienced considerable difficulties in complying with the covenants of loans from both the Bank and the IMF, particularly with slippage in policy implementation and in required economic performance. IMF lending conditions have been met only reluctantly, under economic duress and have not yet been institutionalized.

The major issues confronting the Bank in its relationship with Pakistan lie in the areas of good governance, transparency of process and dealings with regional entities, including the Baluchis.

Next steps. At the point where governmental agreement is obtained to work on these issues, the Bank's primary thrust logically would lie in the creation of an enabling environment that would allow development of the country's large untapped natural gas reserves. With access to an abundant source of domestic energy, Pakistan could move forward on the related fronts of power generation, infrastructure development and the creation of import mechanisms to augment its domestic oil and gas reserves.

27. India

Petroleum sector overview. India, in a fashion similar to Africa, has a great deal of hydrocarbon potential around its continental margins and along its major mountain fronts. To exploit this potential, India has developed a highly competent National Oil Company, the Oil and Natural Gas Corporation (ONGC). ONGC has insisted, until recently, on undertaking all of its own operations, including research and development, using its own resources. This has resulted in a technically competent staff and management. At the same time, however, it has created company that has unnecessarily constrained itself through lack of interaction with the rest of the petroleum world. In addition, ONGC is under-funded with respect to its mandate of supplying the Indian population with needed hydrocarbon products.

The result of this strategy has been that India meets only 20% of domestic demand for petroleum with indigenous production and must purchase the remainder on the international petroleum market. This external purchasing activity consumes a large portion of India's available foreign exchange and makes it particularly susceptible to international crude oil price increases.

ONGC's exploration activities are focused close to known production areas as a means of reducing the technical and financial risks of non-discovery, thus leaving potentially prolific areas such as the Himalayan foreland fold belt and the deep water continental margins under-explored. The old producing areas in Assam, in the far northeast of the country, lack modern redevelopment and further exploitation. The associated gases that accompany the crude oil production, and their entrained LPGs, are routinely flared, while local villagers burn wood and agricultural byproducts for domestic fuel.

The major offshore fields in the Bombay high are prematurely depleting due to lack of computerized reservoir productivity modeling and reinjection of produced gas and water to maintain reservoir pressure. In addition to loss of productivity, this form of reservoir depletion also results in the bypass of much of the oil within the reservoir, thus reducing the ultimate reserves that may be produced from each field. Steps are now being taken to remedy these problems, but their delayed implementation has caused considerable permanent loss of production that was avoidable and unnecessary.

The Indian Government is well aware of these operating and financial constraints. It has taken a number of steps to alleviate them by opening its upstream petroleum sector to the IOCs. This has been a long process, however, and India is currently in its eighth bid round for exploration blocks. On paper, the response to these rounds has been good, with large numbers of data packages being sold and many bids submitted. In reality, the majority of bids are from Indian independents, which does not satisfy the objectives of bringing in foreign direct investment, as well as the technical expertise and managerial experience held by successful foreign oil companies. In addition, in cases of foreign oil companies that do bid for blocks, negotiations are extremely protracted and create major disincentives to bidding in succeeding bid rounds.

As with the constraints, the Government is well aware of these problems and has conducted a number of studies on what needs to be done to change the situation. Although competent conclusions are reached, are presented to Parliament and are largely adopted into law, implementation of the required changes is very poor. There remains a deep feeling within the management and functionary levels of ONGC that India can manage its own affairs without the need for foreign intervention, if given enough time. Although laudable, this viewpoint unnecessarily constricts the economic development of the country by restricting the availability of energy to those who need it, will profit from it and will enlarge and improve their outputs because of such access.

Bank position. In the past, the Bank has had a great deal of involvement in the upstream portions of India's petroleum sector. To a large extent, this experience has been positive. In addition, the government has made periodic requests for the Bank's opinion and peer review on proposed policy changes. These requests have been honored and appear to have been appreciated. Despite this, the government has expressed little or no interest in further Bank involvement in sectorial lending. This is not likely to change in the near to mid-term future, but may at a later date, following full implementation of reforms currently underway.

Next steps. India's efforts at continued industrialization, upgrading an antiquated infrastructure system and alleviating poverty are heavily dependent on access to commercial energy sources. To be successful in this, the government must improve its access to foreign direct investment, particularly in the energy sector. As part of this program, ONGC needs to become more open to joint ventures and making quality exploration acreage available to foreign companies on terms equal to those enjoyed by ONGC. The Government is already aware of these points, but needs to be convinced to act forcefully in their implementation.

Towards this end, it may be useful for the Bank's regional management to undertake the task of articulating the economic benefits that are lost due to lack of implementation of these policies. The cost of not making these policy changes is considerable. If the Bank can persuade the government that it is in its best interests to effect these changes, much good would come from the required economic sector work. If the changes are enacted, the Bank might respond with a sector adjustment loan.

In the meantime, there is no lack of interest among the foreign oil companies in entering into India's energy development program. Once meaningful movement is seen toward opening up the sector to foreign involvement, there likely will be an abundance of outside partners available for contract licensing negotiations.

28. Bangladesh

Petroleum sector overview. For a small country, Bangladesh is remarkably well endowed with hydrocarbons in the form of natural gas. Despite this, the endowment is very poorly developed and its exploitation poorly managed. More than half of the country is represented by the ancient and modern counterparts of the Ganges Delta. As with most deltas, it is highly gas prone and prolific with entrapped hydrocarbons. These deposits have been accentuated by the older portion of the delta being deformed into the Chittagong Hills, which extend both northward into the Tripura Province of India and westward into the subsurface of Bangladesh, where they form the major gas-filled structural traps that have been drilled to date. This combination of deltaic sand lenses encased in source rock shales, and draped over larger structures, results in extensive, complex fields.

Despite the abundance and complexity of these structures, many have not been drilled. Those that have been explored and have yielded discoveries have not been fully developed. As a result, gas reserves have been calculated only in the areas immediately surrounding the wells, in accordance with standard petroleum engineering practices. The potential for additional reserves at the distal ends of these long (some as long as 30 km.) structures is not counted in the reserve determinations. In similar fashion, deeper reserves that are encountered, or reserves in sand lenses located on the flanks of the structure, but not over the crest, are also not counted. As a consequence, the government firmly believes that its reserves are limited to less than 10 TCF of gas and has formed its energy utilization policies accordingly.

During the second bid round, held in 1997, most of the IOCs who studied the data believed that the more likely domestic reserve number was closer to 25 TCF on the structures that have been drilled. Taking into account the remaining structures that are apparent on the available

geophysical data, the total national reserve should be on the order of 70 TCF. Reserves of this order are far in excess of what the foreseeable domestic demand will be and represent a major export resource, the development of which would lift the country's economy from one of the poorest in the world to that of a lower middle income country. More important, access to an energy base of this magnitude would allow the economy to rapidly develop and industrialize. This is the single most important factor in the alleviation of Bangladesh's present state of poverty.

Present status. Bangladesh has a large, complex, poorly managed, poorly funded and technically underdeveloped national oil company in the form of Petrobangla that controls the exploration, development, production, distribution and sale of all hydrocarbons in the country. Until recently, Petrobangla held a monopoly on this economic sector. Starting in 1991, under strong Bank pressure, the hydrocarbon sector was opened to international bidding for exploration and development rights on the eastern portion of the country. At that time, only 55 wells had been drilled throughout Bangladesh, resulting in twelve commercial gas fields and seven discovered-but-undeveloped gas fields. In ensuing exploration and development work, one of those fields was developed and several new discoveries were made. By international standards, this level of exploration success is remarkable and tends to confirm the earlier estimates of major yet-to-be-discovered fields being present in abundance in the country.

Development of the original, pre-round-one fields has been slow and inefficient. Discoveries made by foreign companies have been plagued by contractual disputes regarding gas purchase volumes and prices and cost recovery issues. Round two bidding took place for the remainder of the country in 1997, and although technically a major success, subsequent disputes regarding bidding parameters and conditions led to major disputes, withdrawal of several foreign companies and significant delays in proposed work programs.

In addition to the exploration and development problems, central planning of the required infrastructure to process and transport the resulting gas production has been handled so poorly that major bottlenecks are already present. The most significant of these is in the major north-south trunk line that will have to be either rebuilt or twinned in order to handle production increases from the new discoveries.

Bank position. The Bank has encountered considerable problems dealing with the Bangladeshi government. Areas of conflict include the solicitation, contracting and monitoring of foreign direct investment. Major issues are transparency of process, contractual stability and a clear definition of the public/private sector interface. On the macroeconomic level, difficulties have also been encountered regarding the development of export markets for Bangladesh's excess gas. This has proved to be a political as well as economic difficulty due to Bangladesh's reluctance to sell to India.

Next steps. The Bank's major objective is therefore to provide economic arguments for the development of Bangladesh's natural resource base in an orderly fashion through the use of foreign direct investment. Similar problems are being encountered in its attempted intervention in the development of Bangladesh's power sector. Its second objective is to argue

Other South Asian Countries

29. Nepal

There are no known oil or gas reserves in Nepal. In the past, through Canadian bilateral assistance, an exploration promotion was carried out that resulted in Shell signing an exploration license, undertaking some work and then relinquishing the acreage. Although the exploration concepts present in Nepal are of a high risk/high reward nature, they are valid. These types of overthrust exploration plays have proved to be productive in North and South America, the Oman Mountains and elsewhere. The Nepalese government realizes this, has adjusted the terms and conditions of data sales and licensing accordingly. It also has attempted follow-on promotions, but without noticeable success.

The government has informally requested Bank assistance in these promotions, but the Bank has declined, pointing out that future energy investment lending should be focused in the power sub-sector, to the exclusion of oil and gas. This was a compromise agreement, based on the cancellation of a major hydro-project in response to NGO protests regarding resettlement issues.

Given Nepal's high risk/high reward exploration potential and its need for natural resource development, the Bank might wish to revisit its earlier CAS decisions regarding exclusion of hydrocarbons from Bank assistance. This would logically take place as part of the Bank's ongoing dialogue with the government. A review of the existing petroleum legislation, model contracts and regulations, particularly those involving access to the existing hydrocarbon data set, would be a useful start. A modest exploration promotion program, costing between $500,000 and $750,000, including the legal reviews, would likely follow this. It's target audience would be well-funded medium-sized IOCs that possess the required advanced technology to undertake this type of exploration. Such a program could easily be made a part of a larger energy or power project, yet still serve economic development objectives quite well.

30. Sri Lanka

There are also no known oil and gas reserves in Sri Lanka. A case could therefore be made for an exploration promotion effort, particularly in the shelf area shared with India, where the industry is in general agreement that there is petroleum potential. Little interest has been expressed in this by the government, however, which is focusing its energy sector lending on hydropower generation. It may be useful to revisit the government's decision, however. As with Nepal, such a program need not be a major project, but rather could form a hydrocarbon component to a larger energy or hydropower project. Since there has never been an exploration promotion in Sri Lanka, there would likely have to be a considerable amount of background study, data gathering, interpretation and preparation of promotional materials. These activities would not necessarily be required in Nepal, where most of this material has already been placed in a promotional format. Accordingly, a promotional component would likely cost more in Sri Lanka, but would still probably be less than $2 million.

31. Afghanistan

Afghanistan remains severely stunted in its natural resource development as a result of years of war and political instability. Since the Soviet invasion in 1979 there has been no Bank lending to the country. There are some 20 discovered-but-largely-undeveloped oil and gas fields, mostly along the Turkmeni/Uzbeck border. Most production has been halted due to the war and the following political instability. A trans-Afghan gas pipeline, connecting gas fields from Turkmenistan to Pakistan has been proposed. The government is seeking interested investors since Unocal withdrew from the project in late 1998.

32. The Maldives and Bhutan

Similar comments are true of these two countries, with the exception that there is little industry interest in either country. Shell undertook some exploratory work in the Maldives several decades ago, but without any encouraging results.

Primary East Asian and Pacific Countries

33. Myanmar

Petroleum sector overview. For more than a century, Myanmar (Burma) has produced oil from shallow, often hand-dug wells in the Irrawaddy Valley Basin. From the evidence of many oil seeps as well as continuous production from individual wells over a number of decades, it is apparent that this sedimentary basin is highly petroliferous and no doubt would benefit greatly from modern exploration techniques.

A number of medium-sized gas fields have been discovered and produced on the onshore portion of the delta. More recently, early exploration in adjacent, offshore areas of the delta have yielded two major gas discoveries. Development of these fields has been plagued with problems involving civil rights of indigenous people along the onshore portion of the pipeline right of way, as well as market off-take problems with Bangkok Power Company, which was contracted to purchase the produced gas.

Present status. Despite these non-technical problems, all current evidence suggests that Myanmar could become a major source of both domestic and exportable oil and gas reserves. What is required is open access to these sedimentary basins by the international industry. Developing this natural resource endowment would have a major impact on the national economy. It would result in rapidly moving the country from its present low-income status to that of a lower middle-income country. Its impact on national poverty alleviation, industrial development and environmental remediation would mesh well with the Bank's overall objectives.

Bank position. The Bank stopped lending to Myanmar in 1987, automatically shelving any subsequent project proposals. Myanmar is currently in arrears to the Bank and is the subject of UN resolutions on human rights abuses as well as US and EU sanctions policies. Until there is stronger support for assistance to Myanmar among the Bank's major shareholders, there are limited prospects for Bank activity. For these reasons, it is unlikely that there will be much project work within the energy sector of the country until sanctions are lifted. Once sanctions are lifted, however, oil and gas companies for certain would return to Myanmar in large numbers – assuming that macroeconomic stabilization also would be accomplished.

Next steps. In the interim, studies of available information on Myanmar's oil and gas sector would provide useful background information. Likewise, developing a plan for managing future petroleum-related direct foreign would be useful. However, all investment and sectorial technical assistance must wait for political developments.

34. Vietnam

Petroleum sector overview. Vietnam's entrance into the international oil industry came rather late, compared to other countries in the region. Mobil made an oil discovery whose testing was prematurely stopped by force majeure as the Vietnam War intensified. A joint

Vietnamese-Soviet consortium subsequently undertook development of the field, now known as the Bach Ho field, in 1986. It produces 180,000 b/d of 33 gravity oil and contains 250-500 million barrels of reserve.

Following cessation of hostilities, a large number of companies applied for exploration licenses. The process of granting these licenses proved to be protracted and difficult. This was compounded by early results from the resumption of drilling. The data suggested that most of the prospective areas, located a considerable distance from shore, had proved to be gas prone. With no readily-available market for gas, exploration has slowed down until a gas market, primarily for power generation, can been developed. This, too, has proved to be a lengthy, bureaucratic process that to a large extent is still underway. Consequently, foreign direct investment is falling rapidly.

Present status. In addition to the Bach Ho field, three other, much smaller oil fields are producing. They are all offshore and total 190,000 b/d. The government had planned to increase production from the newer fields to a total of 400,000 b/d by the end of 2000. Major gas discoveries have been made, but because of lack of agreement regarding gas pricing, their development has been delayed. All existing production is from associated gas as a byproduct of Vietnam's crude oil output. Apart from a small topping plant, there is no refining capacity in Vietnam; hence all production is exported, and all petroleum products are imported.

Current problems exist mostly in the area of natural gas, rather than in oil. As a result, industrial interest in Vietnam's natural resource endowment has dropped off significantly in recent years.

Specific problems reported by the industry include the following:

- The government still views information regarding its oil and gas potential as strategic secrets that are not to be shared. Information is withheld from both the oil industry and the Bank.
- The PSC system works, but there is no model contract. Presumably, most of the existing contracts – also regarded as highly confidential and hence not available for comparison – closely resemble one another.
- The Vietnamese petroleum economic framework is strongly biased in favor of the government. It needs to be brought into alignment with those of its neighbors in order to be made more competitive.
- A workable enabling framework needs to be put into place.

The position of the National Oil Company is also a major problem. At present, the NOC is simultaneously the regulator, negotiator and competitor of the IOCs, as well as being their partner. Additional problems persist in downstream regulation, lack of a policy statement on natural gas in the areas of gas ownership, custody transfer and pricing. Last, development and implementation of a gas master strategic plan is urgently required.

Bank position. There are no current oil and gas projects in Vietnam, other than two ESMAP projects on upstream fiscal systems and reservoir management. There are two ongoing Bank power projects and technical assistance in the field of electricity transmission. In addition, IFC is participating in the first BOT Wartsilal power plant (120 MW) in the southern province of Ba Ria-Vung Tau.

Investments of an estimated US$3 billion will be required in the oil and gas sector over the next five years in order to bring Vietnam's hydrocarbon resources into economic development. Investment opportunities, both in the upstream and downstream portions of the sector, are present in great number, the largest of which are in gas infrastructure investment. However, the government has not agreed to either industrial or Bank requirements for such investment.

The National Oil Company wants the Bank's support, but the government does not want to use scarce IDA funds available to it in the oil and gas sector. It believes that investment should come from industrial sources. Meanwhile, the weak regulatory framework and the difficult environment that the private sector has faced in general in Vietnam has discouraged large investments by private industry.

The Bank has not appreciably changed its sectorial objectives with respect to Vietnam since its guidelines were formulated in the late 1980s. This lack of change has been a major detriment to meaningful Bank involvement in the sector and should be revisited.

Next steps. The once-intense interest by the IOCs in petroleum investment in Vietnam has largely abated due to the problems listed above. This marked change suggests that there may now be a meaningful role for the Bank to play, both in economic sector work and in revision of the enabling envelope. It may also suggest that, in the course of dialogue between the Bank and the Government, there may be agreement on an effort to remedy these problems. In past dialogues, the government has asked the Bank for assistance with its petroleum law, development of a model contract and implementation of an award system. It has however, demanded that such assistance be made on a grant, not a borrowing basis. It is possible that these demands may be open to discussion. Moreover, the industry believes the Bank has a clear advantage and would like the Bank to be involved in revision of the enabling environment. Last, Vietnam's weak currency is a major disincentive to foreign direct investment in domestic projects such as power generation, in which repayment would be in local currency.

Logical future roles for the Bank in Vietnam might include the following:

- Revision of the petroleum law
- Provision for proceeds from National Oil Company activities to reside with the NOC so that it may be self-financing

- Provision of Bank guarantees, or instruments similar to those developed for the Songo Songo gas-to-electricity project in Tanzania, for the government's foreign exchange obligations and risk of convertibility

In addition, IFC's presence may be needed for future projects. Several industrial inquiries have been made in the recent past for projects such as the development of the Nam Con Son natural gas field and associated 400-km marine gas pipeline project.

At a minimum, the Bank can provide sector work and assistance in revising the enabling environment, coupled with selected IFC project participation. These efforts would provide a sound base, from which the industry probably would be more willing to commit its own considerable financial and technical resources to develop Vietnam's oil and gas sector.

35. Papua New Guinea

Petroleum sector overview. Papua New Guinea holds significant deposits of oil and gas as well as minerals and rain forest timber. Exploitation of these resources is undertaken largely by the private sector. Nearly one-third of its export earnings are from oil. Oil and gas activity accounts for approximately 15% of the GDP, a share that will grow in the coming years as development continues.

Prior to 1980 only small hydrocarbon discoveries had been made. Then in 1983 a Bank-funded petroleum exploration promotion campaign was undertaken. It resulted in attracting more than 20 companies into exploration activities in PNG. At the same time a geological database was developed, an improved model contract drafted and attractive fiscal terms established, along with a Petroleum Division.

The initial discovery was the Iagifu oil field by Chevron in 1986. It is now part of the Kutubu complex. Production started in 1992. In 1987, BP discovered the large (8 TCF) Hinde gas field. A small production scheme using this gas was put onstream in 1991 to supply power to the Porgera gold mine. Many other companies were attracted by these discoveries and, as a result, a significant amount of seismic lines were executed and 90 exploratory wells were drilled between 1988 and 1994. Most of these were in the Papuan Basin and resulted in another nine to ten discoveries.

Production of the Kutubu field peaked in 1993, at 126,000 b/d and has declined since then. A second field, Gobe, came on stream early in 1998, with a peak production of 50,000 b/d in 1999. A third field, Moran, is producing 10,000 b/d as part of an extended testing program and appears to be as large as Kutubu. A notable feature of all of these fields is their relatively short production life and rapid decline as a result of their characteristic gas solution drives.

On the basis of 21 proven fields, remaining crude oil reserves are estimated to be 314 mm bbl, and gas reserves at 14 TCF. Recovery of the associated condensates adds a further 200 mm bbl of liquid reserves to the country. In energy terms, gas reserves are eight times the amount of crude oil reserves. In a number of smaller oil fields the reserves, although commercial, are not as significant as those contained in the gas deposits.

Present status. PNG has major gas reserves but very little domestic market. As a means of developing these resources, two major gas export schemes are under development. The first involves construction of a large-scale gas pipeline, operated by Chevron, from PNG southward to markets in the state of Queensland, Australia. Negotiations and financing arrangements for this project are well underway. A second export project, operated by Exxon, plans to develop an LNG plant for liquefaction and exportation of gas to China. Progress has been slowed considerably by the recent Asian financial crisis. Petroleum product consumption has increased significantly in the last decade. Two plans are being matured for the installation of one or more small refineries in the country to meet this demand from locally-refined domestic crude oil.

Bank position. Within the hydrocarbon sub-sector, a Bank loan closed at the end of CY 99. Although current relationships between the Bank and PNG government are adversarial, it is quite likely that a small, largely downstream, sectorial technical assistance loan ($5-10 million) will be requested and implemented shortly after the current loan is closed. Additional technical assistance may be needed in the following areas:

1) Review and possible redraft of existing oil and gas fiscality terms. If these were improved, there could be a significant increase in petroleum exploration within PNG, which has slowed considerably from its previous levels.

2) Improve and stabilize the corporate taxation regime, as well as improve fiscal discipline within the governmental budgetary process. Governmental budgetary restraints have made corporate tax rates volatile. In an otherwise very pro-business environment, tax unpredictability is a strong disincentive to foreign direct investment. To date, companies have been offsetting this risk through asking for, and receiving, long-term tax breaks plus tax incentives. Although such action provides the stability and transparency required by the business investment community, it also severely restricts the tax revenue stream.

3) Petroleum Division training and staff development. During the existing loan, staff training for this department was contracted out to the British Geological Survey. It was granted, from early 1995 to the present, on the basis of international competitive bidding. The program was sufficiently successful that one-third of the staff of 32 left government service to take up positions within the petroleum industry. Those that remained within the government have become motivated largely because of the opportunity for upward movement due to the resignations of their colleagues. Training needs are still present, however, and will no doubt continue for the foreseeable future. Additional areas of oversight and regulation have presented themselves. These include

   - Evaluation of new discoveries and their potential for commercial development
   - Promotional activities relating to as-yet-unexplored sedimentary basins within PNG

- Permitting, regulation and environmental safety of the proposed new refinery near Port Moresby
- Gas utilization
- Regulatory oversight of the PNG-Queensland gas pipeline, once it has been completed
- Indigenous peoples' rights protection
- Staff retention

Next steps. It is clear that there is a vibrant, well-established private energy sector presence within the country with little direct need for Bank support. There is, however, considerable need for training and technical assistance in the further development of PNG's usage of its hydrocarbon endowment. There is also opportunity for IFC transactions to provide financing to companies such as Oil Search, Woodside Petroleum, and Petronas in connection with their participation in the PNG-Queensland pipeline. Chevron has already indicated to IFC that these companies may benefit from IFC's involvement in the project, given their limited access to financing. Last, there may also be room for MIGA to insure private sector investments and possibly to environmentally monitor energy sector projects.

36. Indonesia

Petroleum overview. For well over 100 years, Indonesia has been one of the significant producers of petroleum in Asia. Its complex geology has resulted in an abundance of sedimentary basins, exploration play types and vast reserves of petroleum and, increasingly, gas.

Indonesia has been a leader in creating innovative mechanisms for dealing with the international oil community in developing its natural resource base. It originated the now-standard Production Sharing Contract. For this reason, most Indonesian oil fields that are technically producible are either producing or are the subject of plans for doing so under satisfactory economic conditions. Indonesia is one of the non-Arab members of OPEC and one of the major exporting countries of the Pacific Rim area.

This is not the case for gas, in which either ownership resides with Pertomina, the National Oil Company, or Pertomina controls the price of the gas and the domestic market. The exception to this is gas sold outside of the domestic market, usually in the form of LNG.

Liquefaction projects are expensive, long term and technically and commercially complicated. They require, simultaneously, completing producing, processing, transportation and purchasing agreements, all of which must extend two decades or more, due to immense capital requirements.

Present status. Due to the large size of both capital expenditures and gas reserves required to supply such LNG projects, many smaller gas fields lie stranded throughout the country.

In addition, there is a large amount of flared or otherwise-wasted associated gas that is a byproduct of the production of crude oil. The resulting enormous waste of natural resources also represents a significant addition of carbon to the world's atmosphere, a substance thought to be a causative agent in global warming – hence its reduction is a centerpiece of the Kyoto Protocols.

Fields in which the gas/oil ratio is significantly high are usually shut in due to production inefficiency. This is a loss to Indonesia's economic development as well as to the company that has discovered the fields. This combination of stranded gas fields and undeveloped high-gas ratio oil fields amounts to between 350 and 400 discovered-but-undeveloped properties throughout Indonesia.

Bank position. The recent major financial crises in Asia were particularly severe in Indonesia. The Bank has had little lending activity within the country's oil and gas sector. Although poorly administered by Pertomina, the sector enjoyed significant foreign direct investment by the IOCs and was a major contributor to the country's economic development. The resulting economic setbacks, plus associated political changes –particularly with respect to Pertamina – suggest that there are major areas within the sector where Bank intervention would be useful.

Next steps. As part of the Bank's present ongoing dialogue with Indonesia regarding its economic restructuring, it would be useful to include the subject of gas development as well. Specific areas for discussion would be the following:

1) Gas ownership. In many cases, ownership of any gas that is discovered belongs to Pertamina, rather than the operating company. This is a major disincentive for foreign companies to explore in areas thought to be gas prone. It would be useful to revise existing petroleum law, as well as contracts and regulations, to allow for private sector ownership and development under conditions regulated by the state.

2) Gas pricing. Pertamina currently sets the price for any gas delivered to its pipeline and distribution network. The price is generally uneconomically low and amounts to a strong subsidy for domestic users of gas and gas-fueled power generation. The subsidy should be lifted, with gas being priced on a BTU-equivalent basis. This would allow market forces rather than domestic political issues to determine gas development.

3) Ownership of natural gas pipelines. At present, Pertamina reserves the right to build, own and operate all natural gas pipelines within Indonesia. This is a strong disincentive for foreign companies to develop natural gas fields. It also amounts to de facto central planning of the economic development of the local population centers that might otherwise be served by nearby gas fields. This is particularly true of Sumatra and Java, but also applies to lesser extents in Kalimantan, Sulawesi and Irian Jaya, islands in which there are smaller populations.

4) Development of an effective regulatory agency. The foregoing proposals imply that ownership of natural gas and natural gas pipelines will be private; hence issues of

pricing, pipeline access and transportation charges will be established and regulated in a transparent manner. To do this will require an effective, competent and transparent regulatory agency, an area in which Bank assistance would be required and useful.

5) Pipeline export of natural gas. Major markets for gas exist in nearby Singapore and Malaysia. This is true particularly for discovered gas fields in Sumatra and in the Natuna Sea. These markets likely could be served by undersea pipelines from the Indonesian fields. There are no known major Indonesian governmental barriers to such project development, other than required approval for field development and obtaining export licenses. Nevertheless, projects of this nature have not matured. This suggests that impediments do exist within the regulatory processes and there may be economic concerns by potential project sponsors.

Before raising these issues with the government, the Bank should consider undertaking focused economic sector work to identify governmental policies and regulations that discourage gas export projects. A corollary to this ESW would be a series of interviews with the operating companies of fields in these areas who logically would be interested in such gas exports. The goal would be to discuss what obstacles might be preventing development of these projects.

Discussions with the government should also include the potential economic benefits of developing regional trunk lines to move gas for domestic consumption, both within the major islands and between islands. This effort could perhaps be part of an economic sector work package.

6) Local gas-based domestic industrial development. In a densely-populated developing country such as Indonesia, there is an abundance of potential projects to bring gas to local population centers for use in power generation, industrial processes and agribusinesses. Major disincentives to these projects lie in the areas of gas transmission and pricing, ownership of power generating plants, electricity pricing and access to foreign exchange for repatriation of invested capital and dividends.

   Focused economic sector work could identify these disincentives. Potential solutions would likely involve global environment remediation via fuel substitution, project participation through IFC and possibly making available MIGA non-commercial risk insurance. The latter could be a means of encouraging foreign companies to invest in domestic industrial development.

7) Electricity generation, transmission and distribution regulation. As with the gas issues discussed above, similar electricity issues will need to be regulated by a competent regulatory agency. Whether this should involve the same regulatory agency or a specialized body dealing only with electricity remains to be determined.

37. The Philippines

Petroleum sector overview. As an island country similar to Indonesia, the Philippines have experienced many problems in the economic development of its hydrocarbon resource base. Unlike Indonesia, however, this base appears to be markedly smaller and to a large extent is located in deep water along the southwest margins of the country, mostly off Palawan, where a number of both oil and gas fields have been discovered.

Production began in 1979. Several of the oil fields have been using floating offshore production platforms and storage. This has proved to be more difficult for the gas discoveries, however, although the technology of producing deep-water gas fields is now commercially viable elsewhere in the world.

In addition to these larger offshore fields, several small onshore gas fields have been discovered in central and northern Luzon in the north. Several oil and gas deposits have been found on the island of Cebu in the south-central portion of the country.

Present status. Despite sporadic exploration efforts over the past several decades, proven reserves remain small and the country is a minor oil producer. In 1999, the Philippines produced only 4,000 b/d, while consuming 370,000 b/d. However, the Camao and Malampaya fields, located west of Palawan Island, are scheduled to commence producing between 20,000 and 25,000 b/d by April 2001, with volumes increasing to 50,000-55,000 b/d within two years.

Production in the two fields will be operated by Shell, in conjunction with partners Texaco and Philippine National Oil Company (PNOC), which will exploit the fields' gas reserves later, following completion of a 312-mile submarine pipeline linking the fields to three power plants in Batangas on Luzon Island, south of Manila. This pipeline could be the longest deep-water pipeline in the world, with half its length lying in depths of more than 600 feet.

Reserves of the two fields are carried at 50 MMBO and 2.6 TCF of gas. The gas reserves will be used to generate a combined 2,700 megawatts of power for the next 20 years, perhaps replacing up to 50% of the oil that the government currently imports for power generation. If significant additional gas reserves are not discovered, the government plans to consider LNG as a replacement fuel when the present reserves are exhausted.

Additional exploration is underway, principally by small Australian-based oil companies, in the Palawan and Cagayan Basins in the southwest and south of the country, as well as in the Fuga Basin, north of Luzon.

Bank position. The Bank has been active in the power generation sector of the Philippines, particularly in the areas of electricity transmission and geothermal power generation. However, most of these projects will close within the next one to two years. There has been no direct intervention in the upstream portion of the petroleum sector.

Next steps. There is potential to develop the onshore fields into centers of local gas-fired power generation for local, off-grid supply and distribution. As for the larger, offshore fields, a series of Bank-managed interviews with the operating oil companies would be useful to determine the development options for these fields. It is possible that the Bank can provide useful external financial and development assistance.

Possible solutions for offshore fields would involve converting gas to electric power for distribution to local population and industrial centers. This will depend to a large extent on the applicability of modern technology in long distance electrical transmission underwater. A second possibility is offshore conversion of natural gas to liquid fuels, a technology which is only recently coming into commercial usage elsewhere.

Primary West Central African Countries

38. Cote d'Ivoire

Petroleum sector overview. Petroleum reserves were first discovered in the Cote d'Ivoire in the early 1970s. In the ensuing years, more than 100 wells have been drilled. The Espoir and Belier fields commenced production in the late 1970s. The former produced at 10,000 b/d until 1988 when it was shut in due to high operating costs. Belier's production peaked at 20,000 b/d in the mid-1980s and is now declining rapidly. Subsequently, the Lion oil field and Panthere gas fields were discovered in 1994. Production started in 1995. The larger Foxtrot field is scheduled to commence production shortly, as will four smaller fields (Kudu, Eland, Belier and Gazell) in the eastern margin of the Ivoirian continental shelf.

Recent exploration licensing has been highly active and focused on the deep-water blocks, utilizing the new technology that recently proved so successful in applications in Angola and the Gulf of Mexico. In the meantime, there have been no new discoveries since 1994. Despite the government's efforts to increase daily production from 20,000 b/d to 100,000 b/d by 2000, production is declining.

Cote d'Ivoire has a 59,000 b/d refinery and a 10,000 b/d asphalt plant that are supplied by an on- and offshore pipeline from the Lon and Pantehere fields. Additional feedstock is imported from Nigeria. Feasibility studies are underway regarding the technical and financial requirements to upgrade and enlarge the refinery to 88,000 b/d and increase its hydrocracking capacity. The country is self-sufficient in petroleum products and is a major supplier to neighboring Mali, Burkina Faso, Liberia and, more recently, Nigeria.

Gas is being produced from the Panthere field and pipelined to shore near Abidjan, where it is used to generate electricity and to extract LPGs. In the near future, the Foxtrot field will commence gas production, as will four small gas fields near the Ghanaian border. Agreements in principle have been reached with the Ghanaian government to produce these latter four fields and pipeline their gas to an onshore location at the Takaradi power station. This would involve construction of a 300 km, 12-inch line to Takaradi, capable of delivering at least 30 mmcfd of gas. Additional talks are underway with Ashanti Goldfields for the purchase of gas.

Present status. The Cote d'Ivoire petroleum sector is well developed and mature with a large number of private sector companies active. A second wave of deeper water exploration is about to start and will likely help to rejuvenate the country's declining oil production. Gas productive capability is excess to market demand, but strenuous efforts are underway to develop markets in adjacent Ghana and within the power industry. Additional plants are being built to burn gas and some of the older plants are being converted from diesel or fuel oil to gas. The country's oil reserves are estimated to be 100 million barrels and gas reserves are 1.1 TCF.

Privatization of the energy sector is well underway, including the state owned refinery, several of the existing power plants and the national oil company

Bank position. The Bank has had a considerable amount of involvement in the Cote d'Ivoire's energy sector, starting with an exploration promotion program in the middle 1980s and a current electricity privatization loan. In addition, an ESMAP-funded African gas initiative study, which includes the Cote d'Ivoire, is focusing on gas pricing, revision of the legal code and the design of a gas code. IFC has had a much greater involvement than has the Bank, with significant participation in both offshore gas and oil production and onshore gas-fired power-generation projects.

To a very large extent, this involvement has resulted in significant management modifications in the national sector, to the point that it is now well functioning, well regulated and to a large extent well managed. Considerable work remains to be done, however, particularly in increased power privatization, market development for further gas utilization, policy modifications to make small fields more economic to develop and the overall role of the government in the sector.

Next steps. As far as Bank work is concerned, a number of policy issues should be addressed during the country dialogue, including:

1) Adjusting the enabling environment to expand private power, both as off-takers of excess natural gas and providers of clean, reliable and cost-effective power.

2) Revising the existing PSC terms to allow economic development of the many smaller offshore oil and gas fields that have been discovered. In particular, many of the undeveloped-but-discovered fields are held by current licenses and hence not available for development by other operators. Some thought might be given by the government to "ring fencing" these undeveloped discoveries, should the existing operator be disinclined to develop them. This action would remove them from the existing licenses and make them available to smaller companies, who might be interested in developing these marginal fields.

3) Creating a Gas Code to establish the required institutional framework for the Cote d'Ivoire's future gas industry. This would include:

   - Separating upstream and downstream contractual frameworks to produce and sell private-sector-produced oil and gas
   - Revising the government's role as purchaser of all produced gas and manager of its distribution
   - Creating an onshore open-access or merchant pipeline company
   - Developing an onshore regulatory agency to deal with pipeline rates and gas pricing

- Creating regulatory conditions that allow effective export of excess gas reserves to neighboring countries
- Creating a Gas Institute to establish technical and safety standards for gas transmission, bottling and utilization
- In order to encourage sales of gas and power to the domestic market, the government must provide acceptable assurances that it:
    - has access to sufficient foreign reserves to ensure convertibility of project-derived local currency earnings,
    - will allow convertibility of these earnings into hard currency, and
    - will allow the investor to repatriate these hard currency conversions in a timely fashion.
    - This last item is necessary to ensure recovery of both invested capital and resulting dividends.

There is a need to develop additional domestic gas markets. This can further economic development by using this form of energy for industrialization. The IFC, which is already heavily involved in the production of offshore oil and gas and in the financing of new gas-fueled power generation plants, could be useful in the following potential projects:

1) Developing industrial, mining and agribusiness markets as additional outlets for excess gas reserves. Suggested projects are shown on the attached list of actual, planned and potential projects.
2) Helping to finance additional pipelines to shore as well as potential gas export pipelines to Ghana for the Takaradi power plant and possibly Ashanti Goldfields industrial uses.
3) Creating a "second tier" domestic private sector oil company to compete with the smaller IOCs currently operating within the country.

In summary, the most effective Bank intervention would be to help improve the existing economic enabling envelope for oil and gas development and to encourage additional downstream industrial development to utilize existing gas reserves.

39. Nigeria

Nigeria is a member of OPEC and the largest producer of oil in Africa with more than 2 million b/d of production. It has, however, severe political and economic problems that, until the recent change from military to civilian government, have significantly impeded its economic growth. Until these problems are resolved, there is little of substance that can be undertaken in sector development. As a result of these economic, political, social and environmental problems, there are some 300 discovered-but-undeveloped oil and gas fields in the onshore and offshore portions of the Niger Delta. In addition, there are immense amounts of associated gas that is flared as a byproduct of oil production. Most of the non-associated

gas fields remain shut in for lack of market. An LNG plant is nearing completion and progress is being made on the West African Pipeline project under the sponsorship of Chevron. It would initially deliver 120 MMCFG/D from the Escravos terminal in the West Delta area to Ghana.

Responding to the new government's request for urgent assistance in the petroleum sector, the Bank has dispatched several energy sector missions to Nigeria and it is likely that a series of projects will be forthcoming. As the results of these projects become more clear, the prospects for field development will likely become apparent.

40. Gabon

Petroleum sector overview. Gabon contains substantial natural resources including tropical hardwoods and softwoods and rubber. Mineral resources include manganese, uranium, iron, barite, phosphates and gold as well as oil. This resource wealth has raised the country's per capita income to $3,500, one of the highest in Africa. Despite this diversity of resources, the country's economy is reliant on oil exports that account for nearly 80% of total export revenues.

Petroleum exploration started early in Gabon. The first well was drilled in 1934 and the first discovery occurred in 1954. More than 800 wells have been drilled since then, nearly evenly spilt between onshore and offshore. The principal rights holders in the country are AGIP, Amerada Hess, Elf, Kelt Energy and Shell although recently a number of smaller independent companies have undertaken exploration and production.

Reserves have recently doubled from 1.3-billion barrels in 1996, to 2.5-billion in late 1998, lead by Shell's onshore Rabi-Kounga field with reserves of 440-million barrels. Gabon's export grade oil is light, (30-35 degrees) and largely sulfur-free. There is a small amount of heavier onshore production of 25-degree crude as well. Gabon's withdrawal from OPEC membership in 1996 has allowed the government to focus on raising production levels well above its previous OPEC quota of 287,000 b/d. Gabon's current production is 362,000 b/d, but without significant new discoveries it is unlikely that it will be able to exceed 400,000 b/d.

Gas reserves are approximately 1.3 TCF and production is estimated at 3.5 BCF/Y, most of which is re-injected for pressure maintenance. There is a minor gas infrastructure in place, located primarily offshore and in the central and northern parts of the country. Gas is used for electric power generation at Port Gentile (21 MW, installed in 1976) and at the Owendo power station in the southern suburbs of Libreville (44 MW, installed in 1985).

Local consumption of crude oil is 22,000 b/d. The remainder is exported, more than half of which goes to the US, where it represents 2.5% of all crude oil imports. The remainder is largely exported to Europe. Capacity at the Port Gentile refinery is 17,300 b/d.

Present status. Despite its recent successes, the government is concerned about the long-term trend of diminishing oil reserves without further discoveries. In order to maintain its oil reserves, Gabon has actively sought foreign oil company investment, most recently in its

eighth oil-licensing round in 1998. Then, Gabon offered its deep-water blocks for tender for the first time. In recognition of the costs and risks of ultra-deep water exploration, Gabon reduced government participation, introduced production-based royalties and extended the renewal periods to make the license terms more attractive. The southernmost of these blocks contain the northern margin of the Congo Deep Water Fan play that has proved to be so successful in Congo and Angola to the south.

Despite its lower middle-income economic status, the economy has been badly mismanaged. Social indicators are as bad as many of Africa's poorest states; life expectancy is 55 years and deteriorating; youth unemployment is more than 30% and nearly 40% of Gabonese are illiterate. The IMF estimates that more than $400 million disappeared from public finances in 1997 alone, causing Gabon to default on all categories of debt. By the end of 1998, total foreign debt was $3.54 billion, with over $300 million in arrears, thus interrupting its relations with the Bank and the IMF. Accordingly, the government placed great importance on the eighth oil-licensing round, mentioned in the preceding paragraph.

The government is attempting to improve its macroeconomic position via a number of activities, among which are privatization of most of its public enterprises. Toward this end, it has negotiated an IMF structural reform package and in August 1998, it obtained a $14.8 million loan from the African Development Bank to aid in its privatization efforts. Gabon's water and electricity industries were privatized in 1997. The railway also is in the process of privatization. These divestment efforts have proven slower to put into effect than originally planned.

A 20-year concession to run the state-owned electricity and water utility (SEEG) was awarded to a Franco-Irish consortium (CGE/ESBI) in March 1997, as the first sub-Saharan water and electricity utility involving full commitment for future investment by the private operator. A total of $800 million has been pledged to upgrade and modernize the systems.

Gabon joined the Central Africa Economic and Monetary Community in January 1999, following the pegging of its currency to the Euro. Contrary to expectations, this caused little reaction within Gabon's economy.

Bank position. Gabon has a fully functioning economy that, to a large extent, has graduated from the status of a Bank borrowing country. The country's petroleum exploration and production sector is well developed and its functioning lies in the hands of the IOCs, who operate under standard production sharing contracts. There are, however, a number of smaller onshore marginal fields that have been ignored by the government, which became owner of the fields following their relinquishment by the original operators. There are some 60 discovered-but-undeveloped oil and gas fields in the country, many of which fall into this category of neglected onshore marginal fields.

Next steps. A number of Gabon's marginal onshore oil fields remain undeveloped because of unattractive license terms. Given the large number of independent companies that have become involved in the country's offshore exploration and production, many of the marginal

onshore fields might also prove attractive for development by these companies if the terms were adjusted. The government would benefit from this action through increased oil production and an accompanying augmentation of the national reserve base as the fields were brought into production.

The Gabonese government has shown its willingness to adjust its terms in the offshore area as a means of encouraging exploration in the deep and ultra-deep waters of its continental slope. It is quite possible that, with encouragement, the government could be persuaded to adjust its economic terms for these marginal fields, thus making them economic for development by small operators. If the government could make the required changes in development contracts for marginal onshore fields, the Bank could undertake a specialized promotional program to advertise these new opportunities to the international oil industry.

In many cases, companies that might be interested in projects of this scale are inexperienced in dealing with governments in the developing world. They might feel uncomfortable operating in the economic and political climate of a country such as Gabon, which is very different from the climate in which they customarily operate. To alleviate these concerns, IFC or MIGA could be engaged in the process through either equity participation or non-commercial risk insurance.

41. Cameroon

Petroleum sector overview. Petroleum exploration in Cameroon began in the late 1940s, with exploration drilling starting in 1954 near Douala where a number of surface seeps were located. The resulting Logbaba gas discovery has been shut in since then, waiting on market development. Exploration has been – and to a large extent still is – driven by oil rather than gas. Accordingly, exploration shifted to the offshore area between Cameroon and Nigeria in the Rio del Rey Basin adjacent to the Niger Delta, where significant oil and gas quantities were discovered in the early 1970s, in water depths of less than 70 meters and approximately 50 km from the coast.

The first significant oil discovery was made in 1972, followed by a large number of small-to-mid-sized fields. Production commenced in 1978 and peaked in 1986 at 9.5 MMTY. Since 1990, it has been declining at an increasingly large rate, now approaching 20% year. Inasmuch as petroleum exports and sales form the economic backbone for the country, there is a sense of urgency regarding increasing the search for additional oil fields and exploitation of the country's apparently large endowment of natural gas.

Exploration has also been undertaken in the offshore Douala Basin, which is separated from the Rio del Rey Basin by a volcanic trend. It appears to be largely gas prone and hence has undergone no commercial development. There is no developed gas market within Cameroon, other than for LPG that is produced as a byproduct of the 28,000 b/d Sonara refinery at Limbe, which was commissioned in 1981.

Present status. Current production is approximately 5.0 MMTY of crude oil from 42 small-to-medium offshore fields, all of which are in the Rio del Rey Basin, close to the Nigerian

border. The non-associated gas fields have not been developed. Most of the associated gas, which is produced as a byproduct of oil production, is used for power generation and production operations on the platforms. The rest is flared, amounting to 1.5 to 2.0 million cubic meters per day. About 75% of Cameroon's oil production is by Elf, 22% by Shell-Pecten and the remaining 3% by Kelt.

Mindful of the dependence of the national economy on crude oil exports, and the precipitous fall in production levels during the last several years, the government has made strenuous efforts to increase the rate of domestic exploration. These promotions have been largely successful, although no new fields have been discovered to date. Contract terms generally are regarded as encouraging to the IOCs, and the National Oil Company (SNH) is a competent production-sharing partner.

Many studies and much discussion has been undertaken between the industry and the government regarding development of a viable gas industry within Cameroon. Such a development could compensate for the fall in crude oil production, but little progress has been made thus far. Private sector thinking is that although there are no large oil fields remaining to be discovered in Cameroon, with improved exploration techniques and methodologies, much more reserve augmentation can be accomplished. In addition, there is considerable deep-water potential, similar to what has been recently discovered and developed in adjacent countries of West Africa – for example, in Angola and the Cote d'Ivoire.

This more creative course of exploration has been handicapped in the past by the dominance of one company within the upstream petroleum sector. As concession and license agreements begin to expire, however, and as they revert to the government for re-tendering to other companies, this may change in the near future. This might allow fresh thinking and improved technology to influence exploration for the remaining petroleum potential of the country. Proved oil reserves are on the order of 30 MMT, with proved gas reserves on the order of 250 billion cubic meters. Due to oil companies' past practices of 1) avoiding exploration in areas perceived to be gas prone and 2) failing to delineate the full range of the discovered fields, these figures are probably greatly understated.

The Cameroonian government is expected to improve the petroleum enabling envelope in the near future. Its objectives will be to allow economic development and utilization of the country's abundant proved, probable and possible gas reserves and gas liquids. This gas utilization program is expected to offset the sharp decline in crude oil production.

Bank position. Until recently, the government was not interested in Bank lending within the petroleum sector, due both to the relatively smooth functioning of the sector and the Bank's insistence on financial transparency of fund disposition by the National Oil Company. Recently, however, with the instability of oil prices and the advent of the Chad-Cameroon pipeline project, lending activity has resumed to a limited degree in the form of a technical assistance credit designed to assist in the administration of transshipment fees, taxes and equity ownership in that portion of the pipeline crossing Cameroonian territory.

To this there have also been requests by the government for Bank opinion and possible assistance in developing a gas code, related safety codes and regulatory agencies. These requests will likely be formalized within the next several years.

Next steps. Future Bank work, apart from implementing the Chad-Cameroon Technical Assistance Credit, should be in the areas of gas policy. In particular:

- Reviewing and/or modifying the draft gas code and its passage through the parliamentary process
- Establishing clear private sector ownership rights to any gas found as a result of petroleum exploration
- Establishing gas and LPG safety and operating standards
- Creating the required gas regulatory agencies
- Developing gas and LPG pricing standards

In addition, there is considerable work to be done by the Bank in developing gas-related independent enterprises and small businesses for supplying and distributing gas and LPG to private sector customers in the Douala, Yaounde and surrounding areas. Assistance is also needed to establish small-scale manufacturing enterprises for gas-related appliance construction and LPG/gasoline conversion kits for automotive transport.

In summary, opportunities for potential Bank intervention in the petroleum sector lie in the area of revisions to the existing economic enabling envelope in order for Cameroon to realize the benefits of its large, to-date-untapped gas endowment. Also, intervention and assistance is required to develop gas utilization markets and related micro-finance facilities.

42. Congo/Brazzaville

Petroleum sector overview. Congo has two sedimentary basins, the most important of which is the proven petroliferous coastal offshore Lower Congo Basin. It extends along the entire coast and is part of the general West African sedimentary basin. North of Brazzaville, extending into the interior of Africa and shared with adjacent Zaire, is the much older, much less-explored Cuvette Central. To date, the Cuvette has not yet proved productive.

Although exploration started in the 1940s, the first oil and gas discovery was not made until 1957. It was put on production in 1960 at Pointe Indienne, 20-km north of Pointe Noire at the onshore edge of the Lower Congo Basin. The discovery of the giant Malongo complex of fields, in the adjacent offshore area of Cabinda in 1966, caused the rate of exploration in Congo to substantially increase. Approximately 170 structures have been identified within the area of the Congolese continental shelf, of which the 100 largest have been explored. Oil and/or gas has been discovered in some 30 of these structures, of which 14 have contained commercial quantities of oil. They have been developed and placed into production. An additional four contain non-associated gas and remain shut in due to lack of market. With the change in governing hydrocarbon law from concession agreements to the more incentive-

based production sharing contracts in 1995, the improvement in seismic imaging capabilities and the development of deep water drilling and producing technology, recent activity has shifted into the deep and ultra-deep waters of the continental slope and abyssal plane. Onshore exploration along the basin margin has resulted in only small and non-commercial oil fields with some associated gas. These are now largely depleted.

With the exception of the newer, deeper water fields, most of Congo's oil has proved to be viscous and relatively heavy (22-27 degrees gravity), with up to 2% hydrogen sulfide. Due to the viscosity, most of the fields are produced through artificial lift with the use of down-hole pumps with some gas re-injection. The reservoirs are heterogeneous and highly fractured. This, coupled with the viscous nature of the crude oil, has resulted in poor primary recovery on the order of 15% of the original oil in place, despite extensive use of subsurface pumping equipment.

Improved recovery is expected with increased gas injection and other secondary recovery techniques. The country is thus a prime candidate for application of improved reservoir technology, such as 3-D seismic imaging, horizontal drilling, new pumping methods and reservoir pressure maintenance and production management strategies.

Offshore production is piped through three major crude oil gathering lines to the Djeno onshore terminal, located about 15-km south of Pointe Noire. Most of the older fields are within 50 km of the shore, in less than 140-meters of water.

There is no economic value at present for gas. Hence associated gas not utilized in oil field operations is flared and non-associated gas fields remain shut in and poorly delineated. Proved oil reserves are about 150 MMT. Proved gas reserves are about 120 BCM, of which 54 BCM are associated and the remaining 66 BCM are non-associated. Current oil production is increasing as the new, deeper water fields are coming into production. The current total is approaching 320,000 b/d. Associated gas in excess of operational requirements is being flared at the rate of 70 MMCF/D (2.0MMCMD).

The government vehicle for participating in the country's upstream and downstream petroleum activities is Hydro-Congo, which was created in the 1970s. In addition to significant participation in most of the older fields' ownership, Hydro-Congo is the owner/operator of the 19,000 b/d (1 MMT/Y) Coraf refinery at Pointe Noire. It was commissioned in 1982 to process the heavy Djeno-blend crude from the offshore fields. Hydro-Congo also holds the monopoly on petroleum product supply distribution.

Present status. Per its agreement with the IMF in the middle 1990s, the Congolese government has stressed its commitment to disengage from direct activities in the petroleum sector. As part of this commitment, the incentive-based Hydrocarbon Code was passed in August 1994. This has allowed production sharing contracts to be introduced in Congo for the first time. Three licenses have subsequently been awarded, with applications pending for a number of others. These have utilized PSCs as the licensing vehicles, with the result that a

significant increase in licensing activity has occurred in the higher risk, deepwater blocks that have proved to be so productive in adjacent Angola.

Exploration activity in offshore Congo, which had steadily declined during the early 1990s, has once again started to increase, with an emphasis on shelf-edge licenses and deeper water blocks with depths varying between 500 and 1500 meters. The recent discoveries of Nkossa and Kitina at the shelf break have been brought into production. National crude output has nearly doubled as a result.

Three major IOCs are the current principal operators in Congo: Elf, AGIP and Shell. Recent deep-water exploration of the Congo River Fan play has resulted in the major, world-class Moho discovery by Elf in its Haute Mer License, with estimated reserves of 600 million barrels of oil. Even larger deep-water discoveries have been made by Chevron in the adjacent area of Cabinda (Chevron, Block 14 discovery in 400 meters of water, with an estimated 1.5 billion barrels of reserves). Additional discoveries are considered quite likely along this same deep-water Congo Fan trend within Congo's sector of the continental shelf.

A privatization board has been formed and staffed by senior officials from the office of the President and the Ministry of Finance. Price Waterhouse has contracted to undertake the privatization process of Hydro-Congo and the Coraf refinery, through a public tendering process. Shell and TotalFinaElf have expressed interest in taking over Hydro-Congo's distribution and refining operations. The firm of Coopers and Lybrand of Canada has provided specialized petroleum company audit training for senior staff in the Ministries of Finance and Hydrocarbons.

Bank position. In the past, the Bank has had very little direct lending activity in Congo. This is beginning to change as a result of the IMF accords entered into during the middle 1990s. ESMAP-financed studies, particularly the African Gas Initiative, are nearing completion and should form the basis for future structural adjustment lending, technical assistance and related non-lending activities. The Bank has been asked by the Congolese government to assist in sector privatization activities and to provide advice rather than investment.

Next steps. Despite progress to date, Congo does not have the institutional framework and policies required to implement its logical role as custodian and developer of the national hydrocarbon resource base. This is particularly true regarding development of either a viable natural gas pricing and ownership policy or domestic natural gas markets. There is, therefore, considerable opportunity for technical assistance in the development of hydrocarbon policy and regulatory capacity as well as fiscal audit and operations oversight capability.

There appears to be little need for exploration promotion or investment in petroleum infrastructure, inasmuch as the international petroleum industry has shown an abundance of interest in these areas under reasonable economic conditions.

Joint UNDP/World Bank

ENERGY SECTOR MANAGEMENT ASSISTANCE PROGRAMME (ESMAP)

LIST OF REPORTS ON COMPLETED ACTIVITIES

Region/Country	*Activity/Report Title*	*Date*	*Number*
	SUB-SAHARAN AFRICA (AFR)		
Africa Regional	Anglophone Africa Household Energy Workshop (English)	07/88	085/88
	Regional Power Seminar on Reducing Electric Power System Losses in Africa (English)	08/88	087/88
	Institutional Evaluation of EGL (English)	02/89	098/89
	Biomass Mapping Regional Workshops (English)	05/89	--
	Francophone Household Energy Workshop (French)	08/89	--
	Interafrican Electrical Engineering College: Proposals for Short- and Long-Term Development (English)	03/90	112/90
	Biomass Assessment and Mapping (English)	03/90	--
	Symposium on Power Sector Reform and Efficiency Improvement in Sub-Saharan Africa (English)	06/96	182/96
	Commercialization of Marginal Gas Fields (English)	12/97	201/97
	Commercilizing Natural Gas: Lessons from the Seminar in Nairobi for Sub-Saharan Africa and Beyond	01/00	225/00
Angola	Energy Assessment (English and Portuguese)	05/89	4708-ANG
	Power Rehabilitation and Technical Assistance (English)	10/91	142/91
Benin	Energy Assessment (English and French)	06/85	5222-BEN
Botswana	Energy Assessment (English)	09/84	4998-BT
	Pump Electrification Prefeasibility Study (English)	01/86	047/86
	Review of Electricity Service Connection Policy (English)	07/87	071/87
	Tuli Block Farms Electrification Study (English)	07/87	072/87
	Household Energy Issues Study (English)	02/88	--
	Urban Household Energy Strategy Study (English)	05/91	132/91
Burkina Faso	Energy Assessment (English and French)	01/86	5730-BUR
	Technical Assistance Program (English)	03/86	052/86
	Urban Household Energy Strategy Study (English and French)	06/91	134/91
Burundi	Energy Assessment (English)	06/82	3778-BU
	Petroleum Supply Management (English)	01/84	012/84
	Status Report (English and French)	02/84	011/84
	Presentation of Energy Projects for the Fourth Five-Year Plan (1983-1987) (English and French)	05/85	036/85
	Improved Charcoal Cookstove Strategy (English and French)	09/85	042/85
	Peat Utilization Project (English)	11/85	046/85
	Energy Assessment (English and French)	01/92	9215-BU
Cape Verde	Energy Assessment (English and Portuguese)	08/84	5073-CV
	Household Energy Strategy Study (English)	02/90	110/90
Central African Republic	Energy Assessement (French)	08/92	9898-CAR
Chad	Elements of Strategy for Urban Household Energy The Case of N'djamena (French)	12/93	160/94
Comoros	Energy Assessment (English and French)	01/88	7104-COM
	In Search of Better Ways to Develop Solar Markets: The Case of Comoros	05/00	230/00
Congo	Energy Assessment (English)	01/88	6420-COB
	Power Development Plan (English and French)	03/90	106/90
Côte d'Ivoire	Energy Assessment (English and French)	04/85	5250-IVC
	Improved Biomass Utilization (English and French)	04/87	069/87

Region/Country	*Activity/Report Title*	*Date*	*Number*
Côte d'Ivoire	Power System Efficiency Study (English)	12/87	--
	Power Sector Efficiency Study (French)	02/92	140/91
	Project of Energy Efficiency in Buildings (English)	09/95	175/95
Ethiopia	Energy Assessment (English)	07/84	4741-ET
	Power System Efficiency Study (English)	10/85	045/85
	Agricultural Residue Briquetting Pilot Project (English)	12/86	062/86
	Bagasse Study (English)	12/86	063/86
	Cooking Efficiency Project (English)	12/87	--
	Energy Assessment (English)	02/96	179/96
Gabon	Energy Assessment (English)	07/88	6915-GA
The Gambia	Energy Assessment (English)	11/83	4743-GM
	Solar Water Heating Retrofit Project (English)	02/85	030/85
	Solar Photovoltaic Applications (English)	03/85	032/85
	Petroleum Supply Management Assistance (English)	04/85	035/85
Ghana	Energy Assessment (English)	11/86	6234-GH
	Energy Rationalization in the Industrial Sector (English)	06/88	084/88
	Sawmill Residues Utilization Study (English)	11/88	074/87
	Industrial Energy Efficiency (English)	11/92	148/92
Guinea	Energy Assessment (English)	11/86	6137-GUI
	Household Energy Strategy (English and French)	01/94	163/94
Guinea-Bissau	Energy Assessment (English and Portuguese)	08/84	5083-GUB
	Recommended Technical Assistance Projects (English & Portuguese)	04/85	033/85
	Management Options for the Electric Power and Water Supply Subsectors (English)	02/90	100/90
	Power and Water Institutional Restructuring (French)	04/91	118/91
Kenya	Energy Assessment (English)	05/82	3800-KE
	Power System Efficiency Study (English)	03/84	014/84
	Status Report (English)	05/84	016/84
	Coal Conversion Action Plan (English)	02/87	--
	Solar Water Heating Study (English)	02/87	066/87
	Peri-Urban Woodfuel Development (English)	10/87	076/87
	Power Master Plan (English)	11/87	--
	Power Loss Reduction Study (English)	09/96	186/96
	Implementation Manual: Financing Mechanisms for Solar Electric Equipment	07/00	231/00
Lesotho	Energy Assessment (English)	01/84	4676-LSO
Liberia	Energy Assessment (English)	12/84	5279-LBR
	Recommended Technical Assistance Projects (English)	06/85	038/85
	Power System Efficiency Study (English)	12/87	081/87
Madagascar	Energy Assessment (English)	01/87	5700-MAG
	Power System Efficiency Study (English and French)	12/87	075/87
	Environmental Impact of Woodfuels (French)	10/95	176/95
Malawi	Energy Assessment (English)	08/82	3903-MAL
	Technical Assistance to Improve the Efficiency of Fuelwood Use in the Tobacco Industry (English)	11/83	009/83
	Status Report (English)	01/84	013/84
Mali	Energy Assessment (English and French)	11/91	8423-MLI
	Household Energy Strategy (English and French)	03/92	147/92
Islamic Republic of Mauritania	Energy Assessment (English and French)	04/85	5224-MAU
	Household Energy Strategy Study (English and French)	07/90	123/90

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Mauritius	Energy Assessment (English)	12/81	3510-MAS
	Status Report (English)	10/83	008/83
	Power System Efficiency Audit (English)	05/87	070/87
	Bagasse Power Potential (English)	10/87	077/87
	Energy Sector Review (English)	12/94	3643-MAS
Mozambique	Energy Assessment (English)	01/87	6128-MOZ
	Household Electricity Utilization Study (English)	03/90	113/90
	Electricity Tariffs Study (English)	06/96	181/96
	Sample Survey of Low Voltage Electricity Customers	06/97	195/97
Namibia	Energy Assessment (English)	03/93	11320-NAM
Niger	Energy Assessment (French)	05/84	4642-NIR
	Status Report (English and French)	02/86	051/86
	Improved Stoves Project (English and French)	12/87	080/87
	Household Energy Conservation and Substitution (English and French)	01/88	082/88
Nigeria	Energy Assessment (English)	08/83	4440-UNI
	Energy Assessment (English)	07/93	11672-UNI
Rwanda	Energy Assessment (English)	06/82	3779-RW
	Status Report (English and French)	05/84	017/84
	Improved Charcoal Cookstove Strategy (English and French)	08/86	059/86
	Improved Charcoal Production Techniques (English and French)	02/87	065/87
	Energy Assessment (English and French)	07/91	8017-RW
	Commercialization of Improved Charcoal Stoves and Carbonization Techniques Mid-Term Progress Report (English and French)	12/91	141/91
SADC	SADC Regional Power Interconnection Study, Vols. I-IV (English)	12/93	--
SADCC	SADCC Regional Sector: Regional Capacity-Building Program for Energy Surveys and Policy Analysis (English)	11/91	--
Sao Tome and Principe	Energy Assessment (English)	10/85	5803-STP
Senegal	Energy Assessment (English)	07/83	4182-SE
	Status Report (English and French)	10/84	025/84
	Industrial Energy Conservation Study (English)	05/85	037/85
	Preparatory Assistance for Donor Meeting (English and French)	04/86	056/86
	Urban Household Energy Strategy (English)	02/89	096/89
	Industrial Energy Conservation Program (English)	05/94	165/94
Seychelles	Energy Assessment (English)	01/84	4693-SEY
	Electric Power System Efficiency Study (English)	08/84	021/84
Sierra Leone	Energy Assessment (English)	10/87	6597-SL
Somalia	Energy Assessment (English)	12/85	5796-SO
Republic of South Africa	Options for the Structure and Regulation of Natural Gas Industry (English)	05/95	172/95
Sudan	Management Assistance to the Ministry of Energy and Mining	05/83	003/83
	Energy Assessment (English)	07/83	4511-SU
	Power System Efficiency Study (English)	06/84	018/84
	Status Report (English)	11/84	026/84
	Wood Energy/Forestry Feasibility (English)	07/87	073/87
Swaziland	Energy Assessment (English)	02/87	6262-SW
	Household Energy Strategy Study	10/97	198/97
Tanzania	Energy Assessment (English)	11/84	4969-TA
	Peri-Urban Woodfuels Feasibility Study (English)	08/88	086/88
	Tobacco Curing Efficiency Study (English)	05/89	102/89

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Tanzania	Remote Sensing and Mapping of Woodlands (English)	06/90	--
	Industrial Energy Efficiency Technical Assistance (English)	08/90	122/90
	Power Loss Reduction Volume 1: Transmission and Distribution SystemTechnical Loss Reduction and Network Development (English)	06/98	204A/98
	Power Loss Reduction Volume 2: Reduction of Non-Technical Losses (English)	06/98	204B/98
Togo	Energy Assessment (English)	06/85	5221-TO
	Wood Recovery in the Nangbeto Lake (English and French)	04/86	055/86
	Power Efficiency Improvement (English and French)	12/87	078/87
Uganda	Energy Assessment (English)	07/83	4453-UG
	Status Report (English)	08/84	020/84
	Institutional Review of the Energy Sector (English)	01/85	029/85
	Energy Efficiency in Tobacco Curing Industry (English)	02/86	049/86
	Fuelwood/Forestry Feasibility Study (English)	03/86	053/86
	Power System Efficiency Study (English)	12/88	092/88
	Energy Efficiency Improvement in the Brick and Tile Industry (English)	02/89	097/89
	Tobacco Curing Pilot Project (English)	03/89	UNDP Terminal Report
	Energy Assessment (English)	12/96	193/96
	Rural Electrification Strategy Study	09/99	221/99
Zaire	Energy Assessment (English)	05/86	5837-ZR
Zambia	Energy Assessment (English)	01/83	4110-ZA
	Status Report (English)	08/85	039/85
	Energy Sector Institutional Review (English)	11/86	060/86
	Power Subsector Efficiency Study (English)	02/89	093/88
	Energy Strategy Study (English)	02/89	094/88
	Urban Household Energy Strategy Study (English)	08/90	121/90
Zimbabwe	Energy Assessment (English)	06/82	3765-ZIM
	Power System Efficiency Study (English)	06/83	005/83
	Status Report (English)	08/84	019/84
	Power Sector Management Assistance Project (English)	04/85	034/85
	Power Sector Management Institution Building (English)	09/89	--
	Petroleum Management Assistance (English)	12/89	109/89
	Charcoal Utilization Prefeasibility Study (English)	06/90	119/90
	Integrated Energy Strategy Evaluation (English)	01/92	8768-ZIM
	Energy Efficiency Technical Assistance Project: Strategic Framework for a National Energy Efficiency Improvement Program (English)	04/94	--
	Capacity Building for the National Energy Efficiency Improvement Programme (NEEIP) (English)	12/94	--
	Rural Electrification Study	03/00	228/00
	EAST ASIA AND PACIFIC (EAP)		
Asia Regional	Pacific Household and Rural Energy Seminar (English)	11/90	--
China	County-Level Rural Energy Assessments (English)	05/89	101/89
	Fuelwood Forestry Preinvestment Study (English)	12/89	105/89
	Strategic Options for Power Sector Reform in China (English)	07/93	156/93
	Energy Efficiency and Pollution Control in Township and		

Region/Country	*Activity/Report Title*	*Date*	*Number*
China	Village Enterprises (TVE) Industry (English)	11/94	168/94
	Energy for Rural Development in China: An Assessment Based on a Joint Chinese/ESMAP Study in Six Counties (English)	06/96	183/96
	Improving the Technical Efficiency of Decentralized Power Companies	09/99	222/999
Fiji	Energy Assessment (English)	06/83	4462-FIJ
Indonesia	Energy Assessment (English)	11/81	3543-IND
	Status Report (English)	09/84	022/84
	Power Generation Efficiency Study (English)	02/86	050/86
	Energy Efficiency in the Brick, Tile and Lime Industries (English)	04/87	067/87
	Diesel Generating Plant Efficiency Study (English)	12/88	095/88
	Urban Household Energy Strategy Study (English)	02/90	107/90
	Biomass Gasifier Preinvestment Study Vols. I & II (English)	12/90	124/90
	Prospects for Biomass Power Generation with Emphasis on Palm Oil, Sugar, Rubberwood and Plywood Residues (English)	11/94	167/94
Lao PDR	Urban Electricity Demand Assessment Study (English)	03/93	154/93
	Institutional Development for Off-Grid Electrification	06/99	215/99
Malaysia	Sabah Power System Efficiency Study (English)	03/87	068/87
	Gas Utilization Study (English)	09/91	9645-MA
Myanmar	Energy Assessment (English)	06/85	5416-BA
Papua New Guinea	Energy Assessment (English)	06/82	3882-PNG
	Status Report (English)	07/83	006/83
	Energy Strategy Paper (English)	--	--
	Institutional Review in the Energy Sector (English)	10/84	023/84
	Power Tariff Study (English)	10/84	024/84
Philippines	Commercial Potential for Power Production from Agricultural Residues (English)	12/93	157/93
	Energy Conservation Study (English)	08/94	--
Solomon Islands	Energy Assessment (English)	06/83	4404-SOL
	Energy Assessment (English)	01/92	979-SOL
South Pacific	Petroleum Transport in the South Pacific (English)	05/86	--
Thailand	Energy Assessment (English)	09/85	5793-TH
	Rural Energy Issues and Options (English)	09/85	044/85
	Accelerated Dissemination of Improved Stoves and Charcoal Kilns (English)	09/87	079/87
	Northeast Region Village Forestry and Woodfuels Preinvestment Study (English)	02/88	083/88
	Impact of Lower Oil Prices (English)	08/88	--
	Coal Development and Utilization Study (English)	10/89	--
Tonga	Energy Assessment (English)	06/85	5498-TON
Vanuatu	Energy Assessment (English)	06/85	5577-VA
Vietnam	Rural and Household Energy-Issues and Options (English)	01/94	161/94
	Power Sector Reform and Restructuring in Vietnam: Final Report to the Steering Committee (English and Vietnamese)	09/95	174/95
	Household Energy Technical Assistance: Improved Coal Briquetting and Commercialized Dissemination of Higher Efficiency Biomass and Coal Stoves (English)	01/96	178/96
	Petroleum Fiscal Issues and Policies for Fluctuating Oil Prices In Vietnam	02/01	236/01
Western Samoa	Energy Assessment (English)	06/85	5497-WSO

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	SOUTH ASIA (SAS)		
Bangladesh	Energy Assessment (English)	10/82	3873-BD
	Priority Investment Program (English)	05/83	002/83
	Status Report (English)	04/84	015/84
	Power System Efficiency Study (English)	02/85	031/85
	Small Scale Uses of Gas Prefeasibility Study (English)	12/88	--
India	Opportunities for Commercialization of Nonconventional Energy Systems (English)	11/88	091/88
	Maharashtra Bagasse Energy Efficiency Project (English)	07/90	120/90
	Mini-Hydro Development on Irrigation Dams and Canal Drops Vols. I, II and III (English)	07/91	139/91
	WindFarm Pre-Investment Study (English)	12/92	150/92
	Power Sector Reform Seminar (English)	04/94	166/94
	Environmental Issues in the Power Sector (English)	06/98	205/98
	Environmental Issues in the Power Sector: Manual for Environmental Decision Making (English)	06/99	213/99
	Household Energy Strategies for Urban India: The Case of Hyderabad	06/99	214/99
	Greenhouse Gas Mitigation In the Power Sector: Case Studies From India	02/01	237/01
Nepal	Energy Assessment (English)	08/83	4474-NEP
	Status Report (English)	01/85	028/84
	Energy Efficiency & Fuel Substitution in Industries (English)	06/93	158/93
Pakistan	Household Energy Assessment (English)	05/88	--
	Assessment of Photovoltaic Programs, Applications, and Markets (English)	10/89	103/89
	National Household Energy Survey and Strategy Formulation Study: Project Terminal Report (English)	03/94	--
	Managing the Energy Transition (English)	10/94	--
	Lighting Efficiency Improvement Program Phase 1: Commercial Buildings Five Year Plan (English)	10/94	--
Sri Lanka	Energy Assessment (English)	05/82	3792-CE
	Power System Loss Reduction Study (English)	07/83	007/83
	Status Report (English)	01/84	010/84
	Industrial Energy Conservation Study (English)	03/86	054/86
	EUROPE AND CENTRAL ASIA (ECA)		
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	Increasing the Efficiency of Heating Systems in Central and Eastern Europe and the Former Soviet Union	08/00	234/00
Eastern Europe	The Future of Natural Gas in Eastern Europe (English)	08/92	149/92
Kazakhstan	Natural Gas Investment Study, Volumes 1, 2 & 3	12/97	199/97
Kazakhstan & Kyrgyzstan	Opportunities for Renewable Energy Development	11/97	16855-KAZ
Poland	Energy Sector Restructuring Program Vols. I-V (English)	01/93	153/93
	Natural Gas Upstream Policy (English and Polish)	08/98	206/98

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Poland	Energy Sector Restructuring Program: Establishing the Energy Regulation Authority	10/98	208/98
Portugal	Energy Assessment (English)	04/84	4824-PO
Romania	Natural Gas Development Strategy (English)	12/96	192/96
Slovenia	Workshop on Private Participation in the Power Sector (English)	02/99	211/99
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	Energy and the Environment: Issues and Options Paper	04/00	229/00

MIDDLE EAST AND NORTH AFRICA (MNA)

Arab Republic of Egypt	Energy Assessment (English)	10/96	189/96
	Energy Assessment (English and French)	03/84	4157-MOR
	Status Report (English and French)	01/86	048/86
Morocco	Energy Sector Institutional Development Study (English and French)	07/95	173/95
	Natural Gas Pricing Study (French)	10/98	209/98
	Gas Development Plan Phase II (French)	02/99	210/99
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	Electric Power Efficiency Study (English)	09/88	089/88
	Energy Efficiency Improvement in the Cement Sector (English)	04/89	099/89
	Energy Efficiency Improvement in the Fertilizer Sector (English)	06/90	115/90
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	Energy Management Strategy in the Residential and Tertiary Sectors (English)	04/92	146/92
	Renewable Energy Strategy Study, Volume I (French)	11/96	190A/96
	Renewable Energy Strategy Study, Volume II (French)	11/96	190B/96
Yemen	Energy Assessment (English)	12/84	4892-YAR
	Energy Investment Priorities (English)	02/87	6376-YAR
	Household Energy Strategy Study Phase I (English)	03/91	126/91

LATIN AMERICA AND THE CARIBBEAN (LAC)

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	Natural Gas Distribution: Economics and Regulation (English)	03/92	125/92

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Colombia	Energy Strategy Paper (English)	12/86	--
	Power Sector Restructuring (English)	11/94	169/94
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	Recommended Technical Assistance Projects (English)	11/84	027/84
	Forest Residues Utilization Study (English and Spanish)	02/90	108/90
Dominican Republic	Energy Assessment (English)	05/91	8234-DO
Ecuador	Energy Assessment (Spanish)	12/85	5865-EC
	Energy Strategy Phase I (Spanish)	07/88	--
	Energy Strategy (English)	04/91	--
	Private Minihydropower Development Study (English)	11/92	--
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	Status Report (English and French)	08/85	041/85
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Paraguay	Energy Assessment (English)	10/84	5145-PA
	Recommended Technical Assistance Projects (English)	09/85	--
	Status Report (English and Spanish)	09/85	043/85
Peru	Energy Assessment (English)	01/84	4677-PE

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	Proposal for a Stove Dissemination Program in the Sierra (English and Spanish)	02/87	064/87
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	Privatization, Competition and Regulation in the British Electricity Industry, With Implications for Developing Countries	02/00	226/00
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