The Commercialization Process in Exploration and Production Agreements

A Study from the Africa Gas Initiative

Mohsen Shirazi

The World Bank

Industry and Energy Department
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in Exploration and Production Agreements

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Preface

The Africa Gas Initiative (AGI) is an effort to promote development and trade in natural gas in the countries along West Africa's coastline from the Senegal River all the way to South Africa. The initiative was motivated by the desire of the participating countries to encourage development of gas reserves or to limit the flaring (burning off) of gas in connection with oil production.

The AGI began at a conference held in Addis Ababa, Ethiopia, in May–June 1994, hosted by the World Bank and the UN Economic Commission for Africa. The initiative, which is proceeding at the request of the West African governments involved, poses a new model of development for gas in which governments, domestic and international oil companies, and private sector financing take the lead role in the development of gas resources, rather than, say, multilateral or bilateral donors. Most projects will be small-scale, fast-track efforts, put together in two or three years.

The initiative will provide important environmental benefits by reducing greenhouse gas emissions and by offering an efficient alternative to biomass fuels, thereby limiting deforestation. In addition, use of gas or LPG for cooking improves the quality of life for local residents compared with using smoky and unhealthful traditional biomass stoves.

Natural gas projects also can play an important economic role in the region. First, new gas resources can be a clean source of energy for industrial and commercial uses, wherever gas can be substituted for imported oil. Gas is also well suited for producing power in efficient combined-cycle generators and will allow growth beyond what is possible via the area's hydropower resources, which are reaching their limits in several countries. Second, extraction of LPG from associated gas would provide efficient energy to meet the expanding demand in the household sector. Moreover, using natural gas for local activities will allow oil-producing countries to maintain oil exports and bring in much-needed foreign exchange. This is particularly important for countries where oil production has started to decline.

In addition to its support of project development, the AGI will involve data gathering on gas resources, training and capacity-building efforts, and advice on structuring of the legislative and regulatory environments for the sector. The World Bank and the Joint UNDP/World Bank Energy Sector Management Assistance Programme (ESMAP) are participating directly in the AGI, particularly in conducting regional and subregional studies of gas development options and in training hydrocarbon sector personnel in structuring gas industries and trade.

The present study of the gas commercialization process is intended to assist the participating countries in furthering the commercial development of natural gas. It compares the more familiar development process for oil with that for gas, outlines a
downstream gas development program, sets out the detailed provisions in E&P agreements, and provides a step-by-step discussion and timeline of the commercialization process. The document also includes a sample natural gas clause.

Acknowledgments

The author of this paper has nurtured the idea of explaining the commercialization process in E&P agreements for a long time. He first launched this idea for an international oil company that he worked for before joining the World Bank, where he got the opportunity to enhance the idea and broaden its dissemination. The idea was presented at a UNITAR conference in 1984 and later in 1985 at the Round Table Program organized by the author for the Energy Department of the Bank on gas development in developing countries. This provided a unique opportunity to discuss the idea in more detail with the senior representatives of developing countries and executives of the industry. This was followed by further discussions with the international oil companies as well as a special request by one developing country for World Bank assistance in enhancing their model E&P agreement with gas provisions. The Africa Gas Initiative Program has provided the opportunity to crystallize the ideas and present them in this paper.

The author wishes to thank officials of government institutions and of the international oil companies who provided comments and discussed the paper with the author. Special thanks go to Chevron Overseas Petroleum; Phillips Petroleum Company Europe-Africa; N. M. Rothchild & Sons; Esso Exploration; Shell International Gas Limited; Exxon Corporation; TOTAL; Arent Fox, Kintner, Plotkin & Kahn; and the Turkish Petroleum Corporation. Their experience provided invaluable insights.

Special thanks are accorded to Messrs. Hossein Razavi and Eric Daffern, for funding the study under the AGI as well as their review, Mr. Mourad Belguedj, the peer reviewer of the report, and to Mr. Robert Pleasant for his past consultancy services.

The publishing services of the IEN departmental editor, Mr. Paul Wolman, and word processing by Ms. Carole-Sue Castronuovo are greatly appreciated.
Introduction

1.1 The World Bank is participating in the Africa Gas Initiative to facilitate the commercial development of African gas discoveries. The AGI comprises a concerted effort to assist countries that have access to natural gas resources in making increased use of this gas. Such a strategy will help relieve these countries' dependence on imported petroleum products and will provide a cleaner-burning source of fuel that can help slow the accumulation of greenhouse gases and other pollutants. African countries—and other developing countries—that wish to embark on gas development can reap benefits from attracting the private sector to help them meet their financing requirements and to provide managerial and technical assistance. The AGI thus aims at assisting countries in establishing a sound economic, institutional, and regulatory environment for development of a gas industry.

1.2 Historically, international oil and gas companies have been reluctant to extend their portfolios of investment to include gas development in developing countries when the market for the gas is primarily domestic. Contributing to this reluctance are the companies’ doubts about the size and potential of the market, the contractual framework, pricing, currency convertibility, and the lack of adequate infrastructure. Individually and collectively, such factors tend to increase the perceived risk for the project relative to comparable projects in a developed country.

1.3 Indigenous gas resources have often been an economic way of meeting internal requirements in many developed countries and in a few developing countries. Most gas discoveries in developing countries have remained unappraised and undeveloped, however, even where ample domestic marketing opportunities appear to make development feasible.

1.4 In most developing countries, the production-sharing or license agreement, also called the exploration and production agreement (E&P agreement), specifies all rights and obligations of the contracting parties with respect to operations contemplated during the term of the agreement. But because it is exportable oil that international companies are traditionally seeking in developing countries, typical E&P agreements
contain perfected and familiar provisions regarding commercialization of oil. Rarely, however, do such agreements give more than cursory treatment to natural gas, particularly in the context of the domestic market.

1.5 Further complicating the development of gas is the fact that most E&P agreements treat commercialization of natural gas in the same way as oil, despite clear and major differences, or leave the treatment of gas open to be agreed upon following a discovery. In some E&P agreements, the investor has no rights whatsoever to market the gas. Often, it would appear, neither contracting party wishes to face—either during contract negotiations or following a discovery—the less familiar and more difficult issues related to gas.

1.6 Lack of comprehensive arrangements in the E&P agreement is clearly a major obstacle to timely development of natural gas in developing countries. This paper thus addresses the relevant contractual issues and outlines an efficient and pragmatic approach to commercializing natural gas in countries having domestic market requirements that could be satisfied with indigenous natural gas but still lacking a fully developed policy and infrastructure for the gas industry.

1.7 It should be borne in mind that if a country has gas reserves sufficient both for internal consumption and for export, a domestic market project could be developed in conjunction with export markets or could even be preceded by such projects, thereby facilitating the domestic gas development.
Comparison of Commercialization for Oil and Gas

2.1 The basic process from exploration to marketing of oil and natural gas can be divided into four or five distinct phases, as shown in Figure 2.1. Exploration activities (Phases I and II in the figure) are the same for oil and gas. However, the commercialization process (Phases III through V) becomes quite different once oil or gas is discovered.

2.2 The commerciality of an oil discovery can be evaluated (Phase III) relatively quickly once the main physical parameters of the discovery have been assessed, because comprehensive terms and conditions for oil development and exploitation are contained in the E&P agreement and because the production can be sold in the best available market.

2.3 The commerciality of a gas discovery, however, cannot be established until the field reserves have been established and the conditions for gas utilization and marketing have been defined for the life of the field. This implies a multistep, coordinated effort involving both the upstream and downstream sides of the project. The development phase (Phase IV) for both oil and gas can commence promptly after the declaration of commerciality. However, for gas, the field development must be closely coordinated with the downstream gas development program.
Figure 2.1 Comparison of Oil and Gas Development from Exploration to Marketing Phases

**PHASE I, Oil/gas**
- E&P contracts
- Negotiations or bidding
- Other arrangements

**PHASE II, Oil/gas**
- Exploration
- Geological survey
- Geophysical survey
- Wildcat drilling

**PHASE III, Oil**
- Oil discovery
- Reserve & commerciality evaluations

**PHASE IV, Oil**
- Oil field development
- Development wells
- Production plants
- Pipelines
- Storage & loading facilities

**PHASE III, Gas**
- Gas discovery
- Reserve & commerciality evaluations

**PHASE IV, Gas**
- Planning & development
  - Preliminary eng. & cost estimate
  - Market study
  - Economics
  - Domestic utilization and appliance planning
  - Financial arrangements
  - Contractual arrangements
  - Approvals
- Engineering & construction
  - NGL recovery & H.C. dew point control
  - Water dew point control
  - Sour gas removal
  - Gathering
  - Pipeline transportation
  - Industrial network
  - Consumer installation or liquefaction & shipping

**PHASE V, Gas**
- Gas field development
- Production facilities

Essential requirements for firm commitment

Oil to market

Gas to domestic and/or export markets
3

Downstream Gas Development Program

3.1 In the context of this paper, a downstream gas development program encompasses an integrated chain of activities downstream of the field development operations for the commercial sale and delivery of natural gas to buyers in the internal market. It can include the design, construction, operation, and maintenance of the facilities necessary to receive, measure, treat, process, and transmit natural gas from the field to domestic consumers. Further, it frequently includes all economic and technical studies as well as financing and sales agreements (i.e., producer to downstream entity, and downstream entity to customers within the country). After the commercial gas discovery, a downstream gas entity, which could be publicly or privately owned or both, should be established by the government to conduct the activities under the downstream gas development program. Before formulating specific downstream gas development programs, the government or its designated entity, in collaboration with the relevant production-sharing contractor or license holder ("the producer"), would need to make or update a countrywide or regional gas study (depending on the potential size of the gas discovery) encompassing the following points:

a. Assessment of the availability of and markets for natural gas under various price/cost assumptions for 10- to 20-year projections

b. Comparison of various development-use schemes in terms of their technical, economic, and financial feasibility

c. Determination of a master development plan within which individual projects could be formulated

d. Formulation of economic and financial policies that will ensure the efficient development of gas and the technical and financial viability of the producer, transmission and distribution companies, and users.

3.2 Figure 3.1 shows the basic steps and the possible sequence and timing that could be involved in the typical development of a large gas field and downstream gas development program. For illustrative purposes, Figure 3.1 shows approximately two
years of initial studies and concluding necessary contractual and financial arrangements and three years for parallel upstream and downstream development. The schedule may be longer depending on the size and specifics of the project, particularly when the export market is also involved, although the process remains the same regardless of size. The commercialization process for domestic and export markets, or both, will be significantly facilitated and shortened if the E&P agreement contains comprehensive and pragmatic gas provisions. The close link between the upstream development (gas field) and downstream development (market, sales contracts, transmission, and distribution network) means that at a number of decision points, studies and investments will have to be completed in parallel before the next step can be initiated.

3.3 In the absence of a fully identified, financed, and negotiated downstream gas development program, the commerciality of a gas field cannot be established, and hence its development would not be prudent.
Figure 3.1 Illustrative Plan for a Coordinated Gas Field and Downstream Gas Development

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<td>Industrial, commercial, and household burners and appliances market planning and promotion</td>
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* In case of an export project, some of these activities would be replaced with other activities.

Requirements for firm commitment and declaration of commercial discovery.
4

Provisions in the E&P Agreement

4.1 To expedite the appraisal and development of discoveries, the E&P agreement should include, as is customary for oil, a number of provisions tailored to the unique issues related to gas commercialization. Essential items to be covered are described below.

Term

4.2 The nature of gas development necessitates that exploration and exploitation periods for natural gas will often be longer than for crude oil. The exploration period (i.e., the phase before declaration of commercial discovery) needs to be of adequate duration to allow sufficient time for market assessment and for the multi-step parallel upstream and downstream commercialization process. The exploitation period (i.e., the phase following declaration of commercial discovery when the development and production occur) often needs to be longer because of the following considerations:

a. Longer development phase in view of the need for parallel engineering and construction of both upstream and downstream facilities
b. Longer buildup period for achieving the designed capacity
c. Long-term nature of gas sales and purchase contracts
d. Longer payback period for gas because of the higher investment and operation costs.

Scope of Contractor's Obligations, Operations, and Cost Recovery under E&P Agreement

4.3 In the case of natural gas, the producer’s obligations and operations and cost recovery or cost write-offs under the E&P agreement should normally be limited to upstream facilities and operations (i.e., production and delivery of gas in salable condition to inlet of transmission facilities that connect the field to the major consumers
and city distribution network). If specifically requested by the government or the state oil company, the E&P agreement could include the pipeline between the field and the inlet to the existing principal natural gas transmission pipeline.

**Ownership and Operation of Downstream Facilities**

4.4 Downstream gas facilities in developing countries are usually owned and operated by the public sector, but this does not preclude ownership by private entities (see para. 3.1). In some cases, the producer may be willing to participate in the financing and ownership of such facilities and often will insist on an active role in the design, construction, and operation of the transport system to ensure good coordination between upstream and downstream operations. In the E&P agreement, the government should usually indicate a willingness to consider the producer’s request to participate in the ownership and operation of such new facilities. However, the producer should not be obligated to participate. The cost of ownership and operation of the downstream facilities should be recovered from the margin between the consumer transfer price and the producer transfer price.

**Gas Development Committee**

4.5 A special advisory committee composed of representatives of both the producer and the downstream entity designated by the government should be formed promptly after the gas discovery to coordinate, on a day-to-day basis, the parallel upstream and downstream planning and activities as outlined in chapter 5. This committee would collaborate with and advise the E&P Joint Operating Committee. In view of the specific situations that may govern each appraisal and development process, the Gas Development Committee should propose to the parties from time to time the sequence, scope, and time periods for the commercialization process.

**Framework for Natural Gas Sales and Purchase Contract**

4.6 To encourage the contractor to consider seriously a timely gas development for the domestic market, the framework for a gas sales and purchase contract should be set forth in the E&P agreement. Such a framework should establish clear pricing principles (see the section on pricing below) and contractual safeguards, such as supply commitment, take-or-pay, currency of payment, and so on (see the section on contractual safeguards below).

**Pricing**

4.7 Natural gas, unlike oil, does not have a widely recognized international “market price.” Rather, gas prices have generally reflected the specific conditions in the gas projects, particularly if gas is used within the host country. Traditionally, two
principal methods have been used for gas pricing (although in practice several variations on these methods are used):

a.  *Cost-plus.* This pricing method consists of the buyer's payment of a price determined by the seller's costs plus an agreed margin, either with an adjustment formula based on cost indices or without an adjustment formula (in which case the price is fixed for the contract period). Because cost-plus pricing minimizes the effect of market forces and is often not adhered to by the parties during the life of the contract, it is generally not a preferred option, since it does not create incentives or promote efficiency.

b.  *Market value.* The market value of gas is based on its value to final users and reflects the inherent value of gas as determined by its substitutability for other energy sources, quality, and security and availability of supply. Because market-value pricing realistically reflects market forces, it has traditionally encouraged a fair, stable, and sustained relationship between buyer and seller. With an appropriate base price and indexation system tied to relevant energy prices, the system will allow gas prices to fluctuate in a manner that permits gas to find its natural role in the national energy structure. This provides sufficient price incentives to encourage producers to engage in further exploration and development. The market value will need to be based on the alternative fuels for those major consumers necessary to make the gas project commercially viable.

4.8  Market-value pricing is recommended as the basis for the producer transfer price. Generally, no differentiation should be made between associated and nonassociated gas except where associated gas supplies are expected to be short-lived or unreliable in quantity. The unit price of gas at the field should be related to the market value of the alternative fuels for the use in question. Typically, the market value of gas, or reference value, would be calculated on a caloric-equivalent basis of published international market prices of fuel oil or a “basket” of oil products, at major ports or free markets. In some cases the basket may include coal. However, if a country is an importer or exporter of gas, an appropriate reference value could also be the sales prices of such gas at the national border. Such a reference value would be adjusted by the cost of transportation from the relevant international port or free-market national border, as the case may be, to the point of consumption in the country.

4.9  In the few petroleum laws and E&P agreements that contain meaningful gas pricing provisions, the producer transfer price has been determined by one of the following methods:
a. *Market-related netback method.* The producer transfer price is calculated by subtracting from the reference value the cost of transmitting the gas from the field to the consumer gate and an incentive discount that often is structured to include, over time, the consumer’s cost of conversion to gas.

b. *Ceiling method.* Here, a price ceiling is fixed in the E&P agreement guaranteeing a maximum percentage of the reference value, minus the discount negotiated in the detailed gas sales contract or E&P agreement. (Some countries have fixed a ceiling based on a percentage of imported fuel-oil-equivalent price.) This method suggests a departure from the market-related pricing principle.

c. *Fixed-percentage method.* Here, a fixed percentage of the reference value would either be fixed by the government or be bid by the contractor and fixed by negotiation in the E&P contract. (One country having higher development or production costs for gas has fixed a countrywide producer transfer price of 85 percent of international fuel-oil-equivalent price.)

d. *Price for nonenergy uses.* Where gas is to be used for nonenergy purposes—for example, as a feedstock or in enhanced recovery operations for fields not covered by the E&P agreement—the producer transfer price should be established taking into account the economic value of the gas for the particular use. Thus, where a product is created using gas as feedstock or a fuel, its value can be measured either against an alternative way of making that product using other forms of feedstocks or against the cost of importing that product. It is also possible to link the producer transfer price to a percentage of the sales price of the end product or movements in that price.

**Contractual Safeguards in Natural Gas Sales and Purchase Contracts**

4.10 The following contractual safeguards will help establish a clear framework for natural gas and purchase contracts:

a. Annual and daily contract quantities delivery and offtake obligations on parts of seller and buyer

b. Annual take-or-pay obligation on part of buyer for a fixed percentage of the annual contract quantity or other forms of obligation (with some degree of flexibility commensurate with market conditions)

c. Periodic price adjustment reflecting change in reference value

d. Payment in mutually agreed currency or currencies

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1. In some instances, it would be advisable to fix a floor price in the E&P agreement guaranteeing a producer transfer price that would never be less than a specified percentage of the reference value. The floor price would establish a base case for the producer to evaluate development of a gas discovery.
e. Right for contractor to substitute associated gas for nonassociated gas in supplying contract quantity.

Gas Share

4.11 The producer’s share of natural gas should normally be larger than that for crude oil, recognizing that the risks for gas are higher and that the netback for gas is generally less per unit of energy than for crude oil. The producer’s share of gas and producer transfer price will define the limits within which both the upstream and downstream sides of the project will be financially self-sufficient. However, in certain instances, the economic value of the natural gas to the particular country may be so important that the government may be willing to expand the limit of one or both sides of the project without increasing the consumer transfer price. Such expansion could be achieved by reducing government take (royalty, tax, or production share) from the producer or by supporting some of the cost of downstream facilities with a portion of the royalty or tax share received by government. Where the government has an equity participation in the development, it may be appropriate for it to take less than its equity percentage of gas at lower production levels in order to make the project financially viable for the private sector.

What are Gas Liquids?

4.12 Liquids obtained from gas in customary field separators are usually treated as crude oil for purposes of the E&P agreement. Liquids extracted from such gas by processing (i.e., hydrocarbon liquid recovery) are then treated for fiscal purposes as natural gas. However, in cases specified in the E&P agreement, all production from a field may be treated as natural gas or as crude oil depending on the gas/oil ratio of production from the field during a particular period. In the case where differentiation between associated and nonassociated gas is appropriate, it is essential to define the boundary between the two.

Use Priority

4.13 For associated gas, the use priority would be as follows:

a. Field operations including reinjection to the extent required to maximize recovery of liquids

b. Commercial sale of associated gas, giving priority to the domestic market where this is technically and economically feasible

c. Right to flare only the portion not used under (a) or (b) above but only for such periods as agreed upon by the host country from time to time. (It will be important to follow appropriate conservation and environmental policies.)
4.14 For nonassociated gas the use priority would be as follows:

a. Field operations (free of charge)

b. Commercial sale within host country where technically and economically feasible

c. Export sale (in some cases, export may be accorded priority over internal market sales within the host country for a portion of the production).
The Commercialization Process

5.1 The commercialization process should follow a practical procedure for gas, including a parallel development of upstream and downstream activities, as shown in Figure 5.1 (for illustrative purposes only, this is shown as accomplished within 24 months after discovery). Timing in the commercialization process and the sequence and scope of many of the activities would be determined by key decisions along the way, such as the decision to appraise, the commercial quantity decision, and the declaration of commerciality. The process could in typical cases involve the following steps.

Step 1: Discovery (The Zero Date)

5.2 Contractor/licensee discovers gas in wildcat exploration well.

Step 2: Preliminary Activities (Months 1 to 8)

5.3 These would occupy months 1 to 8.

a. Upstream actions by contractor/licensee:
   - Initial report on reserve range, productivity, quality, and so on
   - Commercial potential notice
   - Preliminary development cost estimate
   - Appraisal program approved by operating committee
   - Preliminary field development feasibility study.

b. Joint actions by both contractor/licensee and downstream entity:
   - Formation of the Gas Development Committee for the life of the project
   - Establishment of terms of reference for the market survey and the feasibility study
   - Negotiation of heads of producer gas sales agreement.
Figure 5.1 Gas Commercialization Process

The Zero Date

MOUTHS
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24

UPSTREAM ACTIONS
- Exploration
- Seismic
- Wildcat drilling
- Discovery
- Testing
- Reserve data analysis
- Commercial potential decision
- Preliminary development cost estimate
- Appraisal program approved by operating committee
- Preliminary field development feasibility study

Decision to appraise
- Mobilization of rig
- Field appraisal program
- Appraisal report
- Refine cost estimates
- Refine field feasibility study
- Pursue financing arrangement

Commercial quantity decision
- Field development program and budget
- Field financing

Declaration of commerciality
- Engineering and construction

GAS DEVELOPMENT COMMITTEE, UNDER THE OPERATING COMMITTEE
Planning and Coordination

Joint Actions
- Negotiate heads of gas sales agreement
- Negotiation of gas sales agreement
- Finalization of gas sales agreement

Market survey
- Preliminary cost study
- Preliminary financing study
- Preliminary effect of gas on petroleum production pattern
- Preliminary pricing
- Preliminary feasibility study by independent expert

Refine cost estimates
- Refine market study and feasibility study
- Pursue financing arrangements
- Reach heads of agreements with major consumers

Downstream development program and budget
- Financing
- Major consumer gas sales contracts
- Engineering and construction

MOUTHS
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
c. Downstream actions by downstream entity:
   - Market survey
   - Preliminary cost study
   - Preliminary financing study
   - Analysis of effect of gas on petroleum production pattern
   - Preliminary pricing study
   - Preliminary feasibility study by independent expert.

**Step 3: Decision to Appraise (Month 8)**

5.4 Identification of a feasible market and determination of feasibility of constructing downstream facilities would trigger the following activities (Months 9 to 19).

a. Upstream actions by contractor/licensee:
   - Field appraisal program (in some instances it may be appropriate for the state oil company with a participation option to bear its participating interest share of the gas appraisal program)
   - Mobilize rigs and carry out drilling
   - Appraisal report
   - Refinement of cost estimates
   - Refinement of field feasibility study
   - Financing arrangements pursued.

b. Joint actions by contractor/licensee and downstream entity:
   - Refinement of cost estimates
   - Refinement of market study and feasibility study
   - Pursuit of heads of agreements with major consumers
   - Coordination between upstream and downstream activities
   - Negotiation of gas sales agreement with the major consumers.

**Step 4: Commercial Quantity Decision (Month 19)**

5.5 At the end of the field appraisal process, the contractor would determine and notify the government whether or not it considers the gas field to contain commercial quantities of gas. A positive commercial quantity notice would trigger the following
parallel activities (Months 20 to 24), all of which would be expressly contingent on contractor’s declaration of commercial discovery under Step 5 below.

a. Upstream actions:
   • Preparation by operator, and operating committee’s contingent approval, of field development program and budget
   • Field financing.

b. Joint actions:
   • Finalization of producer gas sales agreement between the producer and the downstream entity.

c. Downstream actions:
   • Downstream development program and budget
   • Financing
   • Major consumer gas sales contracts.

**Step 5: Declaration of Commerciality (Month 24)**

5.6 The contractor/licensee would make a final decision on commerciality once all of the steps under Step 4 were in place. Contractor’s declaration of commerciality would satisfy the contingency on the approval and arrangements under Step 4 above and trigger the following parallel actions on both the upstream and downstream sides (Months 24 to 36).

a. Upstream actions: Engineering and construction

b. Joint actions: Coordination of upstream and downstream project implementation

c. Downstream actions: Engineering and construction.
Conclusion

6.1 The scheme outlined in this paper is designed to facilitate the timely commercialization of gas in countries where gas is to be introduced rapidly either for the first time or as a major increment. It should be noted that a number of features introduced may not be comparable with the practices in countries with well-developed gas markets and infrastructures or with a long-established major gas utility. However, the fundamental principles elaborated here are essential for effective introduction of gas in most developing countries.

6.2 The paper emphasizes that gas development is an integrated chain from reservoir to marketplace. The need for the parallel appraisal of the prospective markets and of the production potential of the known fields implies a series of analyses and decisions until an optimal program for gas development is reached.

6.3 The complexity of this chain, and the subsequent interdependence of the producer, the gas transmission and distribution network, and the users, requires a high degree of commitment from all partners involved in a project as well as from the government. Given this situation, one of the stumbling blocks in gas development for the internal market is the failure of the E&P agreements to provide the basic terms and conditions that would prevail in the event of a gas discovery. This paper has thus sought to provide a general commercialization process and provisions for major issues such as producer pricing and other principles for the gas sales agreement, upstream and downstream responsibility, appropriate term, profit sharing, and appropriate fiscal regime.
Annex: Sample Natural Gas Clause

1. Natural Gas Use Priorities

If Contractor discovers natural gas in the contract area in commercial quantities, priority shall be given to development of such natural gas to supply the internal market in host country after satisfying free of charge Contractor's requirements or field operations related to the contract area, including reinjection. Contractor may dedicate to an export project natural gas not required for field operations and identified and quantified internal market. The commercialization process for a potential export project may be different from that outlined in sections 9 through 23 of this Article and, in such event, the parties will agree on an appropriate commercialization process.

2. Definitions

For purposes of this Article, the following terms pertaining to natural gas shall have the indicated meanings:

a. *Upstream operations* means all operations and facilities related to the contract area for producing and delivering natural gas in salable condition to the inlet of the transmission facilities that transport the natural gas from the field to the major industrial consumers and city distribution networks.

b. *Downstream operations* means all operations and facilities within host country for receiving natural gas from the contract area at the field and transmitting and selling such to the internal market.

c. *Downstream Entity* means the national oil company (NOC) or the designated public/private entity that undertakes the downstream operations with respect to natural gas produced for the internal market.

d. *Reference value* means the average Rotterdam price during the past calendar quarter of low-sulfur, Grade 6 fuel oil as published in *Platt's Oilgram* (or such other agreement of NOC and contractor from time to time), adjusted to include the cost of transportation from Rotterdam to the point of consumption in host country, stated on a calorific equivalent basis.

e. *Producer transfer price* for natural gas sold for the internal market means the price payable to Contractor by the Downstream Entity at the point of field delivery.

3. Scope of Joint Operations/Cost Recovery

The scope of joint operations under this agreement with respect to natural gas produced for the internal market shall include only upstream operations. Cost
recovery under this agreement with respect to natural gas produced for the internal market shall be limited to the cost of upstream operations. With respect to natural gas produced for export, both the scope of joint operations under this agreement and of cost recovery shall be agreed upon between the parties as part of the export development plan.

4. Downstream Operations

Downstream operations will be conducted by the Downstream Entity. However, the Downstream Entity will consider the Contractor’s written request to participate in the financing, ownership and/or operation of the transmission facilities that transport the natural gas from the field to the major industrial consumers and city distribution networks. Any such participation by Contractor in the transmission facilities will be covered by a separate agreement, and such participation shall not be considered as petroleum operations under this agreement.

5. Discovery Notice/Testing

Upon discovering primarily natural gas or natural gas and condensate in an exploration well, Contractor shall notify NOC of the discovery. If such discovery appears to be of possible commercial interest, Contractor and NOC shall promptly agree on the series of tests that are warranted, which agreed testing program shall be carried out by the Contractor.

6. Commercial Potential Notice

Within 30 days after release of the drilling rig from such discovery well, Contractor shall notify NOC whether or not it considers the discovery to have commercial potential (commercial potential notice). The commercial potential notice shall include all technical information on which contractor based its decision, including, for example:

a. Well-test results
b. Contractor’s best estimate of reserve range and probable production rates (including basis and assumption for calculations)
c. Chemical analysis of the natural gas.

7. Extension of Exploration Term

If a positive commercial potential notice is issued by Contractor, NOC will, upon the written request of Contractor, support Contractor’s request for extension of the exploration term if needed to allow Contractor time to undertake and complete the natural gas commercialization process outlined in this Article.
8. Gas Development Committee

Within 15 days after NOC’s receipt of Contractor’s positive commercial potential notice, NOC and Contractor shall each designate two specialists to serve on an advisory committee (Gas Development Committee), reporting to the operating committee and the Downstream Entity, that will coordinate on a day-to-day basis the parallel upstream and downstream planning and activities relative to the discovery. In coordinating the gas commercialization process, the Gas Development Committee will propose to the parties from time to time for approval of the sequence, scope, and time periods for the specific work to be carried out pursuant to sections 12 through 22 of this Article.

9. Market Feasibility Study

A feasibility study (market study), including a market survey, for utilization of Contractor’s natural gas in the internal market shall be conducted, making maximum use of pre-existing market data. The market study shall be conducted by the entity (study group) selected by the parties. The market survey portion shall be conducted by a host government national team under the direction of the study group. Such market study shall be carried out on the joint behalf of Contractor and the Downstream Entity, with Contractor and NOC each bearing 50 percent of the cost thereof. Both Contractor and NOC shall provide information to the study group as requested during the conduct of the market study. The study group shall be required to keep Contractor, NOC, and Gas Development Committee informed and involved at all stages of the market study.

10. Heads of Agreement for Producer Gas Sales Contract

Contractor/NOC and the Downstream Entity (if not NOC) undertake to negotiate and initial a heads of agreement for the producer gas sales contractors covering the sale of natural gas from the contract area to the Downstream Entity for use in the internal market. Such heads of agreement shall expand, among other things, on the following agreed principles.

a. **Producer Transfer Price:** For natural gas to be used for energy uses, the unit price at the field shall be the reference value reduced by the per-unit cost of transmitting the natural gas within host country from the producer transfer point to the industrial consumer gates or city gate stations, provided that the producer transfer price shall never be less than ___ percent.

b. **Price Adjustment:** The producer transfer price for natural gas purchased for energy purposes shall be fixed as of the beginning of each calendar quarter based on the average reference value during the preceding calendar quarter.
c. **Take or Pay:** The Downstream Entity shall undertake an annual take-or-pay obligation for a fixed percentage of the annual contract quantity.

d. **Delivery Obligation:** Contractor shall undertake to deliver to the Downstream Entity a daily contract quantity. Contractor shall have the right to substitute associated gas produced in the contract area for nonassociated gas in supplying such contract quantity.

e. **Currency of Payment:** The Downstream Entity shall pay Contractor at a location designated by Contractor in mutually agreed convertible currency or currencies, except to the extent that Contractor requires local currency to pay current income taxes, royalty, and other local currency costs.

11. **Appraisal Work Program and Budget**

Operator shall prepare and present to the parties a proposed work program and budget for appraisal of the natural gas discovery. At the time of transmitting such proposal, Operator shall call a meeting of the operating committee to be convened not later than thirty (30) days thereafter for the purpose of considering the proposal and adopting an appraisal work program and budget. The costs of such Appraisal Work program and budget shall be borne by the parties in accordance with their participating interests and treated as development costs.

12. **Other Preliminary Upstream Activities**

Operator shall prepare and provide the parties and the Gas Development Committee with

a. A preliminary field development feasibility study

b. A preliminary plan, cost estimate, and schedule for development of the field and related upstream facilities.

13. **Preliminary Downstream Activities**

The Downstream Entity shall prepare or have prepared and provide the parties and the Gas Development Committee with the following:

a. A preliminary feasibility study of downstream facilities required to sell in the internal market natural gas from the contract area

b. A preliminary plan, cost estimate, and construction schedule for such downstream facilities

c. A preliminary study on means and cost of financing such downstream facilities

d. An analysis of the effect of natural gas from the contract area on the petroleum production and distribution patterns in host country
e. A preliminary study for consumer sales price of natural gas from the contract area.

14. Heads of Agreements with Consumers

The Downstream Entity shall negotiate a heads of agreement with each major consumer envisioned to use the natural gas from the contract area. The Downstream Entity shall provide the Gas Development Committee with a copy of each such initialed heads of agreement.

15. Upstream Appraisal Program

The appraisal work program adopted by the operating committee under this Article shall be carried out by operator on behalf of the parties after the following conditions have been satisfied:

a. Issuance of report by the study group that the market study has identified, for natural gas from the contract area, the near-term and ongoing existence of at least the minimum feasible internal market specified in the terms of reference for such market study

b. Issuance of letter by Downstream Entity to Contractor stating that the preliminary downstream activities under section 13 of this Article indicate that the downstream portion of the project appears to be feasible.

Operator shall keep the parties and the Gas Development Committee fully and currently informed of the progress and results of such appraisal program.

16. Refined Upstream Feasibility Study

Operator shall refine or cause to be refined its preliminary feasibility study, plan, cost estimate, and schedule for upstream development and provide such to the parties and the Gas Development Committee. Such refinements shall be based on preliminary engineering studies and cost studies prepared by generally recognized experts.

17. Field Evaluation Report

Following completion of the approved appraisal work program, Operator shall prepare and provide the parties and the Gas Development Committee with a detailed field appraisal report, including certification by a recognized international expert, of discovered reserves ("proven, probable, and possible") per well, field production rates, and an estimated production profile for the life of the field.
18. Upstream Financing Plans

Contractor and NOC shall each endeavor to arrange sources for financing their respective shares of upstream development costs.

19. Downstream Appraisal Programs

In parallel with the upstream appraisal program, the Downstream Entity shall

a. Refine the preliminary feasibility study, plans, cost estimates, and schedule for the downstream facilities based on preliminary engineering studies prepared by generally recognized experts
b. Refine the market study
c. Pursue commitments for financing the downstream facilities
d. Expand the heads of agreements with major consumers into more detailed understandings.

20. Negotiation of Producer Gas Sales Contract

Contractor, NOC, and Downstream Entity (if not NOC) shall commence and diligently pursue negotiation of the producer gas sales contract for natural gas from the contract area, using as the basis for such contract the initialed heads of agreement for the producer gas sales contract.

21. Commercial Quantity Decision

Following Operator’s delivery to the parties of the field appraisal report under section 17 of this Article, Contractor shall notify NOC whether or not it considers the appraised gas discovery to contain commercial quantities of gas.

If the commercial quantity decision is negative and Contractor does not agree to undertake within the ensuing 24 months additional exploration and/or appraisal drilling for the purpose of enhancing the reserves, Contractor shall, if requested by NOC, relinquish the area of such discovery to NOC.

22. Pre-Development Arrangements

If the commercial quantity decision is affirmative, the following steps shall be accomplished in parallel with the following six approvals, commitments, or agreements required, each being contingent solely on the parties’ or Contractors’ “declaration of commercial discovery” pursuant to section 23 of this Article:

a. Operator shall prepare and present to the operating committee for contingent approval the overall upstream development program and budget.
b. Contractor and NOC shall each obtain contingent financing for their respective shares of such upstream development.

c. The Downstream Entity shall assume responsibility for preparing (including design work required for refined cost estimates) and obtaining contingent approval by all concerned of the downstream development plan, work program, and budget.

d. The Downstream Entity shall obtain contingent financing of such downstream development.

e. The Downstream Entity shall complete negotiations and execute contingent consumer sales agreements with the major consumers for natural gas from the contract area. Operator shall proceed with engineering and design required for refined cost estimates for the upstream facilities and field development and shall prepare and present to the operating committee for contingent approval a complete field development plan, work program, and budget. Costs involved in this step by Operator shall be treated as development costs.

f. Contractor and NOC, as producers, shall complete negotiation and execute with the Downstream Entity a contingent producer gas sales agreement.

23. Commercial Discovery Decision

Immediately following accomplishment of the six predevelopment arrangements, Contractor and NOC shall determine by unanimous agreement whether or not the discovery is a “commercial discovery.” In the event Contractor, but not NOC, considers the discovery a “commercial discovery,” Contractor shall have the right to carry out the field development of such discovery at its sole risk and cost and receive 100 percent of all cost recovery and profit petroleum therefrom under this agreement.

In the event the joint decision is affirmative or Contractor elects to carry out the field development of the discovery at its sole risk and cost, the contingency on the six predevelopment arrangements shall be deemed satisfied, each such approval, commitment, or agreement shall become effective, and the Operator and the Downstream Entity shall implement their respective parts of the project in such a manner that both the upstream and downstream sides of the development shall be completed as closely as possible at the same time. The Gas Development Committee shall coordinate the parallel development work.

24. Disagreement on “Commercial Discovery”

If NOC, but not Contractor, considers the discovery a “commercial discovery,” NOC shall have the right to request the Contractor to surrender its rights in the discovery area to NOC for NOC to develop such area.
25. Liquid Hydrocarbons Extracted From Gas

Liquids obtained from gas in consumer field separators shall be treated as crude oil for purposes of this agreement. Liquids extracted from such gas by further processing (i.e., hydrocarbon liquid recovery) shall be treated as natural gas. Where both crude oil and natural gas are produced from the same field, the entire production from that field shall be considered for purposes of cost recovery and sharing of profit petroleum as crude oil where at least 50 percent of aggregate production in the calendar year from that field, on a calorific equivalent basis, is natural gas.

26. Limitations on Gas Flaring

In the course of operations hereunder, flaring of natural gas, except short-term flaring necessary for testing or other operational reasons, is prohibited except upon previous authorization of the ministry following a request by the operating committee. Such request shall include an evaluation of alternatives to flaring that have been considered along with information on the amount and quality of gases involved and the duration of the requested flaring.
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