

Report No. 52865-VN

Vietnam Gas Sector Development Framework

Final Report

January 2010



Document of the World Bank

Energy Sector Management Assistance Program (ESMAP) reports are published to communicate the results of ESMAP's work to the development community with the least possible delay. Some sources cited in this paper may be informal documents that are not readily available.

The findings, interpretations, and conclusions expressed in this report are entirely those of the author(s) and should not be attributed in any manner to the World Bank, or its affiliated organizations, or to members of its board of executive directors for the countries they represent, or to ESMAP. The World Bank and ESMAP do not guarantee the accuracy of the data included in this publication and accepts no responsibility whatsoever for any consequence of their use. The boundaries, colors, denominations, other information shown on any map in this volume do not imply on the part of the World Bank Group any judgment on the legal status of any territory or the endorsement of acceptance of such boundaries.

Contents

List of Acronyms and Abbreviations.....	ix
Preface	xi
Acknowledgements.....	xii
Summary	xiii
1. Background	1
1.1 The National Strategy on Energy Development as the Broad Policy Guideline for this Report.....	1
1.2 Status of the Sector.....	2
1.3 Issues and Challenges for the Gas Sector	4
1.4 Implications	9
1.5 Alternative Approaches to Gas Sector Development.....	11
1.6 The Policy Case for Gas Development	12
2. Developing a Framework for Gas Sector and Policy Development Decision- Taking	14
2.1 A Vision for Vietnam’s gas industry.....	14
3. The Gas Sector in the Context of National Energy Planning	18
3.1 The Policy Basis for Sound National Energy Planning	19
3.2 Economic principles that should underpin sound sector planning.....	19
3.3 An economic approach to energy security	22
3.4 Organizing for Gas Sector Planning within Country Energy Planning	23
3.5 The Operation of the Governing Institutions	26
3.6 A Petroleum Directorate.....	27
3.7 Is there a Need to Consider Fundamental Institutional Change at the Policy Making and Implementation Level?	29
3.8 Planning and Coordination of Activities within the Institution	30
3.9 The first step: correctly identify the main activities of gas sector planning, and then decide how and with what institutional support they are to be carried out.	30
3.10 The second step: use the Institution to address specific issues identified by World Bank consultants in previous work	34
3.11 The third step: use the Institution to achieve a structured approach to sector decision-taking that will be robust over time:	39

3.12 The place of better planning and decision-taking in achieving GoV goals for the gas sector.....	43
3.13 Pros and Cons of what is proposed	43
4. Pricing Methodology for Natural Gas	45
4.1 A generic gas pricing methodology is a policy priority	45
4.2 Principles for a Generic Gas Pricing Methodology for Vietnam	47
4.3 Recommended methodology for Vietnam: ‘competitive pricing’	49
4.4 Calculating the ‘competitive price’ of gas	58
4.5 How competitive gas pricing can lead to efficient development of Vietnam’s resources	59
4.6 Implementing the Competitive Gas Pricing Methodology in Vietnam	60
4.7 Giving policy and administrative form to “competitive pricing” of natural gas	64
4.8 The Trade-off between Gas Pricing Policy and Upstream Fiscal Terms	66
4.9 Options for Distributing “Rents” along the Gas Chain.....	68
4.10 Recommendations and Anticipated Benefits	71
5. Development of Gas Market Options.....	74
5.1 The need for a competitive gas market.....	74
5.2 What a competitive gas market requires.....	77
5.3 Recommended evolution to a Wholesale Competitive Gas Market: Preparatory (1), Interim (2), and Final (3) Phases	80
5.4 Policy alternatives to what is proposed.....	84
5.5 Transitioning from Phase 1, the current state, to Phase 2, the Interim Model.....	85
5.6 Transition from Phase 2, the Interim Model to Phase 3, the WCGM.....	86
5.7 Implementing the gas market design	89
5.8 Regulatory methodologies for the coordinated development and operation of the gas and power markets in Vietnam.....	93
5.9 Recommendations and Anticipated Benefits	94
6. The Implementation Road Map for the Gas Sector	96
6.1 Key conclusions about what can be achieved	96
6.2 Vietnam’s gas sector in each phase of the road map.....	97
6.3 Detailed implementation phasing.....	101
6.4 Immediate priorities (through the next 12 months).....	102
6.5 Near-term priorities (through 2010/2011)	103

6.6 Long-term priorities (dependent on development of incremental gas supply which may include LNG and pipeline imports)	106
6.7 Implementation risks for improved gas sector management and planning	108

Tables:

Table 0.1: Relating the National Strategy for Energy Development (NSED) & the Recommendations of this Report	xxiv
Table 1.1 Share of Natural Gas in Total Primary Energy Supply – 2008	3
Table 1.2 Alternative Forecasts of Gas Production	4
Table 3.1 Shadow Prices of Fuels for Power Generation	21
Table 3.2: Mapping of Gas Sector in Vietnam Current Status of Functional State Management Organization.....	25
Table 4.1 A Competitive Gas Price: Heating Value vs. Shadow Pricing	63
Table 6.1. Potential Timing of the Recommended Implementation Roadmap for Vietnam’s Gas Sector	102

Boxes:

Box 1.1: About Reserves Classification.....	6
Box 1.2: What is the “Gas Chain”?	8
Box 1.3 Why and How to Regulate Natural Monopolies	10
Box 1.4: The Cost of Project Delays.....	11
Box 2.1: Creation of a “Trunk Pipeline” in Alberta, Canada.....	15
Box 2.2: The Geography of the Vision for Vietnam’s Gas Industry in 2025	17
Box 3.1 : Accounting for Externalities.....	20
Box 3.2: The United States’ Strategic Petroleum Reserve (SPR).....	23
Box 3.3. Why and How to Regulate the Upstream Petroleum Industry	28
Box 3.4: Building Blocks of Goals and Structures for Gas Sector Planning	33
Box 3.5 Recommended Option for Institutional Structure	34
Box 3.6: Salient Elements of a Mid- and Down-stream Gas Regulatory Regime	36
Box 3.7: Integrated Analysis of Natural Gas Issues: An Example from the USA	40
Box 3.8: How the Gas/Power Coordinating Function Could be Exercised Inputs, drawn from, respectively, ERAV and the Petroleum Management and Regulation Unit	41
Box 4.1 Basics of the Vietnam Coal Industry	54

Box 4.2 Are International Coal Prices Sufficiently Transparent for Use in a Competitive Gas Pricing Methodology?	55
Box 4.3 Implementing competitive gas pricing in Canada 1975-85	60
Box 4.3: How Talisman Energy Publicly Addresses High CO2 Gas Issues.....	67
Box 4.4 What is economic rent?	69
Box 4.5: Fiscal Adjustments to make Gas Projects Economic	70
Box 5.1: Power Market Terms and Implementation	76
Box 5.2: Why and How to Regulate Gas Markets	79
Box 5.3: Economic Regulation to Address Monopoly and Provide Transparency ..	89
Box 5.4: Defining and Measuring “Workable Competition”	92

Figures:

Figure 1.1 Progress in Gas Development.....	3
Figure 4.1 A Gas Pricing Methodology for Vietnam Linked to the Power Generation Market	48
Figure 4.2 Under Competitive Pricing, the Wellhead Price is derived from the Value of Gas in Power Generation.....	50
Figure 4.3 Formation of a Competitive Gas Price	56
Figure 4.4 Calculating the Competitive Price of Gas – Simplified Demonstration..	59
Figure 4.6 Rents are best concentrated upstream to compensate for exploration risk	71
Figure 5.1. Current situation of Gas ‘Single-Buyer’ Market Design in Vietnam	77
Figure 5.2 Phase 2: ‘Single-buyer’ with competitive pricing & regulated T&D	82
Figure 5.3: Phase 3 – The Wholesale Competitive Gas Market	83
Figure 6.1. Recommended Roadmap for Implementation over 10-15 Years	100
Figure A5.1. How countries have managed reserves & production.....	149
Figure A5.2 Bangladesh: Reserves and R/P Ratio.....	150
Figure A5.3 Canada: Reserves and R/P Ratio.....	153
Figure A5.4 Malaysia: Reserves and R/P Ratio	156
Figure A5.5 Pakistan: Reserves and R/P Ratio	159
Figure A5.6 Thailand: Reserves and R/P Ratio	164

ANNEXES:

Annex 1 Energy Security for Vietnam	114
---	-----

Annex 2 A “Petroleum Directorate” for Vietnam.....	120
Attachment 1 to Annex 2	130
Attachment 2 to Annex 2	131
Attachment 3 to Annex 2	132
Attachment 4 to Annex 2	133
Annex 3 Is there a role for the National Oil Company (NOC) in the Gas Sector	134
Annex 4 Liquefied Natural Gas (LNG) Issues	138
Annex 5 International Experience of Gas Sector Development	146

LIST OF ACRONYMS AND ABBREVIATIONS

ADB	Asian Development Bank
AGTL	Alberta Gas Trunk Line (Alberta, Canada)
ASEAN	Association of Southeast Asian Nations
BCM	Billion cubic meters
BG	British Gas
BOO	Build, own, operate
BOT	Build, operate, transfer
c.i.f.	Cost, insurance and freight (the delivered cost)
CCGT	Combined Cycle Gas Turbine
C/B	Cost/benefit analysis
CDM	Clean Development Mechanism
CEO	Chief Executive Officer
CER	Certified Emission Reduction Credits (an aspect of the CDM)
CERM	Coordinated Emergency Response Measures (of the IEA)
CGM	Competitive (Power) Generation Market
CNG	Compressed natural gas
CNLOPB	Canada-Newfoundland Offshore Petroleum Board
CNOOC	China National Offshore Oil Company
CNPC	China National Petroleum Corporation
CNSOPB	Canada-Nova Scotia Offshore Petroleum Board
DECC	Department of Energy and Climate Change (UK)
EOSS	Emergency Oil Sharing Scheme (of the IEA)
EPB	Energy Planning Board
ERAV	Electricity Regulatory Authority of Vietnam
ERCB	Energy Resources Conservation Board (Alberta, Canada)
ESMAP	Energy Sector Management Assistance Program administered by the World Bank
EUB	Energy and Utilities Board (Alberta, Canada)
EVN	Electricity of Vietnam
FERC	Federal Energy Regulatory Commission (USA)
FMP	Full Market Price
GECF	Gas Exporting Countries Forum
GHG	Greenhouse Gases
GMP	Gas Master Plan
GoV	Government of Vietnam
HHI	Herfindahl-Hirschman Index
IEA	International Energy Agency
IOC	International Oil Company
IPP	Independent Power Producer
IT	Information Technology
JCC	Japan Crude Cocktail

JSC	Joint Stock Company
JV	Joint Ventures
JVC	Joint Venture Company (with PetroVietnam)
LNG	Liquefied natural gas
LPG	Liquefied petroleum gas
MFO	Medium Fuel Oil
MMBTU	Million British Thermal Units
MMS	Minerals Management Service (USA)
Ministry	Ministry of Industry and Trade
MSBM	Modified Single Buyer Model
MTOE	Million tons oil equivalent
NEB	National Energy Board (Canada)
NGMP	National Gas Master Plan
NGV	Natural gas vehicle
NOC	National Oil Company
NPD	Norwegian Petroleum Directorate
NPV	Net Present Value
NSED	National Strategy for Energy Development
O&GG	Oil and Gas Group (of the UK Department of Energy)
O&M	Operations and maintenance costs are an element in utility costs of service
OPEC	Organization of Petroleum Exporting Countries
PD	Petroleum Directorate
PMDP	Power Master Development Plan
PM3	An oil and gas development offshore of Vietnam and Malaysia that is jointly administered with half of the gas flowing to each country
PPIAF	Public-Private Infrastructure Advisory Facility of the World Bank
PREPA	Puerto Rico Electric Power Authority (USA)
PSA	Production Sharing Agreement
PSC	Production Sharing Contract
PTT	The Petroleum Authority of Thailand (an NOC)
PVG	PetroVietnam Oil and Gas Group
PVN	PetroVietnam
RCM	Retail Competitive Market (for power)
S/D	Supply/demand
SMP	System Marginal Price
SPR	(United States') Strategic Petroleum Reserve
T&D	Transmission and Distribution (of gas)
TAGPL	Trans-ASEAN Gas Pipeline
UK	United Kingdom
VPI	Vietnam Petroleum Institute
WB	World Bank
WCGM	Wholesale Competitive Gas Market
WCM	Wholesale Competitive (Power) Market
WTO	World Trade Organization

PREFACE

This Report was prepared at the request of the Energy Department of the Ministry of Industry and Trade (the Ministry). It is intended to serve both as an input to the National Gas Master Plan being undertaken for the Ministry in 2008/2009 by the Vietnam Petroleum Institute and as a set of concrete proposals and options for Vietnam to utilize.

World Bank work previously carried out at the request of the Government of Vietnam (GoV) identified the need for “a broad qualitative framework for gas sector and policy development decisions”. Key elements of the framework included: gas market design; market management; sector planning; allocation/utilization decision-making; and gas pricing principles. That previous work has therefore led to this ESMAP and Petroleum Governance Initiative (Norwegian Trust Fund)-funded project “Gas Sector Development Framework”.

The client and lead agency for this work is the Ministry of Industry and Trade (the Ministry). A *de facto* working group comprising officials of the Ministry, the Vietnam Petroleum Institute (VPI) and the World Bank team ensured that work proceeded as planned and that there was close and continuous liaison with the client, particularly in relation to the work being carried out in parallel on the National Gas Master Plan (NGMP). There has also been valuable informal liaison with various companies in the PetroVietnam Group.

This work was carried out as follows:

- January 2009: First Mission to Hanoi—review content of the proposed Report with counterparts in bilateral discussions and also at a Training Workshop;
- February 2009: lead consultant visit to Hanoi to liaise particularly with the VPI to provide inputs to the NGMP based on international experience;
- March 2009: submit the Report first draft to World Bank (WB) team;
- April 2009: Second Mission to Hanoi--discuss “pre-workshop” Draft Report with Ministry counterparts; present Draft Report at Consultation Workshop with Ministry-nominated participants from across the GoV, April 9;
- April-May: prepare Draft Final Report based on feedback from the Workshop and from the World Bank team
- May 2009: Provide Draft Final Report to counterparts
- June 2009: Third Mission to Hanoi—discuss and agree elements of Draft Final Report that are to be included in the NGMP; make Executive Presentation at Round Table based on Draft Final Report; agree steps to Report finalization and eventual publication
- July 2009: submit Draft Final Report, third draft, to WB team
- August 2009: Peer Review of Draft Final Report, editing and completion
- September 2009: Submit Final Report to counterparts for final review
- January 2010 Publication of Final Report

ACKNOWLEDGEMENTS

The authors would like to acknowledge the help and support provided on this assignment by leaders and members of the Energy Department of the Ministry of Industry and Trade of Vietnam, especially Mr. Ta Van Huong, Director General, Mr. Nguyen Xuan Dinh, Deputy Director and Ms. Ngo Thi Hoan Hao. The Vietnam Petroleum Institute, as the key counterpart provided support and assistance throughout the assignment, under the leadership of Ms. Tran Thi Lien Phuong. In addition the team would like to thank all those too numerous to name in Vietnam and in the World Bank Group for their support, advice and guidance throughout the preparation of this report.

The financial and technical support by the Energy Sector Management Assistance Program (ESMAP) is gratefully acknowledged. ESMAP—a global knowledge and technical assistance partnership administered by the World Bank and sponsored by official bilateral donors—assists low- and middle-income countries, its “clients,” to provide modern energy services for poverty reduction and environmentally sustainable economic development. ESMAP is governed and funded by a Consultative Group (CG) comprising official bilateral donors and multilateral institutions, representing Australia, Austria, Canada, Denmark, Finland, France, Germany, Iceland, the Netherlands, Norway, Sweden, the United Kingdom, and the World Bank Group.

SUMMARY

Vietnam’s gas sector is at a critical point. Vietnam’s gas industry—from the producing field to the end-user—is already a vital component of the nation’s energy economy and has the potential for major growth. Successes in the past decade have created a strong prospective demand for gas. However, Vietnam has begun to experience gas shortages. If the gas sector is to meet the rising demand for gas, there are challenges that must be addressed promptly. If certain key decisions are not made soon, these gas shortages can be expected to worsen with potentially serious economic impacts.

Significant progress has been made in the past 15 years. Large-scale gas development based on offshore resources began in 1995 in Vietnam with the production of associated gas from the Bach Ho oilfields. This was followed in 2003 when gas from the Nam Con Son basin gas fields started to come on-stream, then from Block 11-2 in 2006. In 2007 came the first deliveries of gas from the PM-3 development in the offshore area jointly administered with Malaysia. Gas production and consumption has soared in its first decade, with volumes growing seven-fold between 1995 and 2005. Gas volumes are now in the region of 7+ billion cubic meters (BCM) annually. The “gas to power” linkage has been critical for the development of Vietnam’s gas sector (and vice-versa) and will be essential for its continued development.

The Bach Ho and Nam Can Son developments feed the Phu My power complex at over 4 BCM annually and the PM-3 development in the Malay-Tho Chu Basin feeds the power and fertilizer plants at Ca Mau at 1.5 BCM/yr. A third gas to power project is presently under negotiation (Block B&52 to O Mon, eventually at least 3.3 BCM/yr.) and gas currently accounts for about one-third of Vietnam’s total annual generation. Gas for industrial use is less than 1 BCM per annum, consumed mainly in two fertilizer plants and by ceramics and metal-working industries in the HCMC area. There is virtually no general commercial and residential consumption of piped gas. Gas now accounts for about 15% of Vietnam’s primary energy supply.

Vietnam has ambitious plans for gas sector development till 2025. Power sector planning scenarios (such as in the Power Master Development Plan 6) as well as the draft National Gas Master Plan envisage gas use for generation in Southern Vietnam to rise dramatically from some 8 BCM in 2010 to 13/15 BCM in 2015 and 21/24 BCM in 2025. This represents an approximate tripling of demand in 15 years focused predominantly on power generation (assuming, of course, that gas supply is able to keep up with demand). Vietnam also sees non-power uses of gas to be an important element of gas sector development in the coming years.

But continued progress cannot come from business as usual. The size of *proven* (1P) reserves is limited. Studies carried out for the GoV in 2008 suggest that only the current annual supply of about 7 BCM is assured from “proven plus probable” (2P) reserves. To achieve annual production of some 25 BCM about the year 2025 would seemingly mean that the “proven plus probable plus possible” (3P) reserves must by then be moved into the “proven” category by means of further successful exploration and development. The

consensus appears to be that much of Vietnam's offshore is gas-prone and that the best prospects are to the southeast and southwest of the Mekong Delta. There is a problem of contaminants, particularly CO₂, in the raw gas. In the potential gas producing areas in the shelf off northern and central Vietnam, where the possible gas accumulations may be smaller than those so far developed in the south, concentrations of CO₂ appear to be higher.

Physical segmentation of the sector into a series of “bilateral” gas-supply and power-market projects prevents the creation of a functioning market; and tends to encourage continuance of the project by project approach if there is no overarching sector vision. There is no “generic approach” to gas development projects. Instead, each is the subject of separate negotiations on virtually all aspects, including pricing. This process has resulted in discouragingly long lead times for some projects. Existing gas pricing appears to be driven to the extent possible by a perceived need to achieve low electricity prices and to confer subsidies on gas consumption in the fertilizer sector. Low gas prices for power generation tends to discourage investment in gas exploration and development and therefore work against some high level objectives for the sector such as rapid growth and diversification of fuel sources for power generation. On the institutional and policy front, the sector is currently dominated by Vietnam's national oil company which is common at such an early stage of gas sector development. The Vietnam Oil and Gas Group (PetroVietnam or PVN) is currently the operator of four blocks and the joint operator of nine more blocks in Vietnam. It is active in more than a dozen overseas countries. In the mid- and downstream links of the Vietnam gas chain, PVN is dominant in processing, transmission and is becoming important in electricity generation.

To achieve its stated objectives for developing national gas resources, Vietnam must seek to create a “moving train” of projects that will convert gas resources into proven reserves and production. It must also stimulate investment in the development of the requisite pipeline infrastructure as well as incentivize investment in gas consuming loads downstream such as power plants. And this will require gas pricing in consuming sectors (particularly the electricity sector) to be appropriately linked with gas pricing in the upstream gas exploration and production sector. Much remains to be done if Vietnam is to realize the potential it sees in its gas resources. This report proposes a vision, a sector framework and the sketch of a coordinated implementation roadmap for this development.

A proposed vision for gas sector development in Vietnam is presented in figure 0.1 arranged in relation to components of the gas sector structure (development; pricing; commercial relationships; management; and infrastructure) and showing how changes are to occur as the recommended transition takes place from the current situation (Phase 1) to an interim phase (Phase 2) in the medium term to a wholesale competitive gas market (Phase 3) in the long term.

Supply: The following is a supply scenario which has a basis in the experience of the first decade of Vietnam's gas development. This is the scenario supported by this report's recommendations: a succession of projects come into the “commercial development pipeline”, ideally at a rate of one every two years (this is not of course predictable) for a total of 6-8 significant new offshore field developments by 2025. Smaller fields come in

tributary to major developments (including the existing ones) as the industry applies a second phase of exploration to the previously-explored blocks. This provides in total an annual supply of about 25 BCM by 2025. At least one of those new developments is adjacent to Northern Vietnam energy markets. In the event that exploration success in the period through 2015 is disappointing, gas imports are developed to contribute, say, 7-8 BCM to national supply by 2025.

Demand: Under this vision, up to 90% of that 25 BCM supply in 2025 is consumed in power generation, perhaps 2-3 BCM in other industrial and transportation uses, including the portion of the market supplied by CNG. Efforts are made to increase the portion in non-power uses which can accept higher gas prices than the electricity sector where there is likely to be strong competition in the very long term from nuclear and renewable energy forms.

“Matching” Supply with Demand: After an interim phase involving competitive pricing with the current “single buyer model”, market mechanisms are allowed and encouraged under this vision. As a result, towards the year 2025, within broad parameters set by government, sellers and buyers of gas are able to make their own commercial arrangements. Therefore, instead of the bilateral gas-supplier/power-buyer contracts that have occurred in the early stages of Vietnam’s gas development, the sector is characterized by a wide variety of freely negotiated arrangements. In other words, there is a wholesale competitive gas market (WCGM) which is to a significant degree shaped and encouraged by the application of power market reforms. The detail of those arrangements cannot be anticipated at this stage but they could include, multiple sellers and buyers and the sellers could include value-adding market intermediaries as well as primary producers of gas.

Infrastructure: In the south, new production feeds into, and new consumption draws from, a “national trunk pipeline” that also connects the O Mon, Ca Mau and Phu My consumption centers to improve security of supply of each.

Institutional: Under this vision, PVN increasingly focuses more on its oil and gas business and the Ministry of Industry & Trade increasingly focuses more on the policy, regulatory, and supervisory aspects of the sector to that extent that, eventually, PVN does not retain any regulatory role in the up-, mid- or down-stream. Instead, the upstream is regulated by a newly created Petroleum Directorate. The mid- and down-stream is subject to either a Gas Regulatory Authority (or, possibly, an Energy Regulatory Authority depending on broader developments in Vietnam’s energy sector), appropriately mandated and resourced, which is responsible for modern regulation of rates and access terms for all T&D systems. All policymaking and advisory functions are clearly concentrated in the Ministry which has strengthened policy and analytical capability.

Pricing: Competitive pricing is instituted in the medium term to allow gas to compete with coal in the main market for gas—power generation. As workable competition appears, negotiated pricing is gradually instituted. Gas prices for new fertilizer plants and for industrial, commercial, residential and transportation uses are also freely negotiated. The state provides overt, targeted subsidies to address any special social and economic needs.

Figure 0.1. Recommended Roadmap for Implementation over 10-15 Years

	Sector Development	Pricing
<u>TODAY</u> Current Vietnam Gas Sector	<i>Supply:</i> Four gas fields in production—Bach Ho in 1995, Nam Con Son in 2002, Block 11-2 in 2006, PM3 in 2007—for power (mainly) and fertilizer; <i>Demand:</i> PVN signs back to back gas purchase and sale agreements	<i>Upstream:</i> wellhead prices are negotiated on a project-by-project basis by PVN using cost-plus <i>T&D:</i> tariffs approved by GoV at project stage <i>End-users:</i> gas sales prices are negotiated between PVN and each consumer
<u>INTERIM PHASE:</u> Single-Buyer with competitive pricing	<i>Supply:</i> successive waves of exploration in Vietnam gas basins; one commercially viable gas supply project every 2 years; 6-8 new projects by 2020 <i>Demand:</i> PVN in value-adding role, e.g. guarantees gas purchase	<i>Upstream:</i> competitive pricing established in <i>T&D:</i> tariffs approved by regulator <i>End-users:</i> gas sales prices are negotiated between PVN and each consumer
<u>PROPOSED LONG TERM FRAMEWORK:</u> Wholesale Competitive Gas Market	<i>Supply:</i> Multiple sources; successive waves of exploration in Vietnam gas basins; possible pipeline gas and LNG imports <i>Demand:</i> Gas suppliers sign contracts with multiple market participants	<i>Upstream:</i> Initially, competitive pricing applies; ultimately, prices are freely negotiated in environment of workable competition <i>T&D:</i> tariffs are regulated by downstream regulator <i>End-users:</i> Suppliers negotiate prices with buyers

	Contractual Relationships	Sector management	Infrastructure
<u>TODAY</u> Current Vietnam Gas Sector	<i>Upstream:</i> PVN is GoV equity holder in PSCs <i>Downstream:</i> PVN signs all GSAs with consumers	PVN conducts day-to-day gas sector management on behalf of GoV, invests in gas pipelines, negotiates all PSCs with E&P companies, monitors contracts	Whole system not inter-connected; no uniform gas quality
<u>INTERIM PHASE:</u> Single-Buyer with competitive pricing	<i>Upstream:</i> PVN is GoV equity holder in PSCs <i>Downstream:</i> PVN signs all GSAs with consumers	MOIT develops sector management capacity; MOIT develops monitoring and regulatory capacity; PVN signs PSCs	Additional gas transport infrastructure created by PVN + new public & private investors Gradual standardization of gas quality
<u>PROPOSED LONG TERM FRAMEWORK:</u> Wholesale Competitive Gas Market	PVN is GoV equity holder in PSCs <i>Upstream:</i> freely negotiated contracts between parties based on GoV policy guidelines (i.e. without direct government intervention in negotiations)	MOIT signs PSCs; PVN is a major player among many; MOIT monitors & regulates; sector structure is stable; GoV interventions are rare	Trunk pipeline available as backbone with producers & importers feeding into it, consumers drawing from it; uniform gas quality

The implementation of this vision requires a coherent gas sector framework under the NSED comprising an institutional structure for sector management, a gas pricing methodology, and a gas market design coordinated into a coherent implementation roadmap. This three-pronged framework and implementation roadmap is the main

substance of this report. As noted, the gas-to-power linkage is key to the development of the gas sector and it is therefore central to this Report.

Since December 2007, the country is equipped with an impressively comprehensive National Strategy for Energy Development (NSED or the National Strategy). The document commends competitive market solutions, opposes monopoly and subsidized prices, encourages sector investment including foreign-sourced investment, and confirms the central role of the Ministry for managing and directing the nation's strategy on energy development. The National Strategy, together with the January 2006 Prime Minister's decision on the Conditions to Establish and Develop the Power Market, is clearly the essential background and guide to sound gas sector planning and development.

Any analysis must however recognize that Vietnam is at an early stage of gas development particularly in relation to exploration of its geological potential. Greater certainty about domestic supply prospects would contribute valuably to policy decision-taking particularly about gas imports, whether by pipeline or in liquefied form.

The National Strategy commends competitive market solutions, opposes monopolies and subsidies, seeks to encourage sector investment and confirms the central role of the Ministry. Based on this clear policy direction, this Report recommends market economic principles that will achieve optimal resource allocation outcomes, increase efficiency and competitiveness while at the same time proposing to take account of environmental and other externalities in decision-taking.

The proposed institutional structure for the gas sector

This Report finds there is no need for fundamental institutional change because the Ministry's recently-conferred energy policy and implementation mandate is comprehensive and is central within government. The state management function can however be improved through the addition of an upstream gas regulator and the institutional structure presented in Box 0.1.

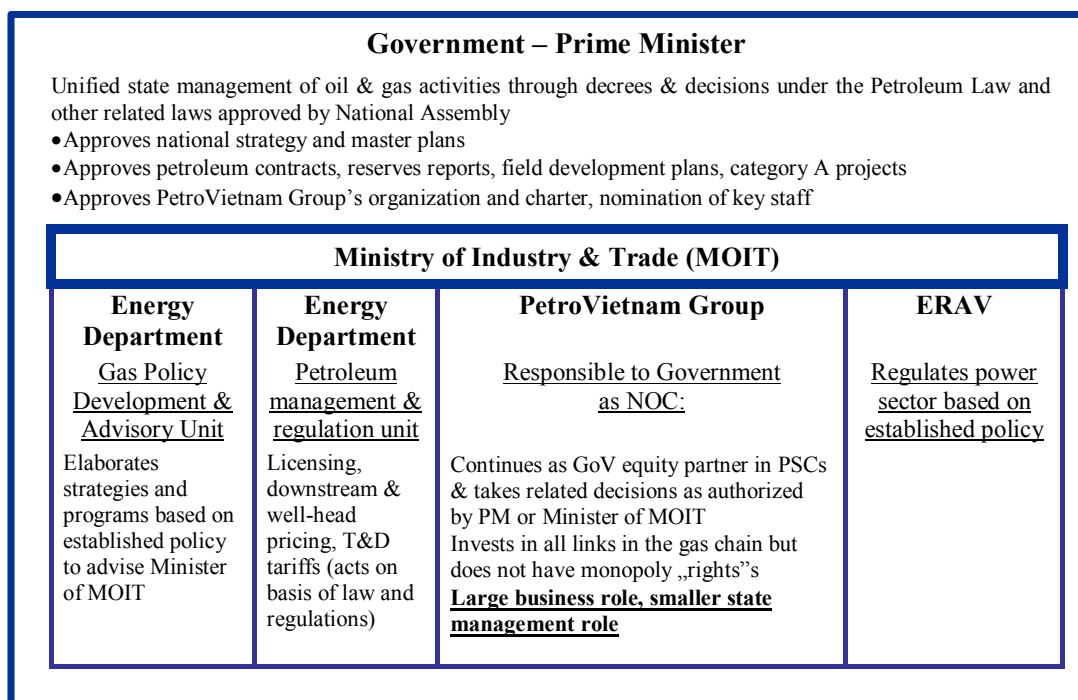
This report calls for a separate Petroleum Directorate (PD) as the upstream gas regulator. The creation of a Petroleum Directorate as the upstream regulator would bring Vietnam's practice into line with that of the leading market-oriented petroleum producing countries. Normally, the Petroleum Directorate would be located as part of the existing Energy Department of MOIT, but consideration should be given to placing it in the Prime Minister's office which would reflect the political importance of some of the Petroleum Directorate's activities and could lead to more speedy decision-taking than if it were situated in the Ministry.

This report also recommends that, first, existing human resources in the Ministry—strengthened where necessary—be organizationally matched to these activities in terms of a Gas Policy Development and Advisory Unit and a Petroleum Management and Regulation Unit—and, second, that those existing, probably-strengthened resources, then be used to address each of the policies, programs, strategies and tactics (and some of them will be new) that are needed to achieve the government's gas sector objectives, identifying and eliminating weaknesses and inconsistencies and bringing to decision-

takers changes in laws, regulations, programs and practices that are needed to reach these objectives.

A first impression is that the Ministry may not presently have the personnel, skills and other resources to properly carry out the additional functions and responsibilities envisaged in this Report. Early, critical attention therefore needs to be given to the question of the quantity, quality, training and resourcing of the Ministry's staff support in this very important area of energy planning. This "capacity building" must be a focus in the next stage of development of Vietnam's gas framework.

Box 0.1 Recommended Option for Institutional Structure



Finally, the Ministry could achieve a more structured approach to sector decision-taking that will be robust over time by introducing a system of "indicative planning" that will provide a biennially updated reference for policymakers, gas developers and for investors in gas-consuming sectors.

The proposed pricing methodology for natural gas

The creation and implementation of a gas pricing methodology would have an early, positive effect on investment and activity in the sector. It is therefore recommended as the first priority for change in state management of this industry.

The National Strategy speaks of energy prices being determined by market mechanisms. The absence of such an approach seriously handicaps Vietnam's gas development by leaving new producers and consumers without guidance for price estimation. Introduction

of a generic gas pricing methodology can achieve some of the benefits of market competition even before the long term goal of a functioning gas market can be achieved.

A gas pricing methodology for Vietnam must serve twin objectives: upstream in the gas chain, a gas pricing methodology, together with the flexible application of the fiscal regime, must provide appropriate financial incentives for investment in exploration and development of gas. At the consuming end of the gas chain, the methodology must give the right signals to investors to choose gas where it is competitive with alternative sources.

In Vietnam, the only market that provides sufficient volume to anchor large new gas projects is power generation. Pricing must therefore ensure that gas is competitive in that sector. And the only pricing methodology that appropriately ensures this outcome is one that links gas with its competing alternative fuel in incremental base load power generation: internationally-priced coal.

Therefore, it is proposed that Vietnam's gas should be competitively priced against coal for power generation. The competitive price of gas in Vietnam's power sector is defined as that at which a generator invests in a combined-cycle gas turbine plant rather than in a modern steam plant burning internationally-priced coal. As to the choice of internationally-priced coal, it is not credible in a 20-year time horizon to expect domestic coal to continue to be priced below its import or export opportunity cost. And if gas is priced to be competitive with internationally-priced coal in this, the largest bulk energy market, it will be fully competitive with coal, fuel oils and LPG in industrial and commercial gas distribution markets.

This linkage to coal will allow Vietnam to develop its gas and coal resources in an economically efficient manner. If a gas field can be profitably developed at the competitive price, it will be economically superior to the development of an alternative coal source, domestic or imported. Conversely, if the gas field cannot be developed at that price even after flexibly applying upstream fiscal terms, the competing coal field or indeed other energy sources should be selected. Implementation of competitive pricing under the single buyer model of market design involves: defining a price or price-range, taking account of heating value and other considerations; deducting from that price or price range the regulated costs of transmission and, if applicable, distribution; setting the values of gas at the outlet of the gas processing plant; and appropriately indexing the resulting prices in relation mainly to the price of imported coal.

Further refinement of competitive gas pricing in the approach to the Wholesale Competitive Gas Market (WCGM) could involve the concept of price floors to protect the producer and ceilings to safeguard consumers from extreme price volatility. However, when a condition of "workable competition" is found to exist, the competitive pricing methodology would give way to prices freely negotiated between sellers and buyers.

There may be two options to give effect to competitive gas pricing:

1. Competitive pricing could be stated as a condition for the sale of gas under Production Sharing Contracts (PSCs) where sale arrangements had not yet been made. To avoid disputes about the application of such a provision, the calculation

of the competitive price could be made by an internationally recognized third party having no commercial interest in the outcome.

2. Alternatively, the actual competitive price could be calculated by the Ministry or by the internationally recognized third party and inserted in the PSCs prior to any sale arrangements being made. This option would give greater certainty to investors in gas exploration and development, to the government and to other stakeholders such as potential gas users.

In both cases, consideration needs to be given to such matters as: indexation; the effective date(s); and price floors and ceilings.

Circumstances may arise in which it is appropriate to adjust upstream gas fiscal terms, such as the proportion or amount of “profit gas” and “cost recovery gas”, in order to make a gas development project commercially feasible at a particular competitive price level. They include cases where gas would have to be produced under exceptional cost conditions such as unusual water depth or the presence of a high proportion of inert gases.

The recommended competitive pricing methodology will tend to concentrate “rents” where they properly belong, namely at the upstream end of the gas chain. There, they can be shared between the resource owner (the State) and the developer. There is no economic case for allowing gas consumers to capture rents through below-market pricing or for the owners of transmission and distribution systems to achieve more than a fair return on and of the capital they have invested.

The competitive gas pricing methodology will provide predictability for producers and consumers and will encourage upstream investment. It will correctly signal which domestic gas and coal resources can be developed to meet the country’s needs, which should be left in the ground pending a change in market conditions and to what extent imported coal should be used in circumstances where domestic gas is also be available.

The proposed evolution of gas market design – There is no functioning gas market in Vietnam today—mainly bi-lateral gas-to-power and gas-to-fertilizer projects independent of each other. Agreement on and implementation of a design for Vietnam’s gas market is a vital long-term project. It is the second policy priority for state management of this sector.

The National Strategy calls for “a sound competitive energy market”. Market solutions have been successfully applied in the oil products and LPG sectors. They are being progressively implemented in the power sector. Their absence in the gas sector may be slowing investment in this part of Vietnam’s energy economy. And a market-based gas sector would coordinate well with Vietnam’s power sector which is already undergoing market-based reform.

As to the conditions for ultimately creating such a market, multiple gas sellers must be able to interact with multiple buyers—gas distributors and large consumers—transacting gas of uniform quality over pipeline networks that are subject to third party access and modern rate regulation. This is therefore a long term project. It relates to incremental gas

supplies: existing contractual arrangements should be left in place unless there is a unanimous desire to change them.

The Report recommends a three-phase evolution of Vietnam's gas market to realize this project:

- **Phase 1:** *The preparatory phase* in which the Ministry's analytical and operational capabilities are improved, further work is done in areas such as the competitive pricing methodology and rate regulation and approvals are obtained from the policymakers (Phase 1 is implemented within the sector framework of TODAY summarized in Figure 0.1).
- **Phase 2:** *The interim phase*, starting when new gas supplies become available, which continues the present "single buyer" model (PetroVietnam would be that single buyer), but with the addition of the competitive pricing methodology and with modern regulation of the rates and conditions of service of transmission and distribution businesses (Phase 2 of market development takes place within the INTERIM sector framework described in Figure 0.1); and
- **Phase 3:** *The final phase*, the creation of a WCGM for the bulk supply of gas by multiple sellers to power generators, other industrial consumers and to distribution companies. Phase 3 is the "end-state" in terms of market design and pricing: initially, the competitive pricing methodology would be retained, but ultimately when "workable competition" exists, prices and other contractual conditions would be decided without government guidance, in negotiations between willing sellers and willing buyers (Phase 3 corresponds with the proposed LONG TERM framework of Figure 0.1).

Careful consideration of Vietnam's circumstances and of international examples leads to the conclusion that there is no obvious long term policy alternative to the WCGM.

The transition from the interim Phase 2 to the WCGM Phase 3 may take 10-15 years, depending partly on the speed with which new gas supplies are developed. During that time, gas and power reforms must be coordinated. Planning for the WCGM even on a prospective basis will favorably impact investors' intentions and activity. Conversely, a failure to move through the phases to a WCGM will discourage developers, hamper their planning and impair achievement of the power market.

Focusing on the market design issue, the Report envisages four steps leading to the final design of the WCGM:

1. The first step involves mapping the gas chain functions and their governance: this will give market players a clear picture of a transparent gas chain and its cost conditions;
2. The second step is to establish a framework for the gas commodity price, namely the competitive gas pricing methodology. Steps 1 and 2 are both part of Phase 1, the preparatory phase, which can be begun immediately. .
3. The third step is implementation of the interim phase, Phase 2. Announcement of the design of the interim phase will give a positive signal to investors. The modified single buyer model will then be implemented as new gas supplies

become available. It is not possible to predetermine when that implementation will take place;

4. The fourth step is preparing for Phase 3, the WCGM, by implementing a gas law in anticipation of further additional new gas supplies from domestic and, if necessary, import sources, monitoring subsequent market developments to identify a condition of “workable competition” which would allow the competitive pricing methodology to be replaced by freely negotiated contractual arrangements which is the ultimate development of Phase 3.

Modern regulatory methodologies would be applied to the development and operation of gas (and power) markets, including appropriate regulation of natural monopolies that are present in gas processing, transmission and distribution.

Policymakers’ attention would move away from project approval and pricing matters to focus on issues of national importance such as: supply-security; resources management; investment climate; international gas relations; sector employment and social matters.

The recommended approach to gas market design will fill a critical gap in sector planning and help achieve the objectives for a competitive power market. It should lead to superior resource-utilization results compared to the current single-buyer model and encourage new private sector investment while PetroVietnam retains a major role. The proposed evolution of gas market design is a vitally important policy step for achieving Vietnam’s goal of a gas sector three times as large as the present one.

This report’s policy recommendations are closely related to previous Prime Ministerial Decisions.

The relationship of this Report’s principal recommendations to the Prime Minister’s decisions on the National Strategy for Energy Development (27 December 2007) and on the Conditions to Establish and Develop the Power Market (26 January 2006) are set out in Table 0.1

The road map for implementation

The key conclusion of this Report is that it is within Vietnam’s reach to capture the many benefits of gas development if the right decisions are taken at the appropriate time. An implementation road map is needed to guide this complex policy undertaking.

In terms of *institutional and policy development in the preparatory phase (Phase 1)*, the road map focuses on the following three closely-related elements:

- Immediately, the *existing institutions* for sound sector planning should be reviewed, and revised. There are no preconditions. This could be done over the next 12 months and should include the creation of a Gas Policy Development and Advisory Unit and a Petroleum Management and Regulation Unit within the Ministry’s Energy Department. The institutions would then be put to work to achieve a structured approach to gas sector decision-taking.
- In the near-term, through 2011, two gas market policy studies should be undertaken simultaneously:

- One: a coherent approach to gas pricing principles should be developed, a pricing methodology agreed and the decision made public
- Two: the gas market design options should be identified, choices made and the basics of the approved market design should be published.

The strengthening of the sector planning institutions is a precondition for these two activities.

Table 0.1: Relating the National Strategy for Energy Development (NSED) & the Recommendations of this Report

The National Strategy Requires	The Present Report Recommends
Energy development pacing national socio-economic development & one step ahead; priority to gas development & use [NSED heading 1, section a].	Priority for natural gas sector
- Enhance evaluation of petroleum reserves [heading 2, section b]; encourage & accelerate oil & gas exploration - Priority to the development, exploration and use of natural gas [heading 3, section c]	Encourage investment in gas exploration & development by sound gas pricing policies
Strongly shift petroleum sector to state controlled market mechanism [heading 2, section b]	Adopt market solutions to the greatest extent possible
- Form a domestic competitive energy market, step by step; reinforce the elimination of subsidy and monopoly [heading 1, section c] - Step by step form and develop power market in Vietnam [heading 3, section a]	- Aim for a Wholesale Competitive Gas Market - The Wholesale Competitive Gas Market would support the development of a power market
Pricing in accordance with market mechanism [heading 4, section b]	Initiate “competitive pricing” for gas in relation to competing fuels in its “anchor market”
Eliminate subsidies in energy consumption [heading 4, section b]	“Competitive pricing” + modern regulation to concentrate “rents” in the upstream, eliminate “consumer rents” which are indirect price subsidies
- Diversify modes of ownership, eliminate monopoly [heading 1, section c] - Licensing and price-approval for gas transmission and distribution [heading 3, section c]	- PVN becomes important competitor among several - Modern regulation of “natural monopolies”
Concentrate state management functions in one agency [heading 3, section c]	Establish Petroleum Management & Regulation Unit
Power Market Requires	The Present Report Recommends
Create competitive generation power market to test competition in generation [Prime Minister’s Decision of January 26, 2006 approving the Roadmap of the Power Market. Step-1, Phase-1]	Gas pricing competitive with internationally priced coal for power generation will support competing gas fired generators
NSED and Power Market decisions by Prime Minister envisage “step by step”, “gradual” and “stable” development	All the recommended adjustments—to pricing, to market structure, to the functioning of institutions—would be stepwise

- By the end of 2011, two other activities should be simultaneously accomplished:
 - The long-term sector role of *PetroVietnam* should be determined and any necessary legal changes put in hand; and
 - The *new institution(s)* for sound sector regulatory management should be created. It is recommended that they comprise a Petroleum Directorate to deal with the upstream and a separate downstream regulatory institution to address primarily natural monopoly issues.

As to preconditions, the strengthened Ministry may need consulting assistance to achieve these steps effectively.

In terms of ***policy implementation***, the road map steps are dependent on greater gas supply and supplier diversity developing, and dates for this cannot presently be given:

- **Phase 2, the interim phase** of gas market development, should be put in place in anticipation of new supply becoming available. It's essential elements are: retention of the single buyer PetroVietnam (PVN); inception of competitive gas pricing methodology and modern regulation of T&D;
- **Phase 3, the WCGM**, is initiated as additional new supply comes on stream with greater supplier diversity. It is characterized as well by multiple buyers, competitive gas pricing and the creation of a trunk pipeline with standardized gas quality. Eventually the competitive gas pricing methodology would be replaced by prices freely negotiated between sellers and buyers. This will occur when the number of market players is sufficient to create a condition of “workable competition”.

In both cases, the governmental precondition is the near-term agreement on and publication of the competitive gas pricing methodology and of the market design that would lead to the WCGM, both of which should be accomplished in **Phase 1**.

The fundamental changes in Vietnam's gas sector framework that are proposed are summarized in the following chart (figure 0.2; for explanation of acronyms, see the list at the start of this report). The five headings represent one way of “classifying” the gas sector framework. The texts under each heading reflect how the activities under each would change as the successive phases of recommended policy implementation occur.

Regarding gas imports and gas supply security, these are not central issues in this Report and discussion of policy steps is confined to the relevant annexes:

- Gas imports: by the end of 2011, the policy, commercial and technical aspects of possible LNG and pipeline imports should be explored and, separately, attention given to security of supply.
- Gas supply security: on a similar time scale, it should be possible to identify the areas of potential supply vulnerability, address them with the help of expert industry advice, and inform policymakers and operators of critical infrastructure with a view to taking steps, particularly the strengthening of supply networks, to improve security.

Concerning preconditions in both areas, the Ministry should mobilize Vietnamese industry assistance and may as well have to call on outside consulting advice.

Figure 0.2 Transition from one phase to the next

	Market design	Pricing	Institutional Structure	Regulation	Role of NOC
Gas sector framework <u>TODAY</u>	PVN signs PSCs; Single-buyer	Wellhead: PVN negotiates prices project by project T&D: GoV approves costs	PVN manages sector and upstream resources	No formal regulation of T&D	Upstream: PSC partner, single-buyer; T&D: single-reseller, transportation monopolist
Proposed <u>INTERIM</u> Framework: <i>Single-Buyer + competitive pricing</i>	PVN signs PSCs; Single-buyer; <i>PVN in “value adding” role downstream</i>	<i>Wellhead: for all new projects, competitive pricing built into PSCs</i> <i>T&D: MOIT regulates based on “cost plus”</i>	PVN manages sector; <i>MOIT strengthened</i>	<i>PVN mainly provides T&D but with regulation; private investors enter T&D</i>	Upstream: PSC partner; single-buyer, single-reseller; T&D: <i>regulated monopolist</i>
Proposed <u>LONG TERM</u> Framework: <i>Wholesale Competitive Gas Market</i>	<i>MOIT signs PSCs</i> <i>Several sellers/several buyers</i>	<i>Wellhead: buyers and sellers freely negotiate prices</i> <i>T&D: MOIT regulates prices & access</i>	<i>MOIT manages sector and upstream resources</i>	<i>Free entry of public and private players into T&D with regulation</i>	<i>Large business role, small state management role</i>

Ancillary issues

Although not part of its core content, this Report also deals with: energy security (Annex 1); the design of a petroleum directorate (Annex 2); the role of the national oil company (NOC) in the gas sector (Annex 3); and possible imports of liquefied natural gas (LNG) (Annex 4). Additionally, the Report reviews the experience of the gas sector in each of five other countries (Annex 5).

Energy security: Sound energy policy including diversification of supply, competitive markets and greater networking of supply systems, provides a good foundation for energy security which can be supplemented by such measures as oil stockpiling. The National Strategy is consistent with this approach, which is practiced and endorsed by the International Energy Agency (IEA). Vietnam’s historical dependence on oil products imports is being reduced. If gas imports eventuate, associated security measures may need to be considered. However, domestic-sourced energy is not necessarily proof against supply interruption: attention has to be given to the security of critical infrastructure installations. In a world where energy markets are internationally integrated, there is no “security” against fluctuations in the price of imports. A relatively small player like Vietnam will remain a “price taker”, having to endure “price spikes” and being affected by whatever steps are taken by the potential “price influencers” such

as the IEA, the Organization of Petroleum Exporting Countries (OPEC) and, possibly, the Gas Exporting Countries Forum.¹

A petroleum directorate: The National Strategy requires that “state management functions over the petroleum sector should be concentrated in one agency”. It is assumed that this is a petroleum directorate with responsibility for upstream management only. Based on international practice five different functional and organizational models were examined. They are all designed to discharge three fundamental responsibilities: to provide access to the state-owned petroleum resource; to ensure that those to whom access is granted by Production Sharing Contracts or leases conform to the conditions of those contracts and leases; and to provide services that support these operational functions. Three ways of organizing the staff responsible for these functions are: (1) by professional responsibility (accounting, economics, engineering, environment, law etc); (2) by regulatory function (managing the petroleum resources; regulating those who have been given access to the resources); and (3) by links in the chain of regulated activity (exploration, development, production, abandonment). The possibility is considered of “bundling” mid- and down-stream regulation under the authority of a directorate. Some modest budget savings might be achieved, but these activities have little in common with upstream regulation. Accordingly “bundling” is not recommended. As to the organizational locus for a petroleum directorate, international practice suggests it should be part of the Ministry’s Energy Department. The Report however recognizes that in the Vietnam context there may be special reasons and benefits for it to be placed under the Prime Minister’s control with a dotted line relationship with the Minister of Industry and Trade.

The role of the national oil company: The question is posed of the appropriate role for the national oil company in sound gas sector planning. Presently PetroVietnam plays a central role, spanning the sector from upstream contract partner to power generation, something that is not uncommon in other Asian countries (power generation excepted).

LNG imports: If policymakers decide that Vietnam needs to supplement her domestic gas with LNG imports, it should be possible to contract a long term supply but independent, expert guidance must be obtained. That policy decision should however preferably be deferred until more is known about the potential of Vietnam’s domestic gas resource. An LNG project would have to be “anchored” by a power-generation market: depending on world conditions, prices might be higher than power sector gas users have experienced until now. So far, security of supply has not been a major issue for LNG importers. The technology of importing, storing and re-gasifying would be new for Vietnam, but it is not particularly sophisticated and the LNG importing activity does not bring significant employment.

¹ This organization, which some analysts see as a type of “gas OPEC” was formed in 2008. Its website is <http://www.gecforum.org/>

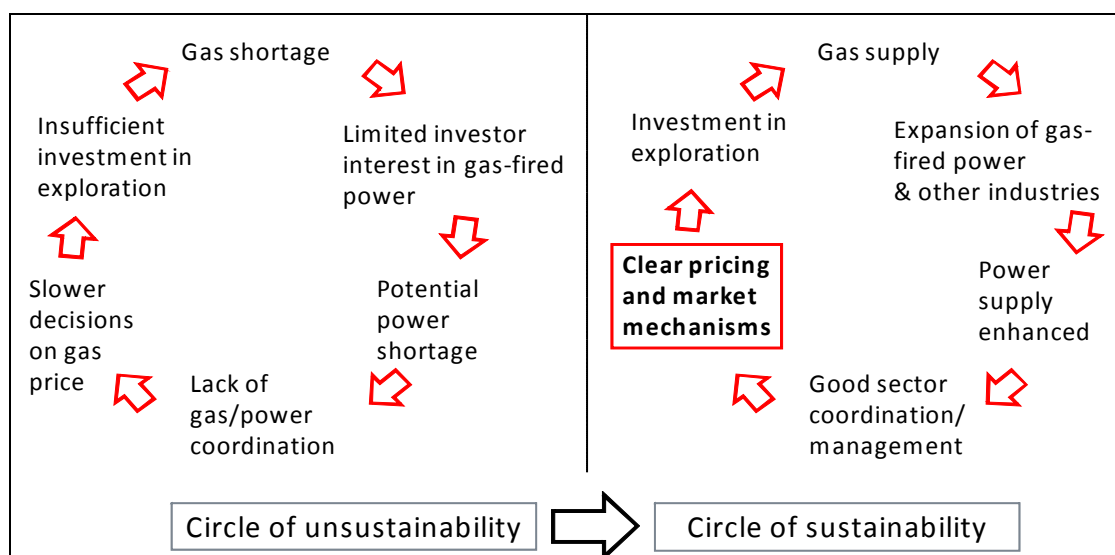
International experience: The most extensive annexed material reviews the experience of gas sector development in five selected countries: Bangladesh, Canada, Malaysia, Pakistan and Thailand. None of these examples provide a comprehensive model for Vietnam whose situation is unique. However there are lessons to be learned from each in terms of what has worked well and what has turned out badly, what can be achieved and how long it might take to achieve it.

The findings of this work are presented in the annex in relation to topics that include: institutional framework; market design; sector development; pricing as it affects gas producers; the share of gas in the energy economy; and the management of gas reserves. Concerning the most important issue in this report—gas pricing—it is found that shifting to generic gas pricing related to international fuel prices can help increase upstream investment to meet gas demand. Conversely, if upstream producers are financially crippled by low prices long-term supply will suffer. And passing upstream rents down the gas chain to subsidized consumer prices can starve the service providers of investment funds that they need to maintain and expand networks. Finally, separate generic pricing schedules for separate basins can be used to incentivize upstream investment in less prospective areas. As to the management of gas reserves, as a country's gas producing sector matures the reserves to production ratio can be allowed to fall, always provided that as a result of a favourable overall gas business environment, the industry is healthy and is vigorously and fully developing the domestic resource.

Reverting to the core issues, there is urgency to these proposals: the entire gas industry, from offshore fields to end-users, is very important for Vietnam's economy; the successes of the past 10 years have created a great demand for gas and there are already potential shortages; if key decisions are not made soon this shortage could worsen and certainly frustrate Vietnam's ambitious plans of taking gas output to three times current output by 2025.

The potential shortages are related to large demands for power generation due to Vietnam's rapid economic growth, insufficient investment in domestic exploration, and lack of clarity and resulting slow decision-taking on the price for gas in new developments. Figure 0.3 shows how this "circle of unsustainability" (left hand panel) causing potential gas shortages can be replaced by a "circle of sustainability" (right hand panel) of improved gas supply and utilization if clear pricing and market mechanisms are adopted:

Fig 0.3 Key actions are needed to take the gas industry to sustainability



The key message is the importance of clear pricing and market mechanisms to stimulate domestic exploration and development and also, it might be added, to provide a framework for possible gas imports. These policy steps plus the development of gas infrastructure and markets and the full implementation of the responsibilities conferred on the Ministry in the National Strategy are what is needed to break out of the circle “circle of unsustainability” which gives rise to potential gas shortages.

The gas and power relationship is crucial for the nation’s energy economy. New large-scale gas fired power is needed to support large-scale expansion of gas supply. And large-scale gas supply expansion is required to provide much of the power generation needed to meet Vietnam’s demands for a growing and reliable electricity supply. This mutual dependency can be satisfied by sound, complementary gas and power policies. This Report is a contribution to that objective.

1. Background

Vietnam's gas industry—from the producing field to the end-user—is already a vital component of the nation's energy economy and has the potential for major growth. Successes in the past decade have created a strong prospective demand for gas. If the industry is to meet that demand, there are challenges that must be promptly addressed. If certain key decisions are not made soon, developing gas shortages can be expected to worsen with potentially serious economic impacts. This section of the Report provides the background to the sector and outlines the challenges to the industry's growth.

1.1 The National Strategy on Energy Development as the Broad Policy Guideline for this Report

In preparing this Report, careful attention has been given to previous World Bank work on Vietnam's gas sector, to ongoing to Bank's activities relating to the country's power sector² and, particularly, to the framework for energy policy that has been created by the GoV.

Economic and energy structure—like many other countries, Vietnam presents a mixed state/private investment economy which has experienced 7-8% per annum economic growth over the past decade. Overall economic policy is to achieve industrialization and modernization with a strong market orientation, but in the petroleum sector retaining a decisive or “key” position for state enterprises (upstream) while fostering “equitization”³.

Energy policy—The National Strategy on Energy Development (NSED) up to 2020 that was approved by the Prime Minister on 27 December 2007 is an impressively comprehensive document containing all the elements of a sound energy policy. In the following text, it is referred to whenever appropriate.

According to the NSED, energy development is to be carried out one step ahead of the country's socio-economic development. It is to be harmonized with the nation's international integration and to draw on domestic and foreign natural resources. A competitive domestic energy market is to be formed step by step, subsidies and monopolies are to be eliminated, although price subsidies are contemplated in respect of

² There is ongoing Public-Private Infrastructure Investment Facility (PPIAF)-financed support for the Ministry in relation to coordination of the planning and development of power generation with particular reference to the integration of Build, Own, and Transfer (BOT) generation in the wholesale competitive power market (WCM). There is also Bank-financed technical assistance to the Electricity Regulatory Authority of Vietnam (ERAV) in developing the regulatory framework for the implementation of the Electricity Law and the competitive generation market (CGM). Finally, a review is contemplated of the fuel options available for power generation in Vietnam.

³ “Equitization” means in effect the complete or partial privatization of state owned businesses, generally by floating part or all of their capital on the stock market in Vietnam.

some electricity users. The development of the energy system is to be uniform and effective stressing all energy forms and diversification of sources. Overall national objectives include: energy security; national economic independence; an adequate supply of high quality energy; environmental protection and the formation of a competitive energy market.

The principal recommendations of this Report are all founded on the viewpoints, objectives, strategies and implementation solutions set out in the National Strategy. They also respond appropriately to the policy requirements for development of the power market which the Prime Minister approved in 26 January 2006.

1.2 Status of the Sector

Much has been achieved, much remains to be done:

- The modern gas industry based on offshore resources began in 1995⁴ with the production of associated gas from the Bach Ho oilfields. This was followed in 2003 when gas from the Nam Con Son basin gas fields started to come on-stream, block 11-2 in 2006, and in 2007 by the first deliveries of gas from the PM-3 development in the offshore area jointly administered with Malaysia. Gas production and consumption has soared in its first decade, with volumes growing seven-fold between 1995 and 2005. Gas volumes are now in the region of 7+ billion cubic meters (BCM) annually.
- Two major gas to (mainly) power projects are in operation: Bach Ho + Nam Can Son developments feeding the Phu My power complex at over 4 BCM annually and the PM-3 development in the Malay-Tho Chu Basin feeding Ca Mau power and fertilizer plants at 1.5 BCM/yr. A third gas to power project is presently under negotiation (Block B&52 to O Mon, eventually at least 3.3 BCM/yr.) and gas currently accounts for about one-third of Vietnam's total annual generation
- Gas for industrial use is probably less than 1 BCM per annum, consumed mainly in two fertilizer plants and by ceramics and metal-working industries in the HCMC area. There is virtually no general commercial and residential consumption of piped gas.
- Gas now accounts for about 15% of Vietnam's primary energy supply⁵. For comparison, the shares of gas in primary energy supply for other countries and regions is as follows, table 1.1:

⁴ A small onshore gas field in northern Vietnam was discovered and developed in the 1970's and is still producing.

⁵ This number is based on the assumption that primary energy supply is currently of the order of 45 million tons oil equivalent (mtoe) and that gas supply is about 7 mtoe. The most up to date published review of the energy situation is a May 2009 paper by the Japan Institute for Energy Economics "Energy Sector Situation in Vietnam" by Shinji Omoteyama, available at <http://eneken.ieej.or.jp/data/2588.pdf>

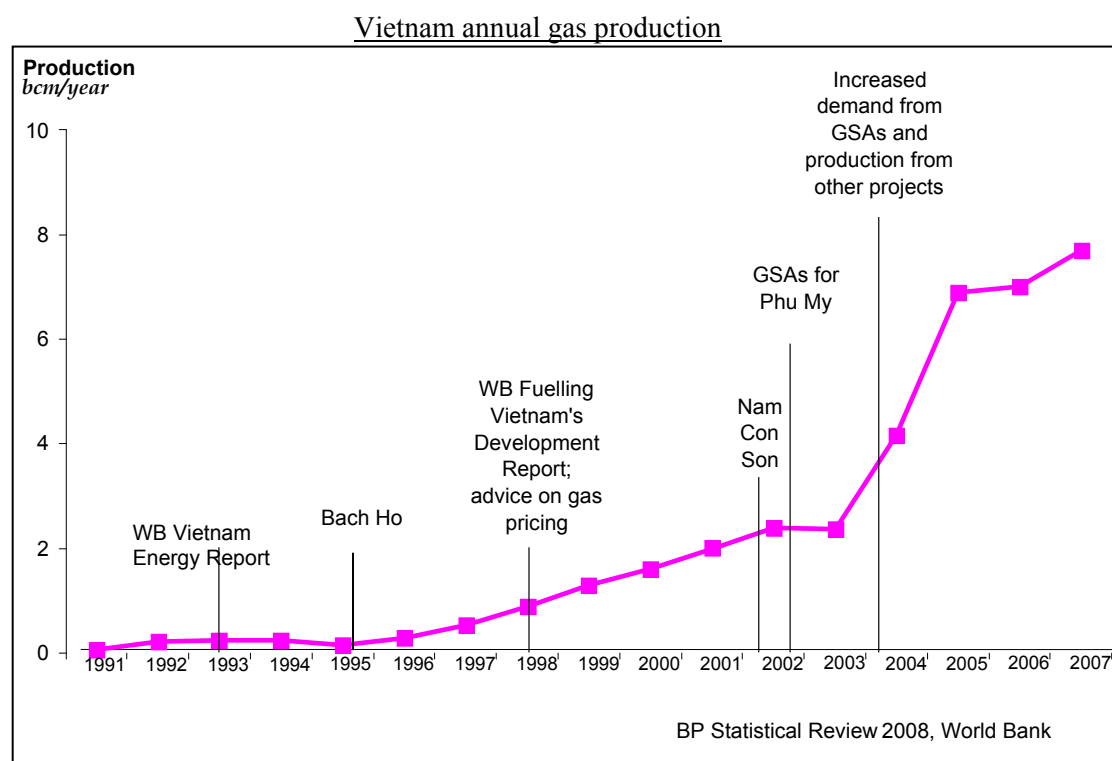
Table 1.1
Share of Natural Gas in Total Primary Energy Supply – 2008

	%
World	24
Asia Pacific Region	11
Bangladesh	75
Indonesia	27
Malaysia	49
Pakistan	51
Taiwan	10
Thailand	39
Vietnam	15

Source: BP Statistical Review of World Energy, 2009).

http://www.bp.com/liveassets/bp_internet/globalbp/globalbp_uk_english/reports_and_publications/statistical_energy_review_2008/STAGING/local_assets/2009_downloads/statistical_review_of_world_energy_full_report_2009.pdf

Figure 1.1 Progress in Gas Development



Ambitions for the future

Power sector planning scenarios⁶ such as the Power Master Development Plan (PMDP) 6 and the draft NGMP envisage gas use for generation in Southern Vietnam to rise dramatically from >8 BCM in 2010 to 13/15 BCM in 2015 and 21/24 BCM in 2025. This represents an approximate tripling of supply and demand in 15 years, focused almost entirely on power generation.⁷

- An unpublished study carried out for the GoV envisages expanding gas use in industry, for transportation (compressed natural gas [CNG]), for air conditioning and in petrochemicals. Progress has so far been very slow but a number of initiatives are under way.
- There appears to be a wide variance in expectations about the supply of gas from domestic sources over the next 15 years—see the following table 1.2

Table 1.2
Alternative Forecasts of Gas Production

Forecast by:	BCM/year	
	2015	2025
VPI's NGMP (subject to further review and editing)	12.8 – 13.7	10.7 – 24
Oil & Gas Industry Development Master Plan (Approved 2009)	12.7 – 16.8	15 – 20
Oil & Gas Industry Development Strategy (Approved 2006)	11 – 15	16 – 17

(Note: A first quarter 2009 Report by Business Monitor International states that “Gas production is expected to rise from 7.7 BCM in 2007 to 25 BCM in 2018, with identical demand growth”).

1.3 Issues and Challenges for the Gas Sector

- **Project Approvals:** There is no “generic approach” to gas development projects; instead each is the subject of separate negotiations on virtually all aspects, including pricing. This process has resulted in discouragingly long lead times for some projects. There does not appear to have been any reduction in lead times of the sort that would be expected as a result of the learning experience with earlier projects. This appears to

⁶ Scenarios are “varied stories of equally plausible futures”. The term is used repeatedly in this Report. Scenarios are described as a tool for ordering perceptions and as an aid to making strategic decisions that will be sound in a variety of plausible futures (Peter Schwartz “The Art of the Long View”, New York: Currency Doubleday, 1996, pages xiii-xiv)

⁷ These numbers are taken from the Draft NGMP which forecasts power generation gas demand at 13-15 BCM in 2015 (volumes depend on the load factor assumed for gas generation—65/70/75% and 20.6-23.8 BCM in 2025 with a similar load factor range. They are necessarily subject to revision as further studies are carried out, for example the studies relating to PMDP 7 that are presently underway.

be at variance with the policy objective of rapid and effective development of the sector.⁸

- In this connection, for the past five years there has been only one large new project under negotiation, namely Chevron's B&52 gas prospect in the Malay-Tho Chu basin for the O Mon power project and it would take about 5 more years to bring it on-stream from the time of a commercial decision to go ahead and government approval of that decision.⁹
- There seem to be few other large projects "in the commercial pipeline"¹⁰: some of the expectations regarding gas generation in PMDP 6 are not matched by corresponding gas supply developments¹¹. It is recognized that the expectations for gas supply included in PMDP 6 may relate in part to undiscovered resources of gas rather than to 2P reserves. If that is true, this power planning seems to be unrealistic. It is also recognized that PMDP 6 gas supply expectations may include imports by pipeline or in the form of LNG. However there are no current commercial proposals for imports from either source.
- **Supply scenarios:** studies carried out for the GoV in 2008 suggest that only the current annual supply of about 7 BCM is assured from 2P gas (see Box 1.1 for a summary of the international reserves classification system¹²). The consensus appears to be that

⁸ The NSED calls for energy development to be carried out "rapidly", one step ahead of the country's socio-economic development (1.Development Viewpoints, Section a) and to achieve "effective use of domestic natural resources" (Section b) involving "Uniform and effective development of the energy system including...petroleum" (Section d).

⁹ According to media reports in July 2009, Chevron, Mitsui and PetroVietnam have signed an initial non-binding agreement for a \$US4 Billion project to develop offshore natural gas fields in the B&48/95 and B&52/97 blocks. Estimated reserves are put at 4.2 Trillion cubic feet or about 120 BCM. Commercial production would begin in 2014. Source:

<http://www.thanhniennnews.com/business/?catid=2&newsid=51105>

¹⁰ Projects that appear to be imminent tend to be small scale such as the collection, as compressed natural gas (CNG), of associated gas presently flared mainly in the Bach Ho area and the tie-in of marginal gas fields mainly in the Nam Con Son area.

¹¹ The Draft NGMP contains production forecasts from several sources. They are in the range 13-15 BCM for 2015 and 11-24 for 2025. Of course this domestic supply could by 2025 be supplemented by imports.

¹² The reserves classification system used in Vietnam is as follows: the PVN group of companies and PSC contractors use the international reserves classification definitions (1P, 2P, 3P). It is fairly typical for reserves to be stated on the 2P basis. Only one company, Vietsovpetro, still uses the former Soviet Union system. PVN prepares and updates reserves reports for the relevant blocks and basins using annual reports of the PSC contractors. For preparing the 5-year plan for oil and gas activities, the reserves by blocks and basins are updated by a group of specialists from PVN for the Report of the National Committee on Oil and Gas Reserves prepared for the Ministry and the GoV. So far, there is no official regulation for approval of updated reserves. The National Committee evaluates and approves reserves on a case by case basis, together with the related production plans for each project, based on reports submitted by contractors. The reserves data for each block and basin are of course dependent on the amount of exploration that has taken place and the proportions of reserves falling in the different classes (1P, 2P etc) will vary from block to block and basin to basin. Vietnam does not yet have studies or assessments of the distribution of offshore reserves by water depth.

much of Vietnam's offshore is gas-prone and that the best prospects are to the southeast and southwest of the Mekong Delta. There is a problem of contaminants, particularly CO₂, in the raw gas. Concentrations of CO₂ appear to be higher in the potential gas producing areas in the shelf off northern and central Vietnam, where the possible gas accumulations may be smaller than those so far developed in the south¹³ (Note: the B&52 gas discoveries appear to contain up to 23% of inert gases and the individual accumulations appear to be small so that the total field development could involve nearly 40 production sites and some 450-500 wells. These conditions seem to be typical of those encountered in the Gulf of Thailand where much successful development has taken place.)

Box 1.1: About Reserves Classification

1P=proved reserves; **2P**=Proved + Probable; **3P**=Proved + Probable + Possible

Proved: "...can be estimated with reasonable certainty to be commercially recoverable...under defined conditions..." (1P)

Probable: "...less likely to be recovered than 1P but more certain to be recovered than 3P...at least 50% probability that the actual quantities recovered will equal or exceed the 2P estimate."

Possible: "...there should be at least a 10% probability that the actual quantities recovered will equal or exceed the 3P estimate."

Source: Extracted from the Report "*Petroleum Resources Management*" by the Society of Petroleum Engineers, the World Petroleum Council and others, 2007.

- The 15/24 BCM volumes in power generation by 2015 and 2025 respectively, plus an additional 2 or 3 BCM in other uses can only be achieved if further exploration and development efforts successfully turn 3P (proven + probable + possible) reserves and even "potential" reserves into proven, commercially developable gas (1P reserves). However, the immediate outlook is not satisfactory from a supply standpoint.
- Currently, the momentum of gas-directed exploration activity seems to have slowed. In the absence of gas export opportunities, the basin does not seem to attract more top tier explorers (super majors) and indeed one of them has just withdrawn from some acreage. However, some second tier companies (Examples: Santos, Talisman and others) appear to consider that there are attractive prospects.
- The NSED's overall development objectives include energy security, independence and effective use of domestic resources: achievement of these objectives may require

¹³ PetroVietnam's exploration and production subsidiary announced that it has made with Petronas the largest natural gas discovery offshore northern Vietnam. The Hac Long field, which is located in the Red River Basin some 100km off the country's northern coast, has produced test flows of 400,000 m³/day. The newly-discovered field is estimated to hold up to 50 BCM of gas reserves and 45 million barrels of condensate (Source: Business Monitor International 20 April 2009).

that cost comparisons with imported energy include shadow pricing^{14 15} and attach values to the security of indigenous energy and to the environmental advantages of using natural gas. Table 3.1 below provides an illustration of the possible use of shadow pricing, but the issue requires a degree of attention that is outside the scope of this Report.

- **Role of the National Oil Company (NOC):** The Vietnam Oil and Gas Group (PetroVietnam or PVN) is currently the operator of four blocks and the joint operator of nine more blocks in Vietnam. It is active in more than a dozen overseas countries¹⁶, Policymakers should determine whether PVN's gas-directed upstream activities in Vietnam are consistent with the size of the company and with the GoV's policy objectives for rapid gas development. In the mid- and downstream links of the Vietnam gas chain (see Box 1.2 for a definition of the gas chain) PVN is dominant in processing, transmission and is becoming important in electricity generation. This necessarily raises questions about corporate capital allocation; scope for unregulated monopolistic behaviors; and, for other users of the gas chain, transparency and whether PVN's activities as an intermediary between producers and users add value.
- **Demand scenarios:** Concentration of gas demand in the power sector is inevitable because it reflects the early stage of development of the Vietnamese gas industry. Some energy planners want to see rapid diversification into other industrial uses such as chemicals, gas air conditioning, natural gas vehicles (NGVs) and of course, into gas distribution to serve industrial, commercial and residential energy needs. This diversification would bring the benefits of clean, competitive natural gas to new market segments while contributing to the growth of the total gas market and to a better balance in overall gas use. There are many references in this Report to gas distribution, alone or as part of "transmission and distribution" (T&D), but there is no focused discussion of distribution issues because of the immaturity of that part of the sector. However, that situation will change: gas distribution is being actively pursued by PetroVietnam Gas Corporation through PetroVietnam Low Pressure Gas Distribution and PetroVietnam Gas City Investment Development, both of which are joint stock companies.

¹⁴ A "shadow price" is an estimate of the true cost of a commodity when its market price deviates from its real worth, so encouraging its over- or under-utilization.

¹⁵ The cost to the Vietnamese economy of imported fuel equals the price of that fuel. The cost to the economy of domestic natural gas may be significantly less than its price, for example because that price includes substantial revenue flows to the GoV which are not present in the case of imported fuel. Shadow prices would include a credit for those revenues. Similarly, shadow prices of imported fuel could incorporate allowances for the cost of insecurity of supply and for the environmental costs associated with burning fuels with higher carbon content than natural gas.

¹⁶ As of July 2009, these countries include: Algeria, Cuba, Egypt, Indonesia, Iran, Iraq, Laos, Malaysia, Myanmar, Peru, Russia, Tunisia, Venezuela.

Box 1.2: What is the “Gas Chain”?

The “physical chain” is the continuum of fixed-in-place engineering infrastructure from the production site through gas processing, transmission, storage, distribution and consumption. It therefore extends from the production casing of the gas well to the burner tip of the gas consumer.

The “value chain” is defined as:

"The chain of activities, adding value to gas-in-the-ground by:

Upstream

- Developing and producing it;

Mid-stream

- Gathering;
- Processing including liquids extraction (if liquids are present);
- Storing (of processed gas prior to transmission);

Down-stream

- Trading;
- Storing (of gas prior to distribution);
- Providing services such as load-balancing;
- Transporting;
- Distributing;
- Marketing; and
- Converting it (e.g. to electricity, methanol, ammonia, urea)."

- **Gas and Power:** The NSED strongly emphasizes gas development, which can for the foreseeable future only take place if gas demand is “anchored” in the power sector. However, there appears to be a lack of coordinated planning as between the gas and power markets and there is no organizational focus for coordinating gas and power, let alone only gas. If this analysis is correct, this situation is contrary to the policy goal of integrated and effective gas development and it could impair financing in both the gas and the power sectors.¹⁷
- **Gas pricing:** Existing gas pricing appears to be driven to the extent possible by a perceived need to achieve low electricity prices and to confer subsidies on gas consumption in the fertilizer sector. Ultimately, gas prices are approved by the Prime Minister on a recommendation of the Minister of Industry and Trade. Concerning gas

¹⁷ There is probably much more to be usefully said about the issue of coordination of gas and power planning, and indeed of coordinated planning among all energy sources. The mention in this bullet is simply to draw attention to the current contradiction between planning practices and policy goals.

in the power sector, in important cases the transactions are non-arm's length: the gas purchaser and reseller and the generator-purchaser are all controlled by PVN. Directionally, low gas prices for power generation will tend to discourage investment in gas exploration and development and therefore work against some high level objectives for the sector such as rapid growth and diversification of fuel sources for power generation.

- **Physical segmentation** of the sector into a series of “bilateral” gas-supply and power-market projects prevents the creation of a functioning market; and will tend to encourage continuance of the project by project approach if there is no overarching sector vision. While there is inevitability to the “bilateral” approach in a young gas sector, if the ultimate objective is to achieve a functioning gas market, policy must break away from this “bilateralism” by methods such as the construction of a trunk pipeline connecting individual projects.
- **Security of supply** concerns lead to, among other things, uncertainties and to ambivalence regarding international trade in natural gas to address supply/demand mismatches (the future *export* of gas that may be “surplus” to domestic needs and the future *import* of gas to meet a “shortfall” in domestic needs). That is to say, there is clearly hesitation about allowing exports even though the Petroleum Law does not prohibit them, and the prospect of gas imports raises security concerns.
- **Appropriate distribution of energy by region:** Central and northern Vietnam do not currently have access to significant natural gas supply. Coal is the dominant fossil energy form in non-transportation uses. There are small gas volumes from the onshore Tien Hai gas field supplemented by LPG and by some syngas from coal.
- **In summary:**
 - There is much uncertainty (therefore high risks) about the nation's potential for domestic gas supply
 - For structural, commercial and technical reasons, new projects are delayed
 - Domestic gas supply security is therefore not ensured for the long term
 - There is no development of a “network” gas industry which is desirable for supply security and for the creation of a functioning gas market
 - The issue of gas supply for Northern Vietnam is unresolved
 - Gas and power planning are not sufficiently coordinated
 - Gas pricing issues are dealt with on a project-by-project basis rather than generically
 - There are strong but unfulfilled desires to develop gas markets outside of the power sector

1.4 Implications

If the impressive momentum achieved by Vietnam's gas sector is to be maintained in face of these challenges, policy action is clearly required. This is not a novel conclusion. It is inherent in, for example, the National Strategy of December 2007 and it is likely to be an important part of the NGMP.

To achieve its stated objectives for developing national gas resources, Vietnam must seek to create a “moving train” of projects that will convert gas resources into proven reserves and production. It must also stimulate investment in the development of the requisite pipeline infrastructure as well as incentivize investment in gas consuming loads downstream such as power plants. And this will require gas pricing in consuming sectors (particularly the electricity sector) to be appropriately linked with gas pricing in the upstream gas exploration and production sector. The desirable participation of private players in each of the links in the gas chain will require a fresh approach.

- Each link of the gas chain must eventually be opened to all investors, regardless whether they are Vietnamese or foreign, state or private;
- The chain must be made more transparent so that participants can monitor pricing and activities in each link but at the same time confidential commercial data must be protected; and
- The links in the chain that have natural monopoly characteristics must be properly regulated

. In this connection, box 1.3 below summarizes why and how natural monopolies should be regulated.

Box 1.3 Why and How to Regulate Natural Monopolies

Natural monopolies: Gas transmission and distribution (T&D) systems are “natural monopolies” because, for reasons mainly of scale economies, their services can be provided more efficiently by one company than by several companies competing against each other.

“Market power”: The owners of T&D systems therefore have a “dominant position” in the business of supplying these services. There is a risk that they might abuse that position of “market power” in order to achieve abnormal profits.

Regulation is a substitute for competition: Because of the inevitable monopoly characteristics in the T&D link in the gas chain, policymakers cannot rely on competitive forces to regulate the rates (prices) and service offerings of these businesses. Policy is therefore to provide regulation as a substitute for competition.

The goals for regulation of natural monopolies:

- To ensure that economies of scale are achieved
- To prevent rates (prices) being higher than required to cover reasonably-incurred costs
- To prevent the business owners from using their dominant position to discriminate among users in rates and other terms and conditions of service, including access to the systems.

The methods of regulating natural monopolies:

- Review and approve projects to construct or expand T&D systems
- Fix rates that provide for the recovery of reasonably incurred capital and operating costs while still providing incentives for efficiency
- Approve terms and conditions for T&D services to ensure fair, non-discriminatory use both by system owners and by third parties.

The foregoing relates to the **economic regulation** of natural monopolies to address natural monopoly situations and to provide a level playing field that accepts and encourages investment from all sources, public and private.

Like other components of the gas chain, T&D businesses are subject to **technical regulation** to deal with issues of human health, public and employee safety and the preservation of the natural environment. This aspect of their regulation is not dealt with in this Report.

1.5 Alternative Approaches to Gas Sector Development

In regard to what approaches are possible if Vietnam is to secure an expanding gas industry future, the following tentative conclusions are offered. Three possible approaches are identified: business as usual; an NOC-led approach; and a market-oriented approach:

1. A “business as usual” approach is unlikely to have the desired results. It is characterized in part by: PVN’s continued dominance of the mid- and downstream; project-by-project price negotiations and their attendant delays; the absence of an objective valuation of gas; a general lack of transparency; the absence of open access and of transport pricing on pipeline infrastructure guaranteed by a regulator (see Box 1.4 The Cost of Project Delays).

Box 1.4: The Cost of Project Delays

Where:

- Investors are technically competent, have adequate funding and are prepared to risk those funds in a project;
- The project has received all regulatory approvals (environment, health, safety);
- There are no concerns about possible adverse effects on competition.

Then delay in providing final government policy approvals can be harmful in terms of:

- Increasing project costs by deferring the return on the pre-development costs which, in the case of upstream gas, can be a large part of total costs;
- Deferring government revenues in terms of taxes and royalties;
- Deferring employment and other economic multiplier effects of investment.

The effects of delays are particularly undesirable where governments are running deficits and where there is spare capacity and under-employment in the economy.

Investors assess the cost of project delays by applying their corporate discount rates to project income streams.

Governments can measure the costs of delay by applying a social discount rate in such areas as “lost” employment income and deferred government revenues.

(Note: Circumstances can arise in which it may be sound policy to delay a project. An example is where technically and economically efficient investments already exists in the same sector and are either underutilized or will become underutilized or “stranded” if the pending project

materializes).

2. An NOC-led approach modeled on that followed in Malaysia (led by Petronas, Malaysia's NOC) might theoretically bring the positive results that several decades of activity by Petronas have achieved. However there are important differences between the Vietnamese and Malaysian models: first, Vietnam's sedimentary area and petroleum resource appears to be smaller than Malaysia's; second, PVN does not seem to have the resources, particularly financial, that Petronas has been able to mobilize; third, Vietnam cannot afford to spend the several decades that it took Malaysia to reach its present impressive stage of development, because gas shortages already exist. Malaysia's gas development experience is summarized in Annex 5.

The preferred approach is one that would bring to bear across the sector the resources and abilities of PVN, of other Vietnamese investors, of the international oil companies (IOCs) and of any other interested national oil companies (NOCs). It would do so in a competitive environment up- mid- and down-stream. Such an environment would require participants to secure their place in the gas chain by demonstrably adding value, rather than by being granted monopoly privileges by decree. It would foster gas resource development and sustain efficiencies in the chain that leads to the monetization of that resource, to the overall benefit of the Vietnamese economy and society. Combined with a new approach to pricing and market design, this is the best policy route to achieving a succession of supply projects of varying kinds to meet the nation's gas needs.

1.6 The Policy Case for Gas Development

The case for according policy priority to gas development in Vietnam can be summarized as follows:

1. Gas is a good “fit” in relation to the GoV's broad economic policy objectives of industrialization, modernization, increased foreign direct investment (FDI) and improved energy security
2. Gas development generates resource rents which can contribute positively over a long period of time to the GoV's fiscal balance.
3. Gas development creates learning and investment opportunities for PVN which can be leveraged nationally and internationally.
4. Gas development attracts FDI from globally important businesses, whether private capital (examples: BP, Chevron, Santos, Talisman) or from state-owned enterprises (example: Petronas)
5. The gas chain can offer business and investment opportunities for Vietnamese capital both public and private.
6. Along the whole gas chain, technology opportunities are created which can increasingly add to and be filled by Vietnamese engineering skills.
7. Natural gas is a clean-burning, efficient, easily-controlled fossil fuel, superior to coal, oil fuels and, in large-volume uses cheaper to deliver than LPG, which can be applied in virtually every possible stationary energy use.

8. Gas can be progressively introduced to occupy a modest share of the transportation sector with favorable results in terms of low-pollution and energy-security compared to the use of imported petroleum fuels.
9. The development of domestic gas resources enables Vietnam to contribute to internationally shared objectives such as diversification of energy sources and the increased use of low-carbon fuels.

This is no doubt the same case that led to the National Strategy's objective to give priority to the exploration, development and use of natural gas and to hold out the prospect of incentives for gas exploration and exploitation, especially marginal gas (see National Strategy, 3. Development Strategy, c) Petroleum Sector).

The rest of this Report principally addresses the following areas for policy action with a view to improving the framework for gas sector decision taking:

- Institutional issues in the context of national energy planning (dealt with under main section 3);
- The design of the gas market (section 4);
- Gas pricing principles and a recommended competitive pricing methodology (section 5);
- A road map to achieving these desirable changes together with some potential problem analysis by examining implementation risks. (section 6)

The annexes deal with energy security (Annex 1); a "petroleum directorate" (Annex 2) the role of the national oil company (Annex 3); liquefied natural gas issues (Annex 4); and international experience of gas sector development (Annex 5). These are all matters that were included in the original specification for this work.

2. Developing a Framework for Gas Sector and Policy Development Decision-Taking

A central element of this work is to provide a Report with concrete proposals and options that Vietnam can utilize in the areas of:

- Gas sector management methodologies;
- Gas pricing principles;
- Gas market design options; and
- An implementation road map for the selected market design

In total this will constitute a gas sector development framework

2.1 A Vision for Vietnam's gas industry

A realistic Vision for the development of the gas sector through 2025 is needed to frame decision-taking in all policy areas, including market design and pricing.

Concept: the identification and publication of a Vision that is both realistic but ambitious could provide an “indicative planning” framework for the gas sector and for relevant components of the power sector. It should be designed to give what one interlocutor called “a clear line of sight” for the sector in terms of where the government aims to go. It must of course be consistent with the National Strategy and the NGMP. Creating a Vision will require consultation, debate and decision. It could not be completed until after the NGMP is finalized. The following text sketches some of the desirable elements of such a Vision. It is in the nature of a scenario and therefore reflects only one possible outcome--a rather optimistic one as concerns the possible 15-year development of the sector.

Time horizon: significant offshore developments may take a decade from discovery to commercial production. A 15-year time horizon is therefore a minimum for a Vision of a national gas sector. That is why the 2025 time horizon is suggested. But if by a combination of sound policy and geological good fortune, Vietnam attracts capital and entrepreneurship to its gas sector that is then successful in turning gas potential into reserves and production more quickly than at present seems likely, then the time horizon to achieve the supply suggested here could be shorter (the Ministry requests that sector planners look at the time horizon in terms of two periods, that is: through 2015, and then 2015 to 2025).

Supply: The following is one possible supply scenario which has a basis in the experience of the first decade of Vietnam's gas development. Clearly, alternative futures can be envisaged. This is the scenario chosen: a succession of projects come into the “commercial development pipeline”, ideally at a rate of one every two years (this is not of course predictable) for a total of 6-8 significant new offshore field developments by 2025. Smaller fields come in tributary to major developments (including the two existing

ones) as the industry, in a second phase of exploration, “works over” the previously-explored blocks. This provides in total an annual supply of about 25 BCM. At least one of those new developments is adjacent to Northern Vietnam energy markets. This supply scenario is less optimistic than the Master Plan of the Oil and Gas Industry (2015 with orientation to 2025) which envisages as many as 20-22 new domestic developments. In the event that exploration success in the period through 2015 is disappointing, gas imports are developed to contribute, say, 7-8 BCM to national supply by 2025.

Demand: Up to 90% of that 25 BCM supply is consumed in power generation, perhaps 2-3 BCM in other industrial and transportation uses, including the portion of the market supplied by CNG. Efforts are made to increase the portion in non-power uses which can accept higher gas prices than the electricity sector where there is likely to be strong competition in the very long term from nuclear and renewable energy forms.

“Matching” Supply with Demand: After an interim phase involving a more sophisticated version of the current “single buyer model”, market mechanisms are allowed and encouraged to work. As a result, towards the year 2025, within broad parameters set by government, sellers and buyers of gas are able to make their own commercial arrangements. Therefore, instead of the bilateral gas-supplier/power-buyer contracts that have occurred in the early stages of Vietnam’s gas development, the sector is characterized by a wide variety of freely negotiated arrangements. In other words, there is a competitive wholesale market for gas which is to a significant degree shaped and encouraged by the application of power market reforms. The detail of those arrangements cannot be anticipated at this stage but they could include, multiple sellers and buyers and the sellers could include value-adding market intermediaries as well as primary producers of gas.

Infrastructure: in the south, new production feeds into, and new consumption draws from, a “national trunk pipeline” that also connects the O Mon, Ca Mau and Phu My consumption centers to improve security of supply of each. The province of Alberta, Canada provides a model for such a trunk pipeline, see Box 2.1.

Box 2.1: Creation of a “Trunk Pipeline” in Alberta, Canada

Alberta is Canada’s oil and gas province. In the 60 years since the modern petroleum era began there, Alberta has grown to become one of the world’s most important natural gas jurisdictions with production of more than 4Tcf (140 BCM) annually.

In 1953 the provincial government accepted the advice of its petroleum regulatory body that “efficient development, gathering and utilization of the gas resources of the province would be promoted by the institution of a “Trunk-Line” system operated within the province as a common carrier”. The trunk line would connect the main producing areas with the main market areas of the province. The Alberta Gas Trunk Line (AGTL) was incorporated in 1954. Construction of its system started the next year and AGTL, later the NOVA corporation, and now part of TransCanada PipeLines Ltd, has a network of some 23,000 kms, one of the largest in North America, see:

http://www.transcanada.com/gas_transmission/alberta.html

Source: Breen, David H. Alberta’s Petroleum Industry and the Conservation Board. University of Alberta Press. 1993, pages 318-419.

Achievement of this Vision for gas supply, demand and infrastructure, which is summarized in Box 2.2, depends on institutional and other changes for it to succeed: it is unlikely that the present protracted case-by-case approach to project approval is consistent with the Vision.

Institutional: PVN does not retain any regulatory role up- , mid- or down-stream. Instead, the upstream is regulated by a newly created Petroleum Directorate. The mid- and down-stream is subject to either a Gas Regulatory Authority or an Energy Regulatory Authority (based on the existing Electricity Regulatory Authority of Vietnam--ERAV), appropriately mandated and resourced, which is responsible for modern regulation of rates and access terms for all T&D systems.

All policymaking and advisory functions are clearly concentrated in the Ministry which has strengthened policy and analytical capability.

The Role of Foreign Capital: The world may be into an extended period where petroleum companies are “cash constrained” rather than “opportunity constrained”. In these circumstances, there is going to be a lot of competition for the available IOC and international NOC cash and the entrepreneurship and technology that these companies can bring with them. GoV policies recognize this and seek to create a positive climate for such investment¹⁸.

Pricing: Gas prices for new fertilizer plants and for industrial, commercial, residential and transportation uses are also freely negotiated. The state provides overt, targeted subsidies to address any special social and economic needs.

Recognition of the “Stage of Development” of Vietnam’s petroleum basins: A necessary part of this Vision is a recognition that Vietnam stands at a relatively early stage in the exploration and understanding of its gas resource. Thus, gas-directed exploration is still relatively new; the first commercial gas projects are only about 10 years old; and all of the blocks so far offered for exploration have only seen one round of activity. Although a total of more than 260 exploration wells had been drilled by the end of 2007, several potential gas producing basins may not yet have seen any exploration drilling¹⁹.

Because intensive exploration has not yet taken place, there is not yet a succession of projects in the “development pipeline”. Projects that await approval are still being negotiated on a case by case basis. This reflects some immaturity compared to

¹⁸ Another developing Asian country which was also preparing a Gas Sector Master Plan was recently advised as follows regarding what private sector investors are looking for:

1. Market access so that investments do not result in uneconomic assets being created
2. Financially strong counterparties to sell to under binding commercial arrangements
3. A sound legal and regulatory framework that is robust, transparent, stable and enforced.
4. An attractive, competitive fiscal regime, including the gas pricing regime.
5. Opportunities for finding and developing gas that are commensurate with the scale of their operations.

¹⁹ Basins that do not yet appear to have seen exploration drilling include: Hoang Sa; Truong Sa and Tu Chinh Vung.

jurisdictions where, provided all regulatory criteria have been met, projects are essentially created by commercial negotiations without government intervention.

Fulfillment of the Vision described above will require in the upstream a more intensive and sustained exploration effort. That in turn calls for fiscal terms to be continuously reviewed and adapted to changing circumstances in order to keep the “exploration hopper” full. In the downstream it requires projects to move much more quickly than in the past through the negotiation and approval stages. This is best achieved by the GoV drawing back as the final arbiter of projects in favor of solutions freely negotiated between commercial parties, whether state enterprises or private ones.

Box 2.2: The Geography of the Vision for Vietnam’s Gas Industry in 2025

- 6-8 significant offshore developments, each of 2-3 BCM/annum, 2 or 3 of which are in the North
- Some of these are supported by new pipelines to onshore, others are tributary to existing pipeline systems such as those from PM-3, Nam Con Son and Bach Ho offshore developments
- Depending on the assessment of domestic gas prospects, a first LNG project has been developed or is in progress for 2-5 BCM/annum (1.5-3.7 million tons/annum)
- A trunk onshore pipeline connects the main gas consuming centers from Ca Mau and O Mon in the southwest, across the Delta to Phu My and possibly extending as far as Quang Ngai province. This requires that all the gas entering and leaving this trunk pipeline is of a standard quality.
- Gas transmission “rings” have been created around HCMC. If large-volume gas supply comes to the North, “rings” are built around Hanoi-Haiphong (compare Bangkok), in both cases feeding distribution systems that serve industrial and commercial markets
- The refinery-petrochemical complex at Dung Quat is the first industrial development of this kind that presents sufficient market to support a new gas project
- Facilities have been created to collect associated and non-associated gas from marginal and remote fields to supply the domestic market
- All offshore basins that are not disputed with other countries have been explored to the degree necessary to provide reliable 1P and 2P reserves data for purposes of oil and gas production planning
- In the technology area, means have been found to deal with high CO₂ content natural gas and to develop CBM from Vietnam’s coal resources.

Having sketched a possible Vision for Vietnam’s gas sector, attention is now given to the four areas of work described at the start of this section of the Report.

3. The Gas Sector in the Context of National Energy Planning

Section 3 argues that by building on sound existing policy and institutional structures (essentially the Energy Department of the Ministry), and employing market economic principles, gas sector planning can be improved without fundamental and disruptive institutional change.

The first step is to correctly identify and rank the GoV's objectives, policies, strategies and tactics applicable to the sector, to link them with specific activities designed to achieve the objectives and implement the policies. The aim is to ensure that those activities are comprehensive in relation to achieving the GoV's objectives and then to reinforce with people and other resources the support for those activities. Underlying this latter point is the tentative conclusion that the relevant component of the Ministry is under-staffed and under-resourced.

The second step is to use the strengthened institution to address specific sector issues. The starting agenda is already provided by previous World Bank work and now by elements of the present Report. .

The third step is to use the institution to achieve a structured approach to decision taking that will be robust over time. It is recommended that this be founded on indicative planning. That means the provision of coordinated scenarios for the gas, power and other energy sectors that can guide the choices and subsequent decisions of market participants whether they are state or private, Vietnamese or foreign, gas explorers or power plant investors. This will fill a gap in the present support for planning activities.

Arrangement of Material

Section 3 of the Report follows the three steps in the above summary. To begin with, however, under **heading 3.1** it seeks and finds a strong policy foundation and salient elements for national energy planning in the National Strategy. Then, it considers under **3.2** economic principles underpinning sound sector planning and an economic approach to energy security is reviewed under **3.3** supplemented by **Annex 1**. Turning to institutional issues, the existing structure is examined under **3.4** and the way it functions is set out under **3.5**. The issue of a Petroleum Directorate is considered under **3.6** and in the related **Annex 2**. The question whether there is a need for fundamental institutional change is considered under **3.7** and answered in the negative. **3.8** discusses planning and coordination activities in the institutions with particular regard to the issue of personnel— attracting, forming and retaining strong employees. After summarizing a three step approach to improved gas sector planning in **3.9**, the successive steps are discussed in **3.10**, and **3.11**. Better planning and decision-taking are placed in a broader context in **3.12** and the pros and cons of what is discussed are reviewed under heading **3.13**.

3.1 The Policy Basis for Sound National Energy Planning

In considering the role of the gas sector within country energy planning, the first step is to identify what is the national energy strategy and its relevance to the gas sector. The GoV has provided an excellent, up-to-date policy foundation for national energy planning. The relevant document is the Decision on Approving the NSED up to 2020, Vision to 2050, No. 1855/QD-TTg, of 27 December 2007.

Based on the NSED, the salient elements of energy planning that are relevant to the gas sector include:

- ***To anticipate socio-economic development:*** Energy development is to be carried out one step ahead of the country's socio-economic development strategy;
- ***To have a strong market orientation:*** The aim is to form a competitive domestic energy market, with diversified ownership striving for consumer benefits, eliminating subsidies and monopolies and reducing and ultimately eliminating the implementation of social policies through energy pricing
- ***Specifically:*** supply is to be sufficient; reserves are to be evaluated; electricity demand is to be fully satisfied; the power, coal and petroleum sectors are to shift to a state-controlled market mechanism, in the case of petroleum in the period through 2015; state management over the petroleum sector is to be concentrated in one agency (in the current Report, this is assumed to be the Petroleum Directorate); oil and gas exploration is to be encouraged and speeded-up; fiscal terms are to be reviewed and adjusted to enhance their competitiveness; priority is to be given to the exploration, development and use of gas in Vietnam and incentives are to be extended to exploration investors, especially in regard to marginal gas; energy prices are to be determined by market mechanisms; domestic and foreign investment in energy development is encouraged; finally, management and direction of the national strategy on energy development is assigned primarily to the Ministry.

Assessment: The National Strategy is comprehensive in terms of objectives, policies and tactics for implementation. It creates an excellent, authoritative frame of reference for consideration of gas sector issues and their solution. The document commends competitive market solutions, opposes monopoly and subsidized prices, encourages sector investment including foreign-sourced investment, and confirms the central role of the Ministry for managing and directing the nation's strategy on energy development. Briefly, the National Strategy is clearly the essential background and guide to sound gas sector planning and development. It will therefore be continuously referenced in this Report.

3.2 Economic principles that should underpin sound sector planning

The economic principles to be presented as part of this work should have the following characteristics:

- They should seek to achieve *optimal resource-allocation* outcomes in terms of use of capital (private and public, Vietnamese and foreign), labor and mineral resources. In

general this will follow from the formation of a competitive domestic market which is one of the objectives of the National Strategy;

- They should be consistent with expected development results of *economic efficiency and competitiveness*. The National Strategy emphasizes competitiveness in terms of domestic markets and internationally; and
- They should take account to the extent possible of *environmental externalities* for example by pricing them into the cost comparisons on which some energy policy decisions may be taken (see Box 3.1).

Box 3.1 : Accounting for Externalities

Externalities are costs (and benefits) of producing goods or services that are not properly accounted for by the price system. The classic example of an externality is pollution generated by some form of production, which adversely affects the interests of other producers and of the society at large.

A significant externality that arises in the power generation industry is the production of pollutants by thermal plants. These pollutants include particulates, oxides of sulfur and nitrogen and, particularly, carbon dioxide because of its effects on global climate change.

Some high-income fully-industrialized countries are bringing the costs of these externalities into the price system by taxing the production of certain pollutants by large emitters.

Where this cannot be done, it is appropriate for policymakers to recognize the costs of relevant externalities in their decision-taking.

In the energy sector therefore, policy should take account of the environmental externalities associated with burning of fossil fuels. In any ranking, natural gas use is likely to produce the least costly externalities and coal using conventional methods of combustion the most. Heavy fuel oils would likely present an intermediate case.

If economic principles with these characteristics are accepted, then planning should be directed *ultimately* towards achievement of market outcomes and *meanwhile* to the greatest extent possible should model-in market behaviors. This could include factoring-in such elements as *opportunity cost of alternative fuel sources* taking account of the *time value of money* (e.g. revenue streams) in relation to the timing of development decisions.

Until energy prices are substantially market-driven, consideration could be given to *attributing (or “shadowing-in”) social costs and benefits* to gas development and fuel choices. For example: for purposes of policy analysis, the transaction price of domestic gas and coal could be reduced by including an allowance for the tax and royalty revenue generation effects of using these domestic fuels. To the cost of imported coal might be added a provision for a security stockpile over and above normal commercial stocks. To all fuels an allowance could be added for the long-term cost of carbon emissions. These

emissions are of course much lower for gas than for coal.²⁰ Once decisions are driven essentially by market pricing, such shadow prices probably cannot be taken into account, unless some of them such as the costs of carbon emissions had by then been taken into account by means of consumption taxes.

None of these shadow-prices are reflected in cash costs, for example the cash costs of generating electricity from gas compared to coal or oil. Those differences in cash costs will mainly reflect differences in heat rates (efficiency) and differences in capital costs, expressed on a per unit generated basis, of coal versus oil versus gas plants.

Table 3.1
Shadow Prices of Fuels for Power Generation
(Hypothetical: for illustrative purposes only)

	\$/MMBTU of fuel input	
	Imported Coal	Domestic Gas
Credits and (debits) for:		
• Revenue generation for the State	negligible	1.33
• Security of supply	(0.03)	Nil
• Carbon emissions	(1.18)	(0.71)
• Value of Vietnam capital & labor inputs	negligible	significant
Total of credits (to deduct from) and debits (to be added to) market prices of coal and gas	(1.21)	0.62

Basis for these data:

Revenue generation: for the State from the application of the natural gas upstream fiscal regime, assessed at one-third of gross revenue of \$4.00. This assumption probably understates the revenue share over the lifetime of the project.

Security of supply: carrying cost of stockpiling 90 days' coal consumption financed at 5%

Carbon emissions: at a global carbon price of \$47/tonne estimated for 2020 and carbon content per MMBTU of 25kg for bituminous coal and 15kg for natural gas.

²⁰ In April 2009, the IEA released in Beijing a major new study entitled *Cleaner Coal in China*. The study examines the challenges facing China's huge coal industry and proposes 10 key recommendations to address them. Two of those recommendations are relevant to this Report. First, the IEA recommends "market-based energy and resource pricing, including the removal of all subsidies" (as of course does the NSED). Second, under the heading "Creating an international price for pollution", the IEA report recommends "Market-based mechanisms such as sulphur and carbon trading should be central to China's pollution abatement strategy and the key incentive to develop cleaner coal technologies". The Summary of this IEA report can be found at:

http://www.iea.org/Textbase/npsum/coal_china2009SUM.pdf

Information about the report itself is at: <http://www.iea.org/w/bookshop/add.aspx?id=355>

There are *technical aspects of comparisons of gas with other domestic and international fuel sources* that need further refinement. This is a matter that is dealt with later in this Report under heading 3.10 and Issue 1, below.

Additionally, planning of the natural gas component of primary energy supply should be directed towards *supporting and fostering* the development of secondary and tertiary investment, employment and economic activity. Examples of this objective are: enabling the development of power supply adequate to national needs; provision of clean gas to replace polluting coal in small industry; and the substitution of piped gas for LPG in certain industrial and commercial applications.

This will require, among other things, identifying *analytical tools for arriving at choices among different energy forms*, imported and domestic, for the future and for properly accounting for economic versus financial values to be attributed to natural gas.

3.3 An economic approach to energy security

This subject matter is best dealt with in the general context of the review of the role of the gas sector within country energy planning.

The broad international consensus is that *energy security* is best achieved by diversification of energy supply and suppliers, including fostering the economic development of domestic energy forms of all kinds. This consensus is reflected in the national policies of the fully industrialized countries and in their joint work in the context of organizations such as the International Energy Agency (IEA).

Particularly in recent years however, energy security is being recognized as broader than simply provisions to deal with disruption of imported supply, particularly oil supply. Additionally, it extends to critical infrastructure. In this connection the greater degree of “networking” of an energy supply system, the more secure it is likely to be. This issue has already been alluded to in the context of the desirable development of a trunk gas pipeline in Vietnam that would link all the major supply sources and consumption centers.

To the greatest extent possible, energy security considerations should not impede the optimal use of energy resources. Energy security should not therefore be a decisive factor militating against gas exports, should Vietnam’s domestic resources prove much larger than expected. Nor should this consideration exclude significant gas imports, if it turns out that they are required to supplement domestic supply in order to achieve policy objectives in regard to the growth of the national gas market. The NSED is clear here: the development viewpoint is that national energy development should be harmonized with tendencies to international integration and the appropriate use of foreign natural resources.

If direct measures are taken to improve security of imported energy supply (for example: stockpiling against possible loss of imported oil or coal supply), then the issue arises as to how the related costs should be borne. Should they be a charge on the national budget

(e.g. the USA’s Strategic Petroleum Reserve [SPR]) or should they fall on the fuel source against whose “insecurity” a stockpile is required (this tends to be European approach to costs of oil stocks). Basic information about the world’s largest single energy security investment, the USA’s SPR, is provided in Box 3.2.

Box 3.2: The United States’ Strategic Petroleum Reserve (SPR)

This is the world’s largest strategic oil reserve, although in relation to oil consumption rates, some other countries such as Japan and Switzerland—both of which are 100% import-dependent—hold proportionately larger emergency oil reserves. Some facts:

- Initiated by legislation in 1975, following the “first oil shock”
- Consists almost entirely of crude oil because crude does not deteriorate significantly over time and because products can be refined from crude in different ratios, depending on market needs
- As of March 2009, 708 million barrels of different grades of crude oil were stored in dissolved salt caverns in the southern USA having a capacity of 727 million barrels, with good pipeline connections to refineries. The reserve can be drawn down at the rate of 4.4 million barrels daily.
- The 708 million barrels currently stored are equivalent to 62 days of imports at 2009 rates. The IEA requirement is to hold 90 days of imports. The combined public and private stocks in the USA are estimated to be equivalent to 118 days in March 2009
- The average acquisition cost of the oil in storage was less than \$30/barrel. The storage facilities cost about \$5 billion to construct.
- Proportionately small volumes of SPR oil have been drawn down on four occasions: a test sale in 1985; during the Iraq war in 1990/91; a test sale in 1996/97; and at the time of Hurricane Katrina in 2005.
- The cost of carrying and operating the SPR is an annual charge on the USA federal budget.

Source: <http://www.fe.doe.gov/programs/reserves/spr/index.html>

These matters are further considered and additional references are provided in **Annex 1, *Energy Security for Vietnam***. That text examines Vietnam’s established policy respecting security, refers to international standards, draws lessons from international experience of insecurity, including the emerging issue of critical energy infrastructure and deals with the security of energy import prices. It reproduces a statement of the official Canadian position on energy security and concludes with some comments on a possible approach to further work on gas supply security.

3.4 Organizing for Gas Sector Planning within Country Energy Planning

This work seeks to identify the key issues and approaches to sound sector planning. A first step is to consider the institutional structure within which this activity currently takes place. Reference has already been made to the fact that the Ministry has been assigned the central role in energy and gas sector planning.

The established institutional structure: The Ministry of Industry (MoI) was created in 2003 under Decree No. 55/2003/ND-CP to manage the state's interests in the industrial sector, including energy (the responsibility for trade matters was added later). The Ministry has wide ranging responsibilities across all aspects of industry and trade, covering policy development and implementation, science and technology and international relations. The Ministry is responsible for directing and implementing the national energy strategy, acting in some areas in coordination with other ministries such as Science and Technology and Environment.

From a review of information on its website, Ministry appears to be comprehensively and appropriately mandated.

The two departments within Ministry affecting gas and electricity are the Energy Department and the ERAV.

The Ministry has overall control of the gas and electricity planning processes, develops strategy for the sector for government approval, and helps develop draft legislation to implement that strategy and may adjust electricity tariffs by up to 5% annually. Larger changes require the Prime Minister's approval. .

The Petroleum Law provides for the right of the Government to prepare a master plan for the development of petroleum sector and this appears to be the authority under which the GMPs are prepared. However, the Law is silent on how this master plan should be coordinated with planning in other sectors, or with national energy planning in general.

The Electricity Law provides for preparation of national electricity development plans, which are referred to here as Power Master Development Plans (PMDPs). The Ministry contracts the Institute of Energy (a subsidiary company of Vietnam Electricity [EVN]) and the Institute of Petroleum (a division of PVN) to prepare the electricity and gas master plans respectively.

To regulate the electricity industry as it moves toward a market structure and to implement the Electricity Law, the Ministry has established a separate body, the ERAV. This Authority is currently issuing electricity licenses, developing the new regulatory framework and the design, structure and rules for the CGM and will later develop the design and the rules for the Wholesale Competitive Market (WCM) and full retail competition.

In the gas industry PVN has a dominant position, and there is no equivalent of ERAV for the gas market.

Table 3.2: Mapping of Gas Sector in Vietnam
Current Status of Functional State Management Organization

Political/Administrative Level	Authority
National Assembly	• Approve Petroleum Law (Law No 10/2008/QH12 came into effect from 1st Jan 2009) and related laws (Investment Law, Construction Law, Environment Protection Law...) • Approve projects of national importance²¹
Government & Prime Minister (Assisted by Sectoral Economic Department, in which energy group is situated, including oil & gas sector)	• Unified State management of oil & gas activities by Decrees and Decisions (by Law No 10/2008/QH12): ○ Approve National Strategy, Master Plans; ○ Approve category A projects, petroleum contracts, oil & gas fields reserves and development plans; ○ Approve cooperation contracts in overlap areas and oversea contracts; ○ Approve PetroVietnam Group's organization & charter, nomination of key persons...
Ministry (Assisting by Energy Department including oil & gas sector)	• According to Law No 10/2008/QH12 come into effect from 1st Jan 2009 -- Responsible to Government for state management of petroleum activities: ○ Issues or submits to relevant state offices for approval legislation documents, strategies, master plans, plans for petroleum industry development, ○ Coordinates submissions to Prime Minister for approval: petroleum contracts; investment projects; reserves reports; field development plans; bidding results relating to concession blocks; overlap areas cooperation plan; petroleum contract term extensions... ○ prepares and submits to Prime Minister: approval blocks list, division and blocks limit corrections, ○ Monitoring petroleum activities, report on progress of developments and achievements in exploration, production, consumption in domestic market and export; ○ Approve programs, and full range of activities from project initiation to decommissioning; ○ Take decisions relating to gas flaring, petroleum recovery... ○ Human resource development& training, rational policy for sector manpower; ○ International cooperation...
Other Ministries: MPI, MOF, MOC, MORE, MOFA...	Fulfill duties and authority relating to petroleum sector according to laws and regulations
Provincial and Municipal (City) People's Committees	Fulfill duties and authority relating to state management of petroleum activities in their geographic areas.
PetroVietnam Group Board of Management: • Plays role in relation to state ownership of petroleum resource, • Takes some government management decisions as authorized by PM or by Minister of Industry and Trade	• State run “ mother company”, • To carry out petroleum activities, • To sign petroleum contracts with organizations, persons according to law and regulations. • Organization: ○ President (Board of Directors) ○ Functional Divisions: Exploration & Production; Oil and Gas Processing; Gas & Power; Petroleum contract management, ... ○ Business units: varying structures—100% state; JSCs, JVCs ...

²¹ “Projects of national importance”: the Law of Construction defines four categories of projects. For each category, the law prescribes the corresponding level of project report, feasibility study, environmental impact assessment, socio-economic impact assessment etc. and the level of project evaluation and approval. “Projects of national importance” represent the highest level and need investment policy approval by the National Assembly following a proposal by the project owner, a submission by the national committee of evaluation, the Prime Minister's office and the Government Office. This procedure applies where the state budget involvement is more than 30% of project investment cost, and also where the project may affect the national security, the natural environment, and socio-economic conditions.

3.5 The Operation of the Governing Institutions

The main elements of the day-to-day management by the GoV of the country's gas sector are as follows:

- National strategies such as the NSED and master plans like the NGMP are developed by the Ministry drawing on the advice and resources of PVN, EVN, international organizations such as the World Bank and international consultants and submitted by the Minister of Industry and Trade (“the Minister”) to the Government and/ or the Prime Minister for approval. Energy strategy issues of particular importance may need the approval of the Communist Party's Political Bureau and / or the National Assembly.
- The Energy Department of the Ministry is responsible to coordinate preparation (by PVN, EVN, international consultants etc) of relevant comments and evaluations. The latter involves evaluation committees with relevant ministries and subsequent submission to the Ministry. The relevant sectoral economic department is responsible to assist the Prime Minister's / Government's approval process.
- Matters relating to approval of onshore and offshore petroleum block lists, the division of blocks and so on are prepared by PVN and the Energy Department and submitted by the Minister to the Prime Minister for approval.
- Monitoring of natural gas sector activities is the responsibility of PVN and the Energy Department and the results of this monitoring are reported to the Minister and the Prime Minister.
- Programs and activities undertaken by PSC holders are reviewed and approved by PVN. Important issues will be reported to the Ministry and the Prime Minister for guidance before approval

Policy on the Governance of the Gas Sector in the NSED: The overall objective for the petroleum sector is to achieve “a strong shift to a state-controlled market mechanism” (Heading 2 “Development Objectives”, item b) “Specific Objectives”). This suggests a continuing important role for the state in sector governance. However, as this Report proposes, that role will change as market mechanisms increasingly replace “command and control” decision-taking by government in all areas where markets can do a better job of equilibrating supply and demand. However one area that will require regulation is the network industry, that is gas T&D, which are “natural monopolies”. Regulation is needed to ensure that the dominant positions held by the owners of those networks are not abused (see Box 1.3). .

As this change takes place, government continues to establish broad policy for the sector, carefully monitors sector development against pre-established “indicative planning”²² and makes any necessary changes in policy and policy implementation. But it tends increasingly to leave sector operational and investment decisions to the

²² “Indicative planning” is defined as the provision of coordinated information that guides the choices of separate entities in the market economy. The practice of indicative planning was successfully used in Western Europe in the post Second World War recovery period.

individual actors who, in the case of natural monopolies such as pipelines, are supervised by the energy regulatory authority. This evolution is clearly consistent with the expectations of the NSED. This is the case in many countries where the energy/gas sector is considered to be of national strategic importance. The state's goals for appropriate management of the sector are achieved through policy, regulation and by fiscal means applied generically across the sector, rather than by policy-level decision-taking focusing on individual projects.

The NSED asserts that “State management functions over the petroleum sector should be concentrated in one agency and a legal basis established for activities in the petroleum sector, paying special attention to the mid-stream and down-stream activities, of which there are important tasks of economic and technical management in the gas sub-sector such as: licensing gas T&D, approving gas price, price of gas T&D, technical specifications, etc” (Heading 3 “Development Strategy”, items c) “Petroleum Sector”).

It is assumed that the NSED is here referring to the concept of a Petroleum Directorate, which is another subject matter of this Report, and to the probable need for a gas law. Such a law, which would apparently deal with the downstream gas industry, would in turn require the creation of a new agency or the grant of new powers to an existing agency. The new agency could be similar to the ERAV, which is part of the Ministry. Or an additional mandate could be granted to the ERAV. Or the Ministry could be mandated and staffed as the instrument for implementation of a gas law. .

Conclusion: The intentions regarding governance of the gas sector appear to be sound, comprising a shift under state supervision to a market mechanism and including provision for a sound legal and institutional basis to be created.

3.6 A Petroleum Directorate

The Ministry is understood to be in the process of drafting a proposal for the creation of a separate Petroleum Directorate (PD). The present work therefore calls for a proposal concerning the responsibilities, organizational structure and operations of a PD. Three organizational options are to be prepared for discussion at the Stakeholder Workshop.

This task has been completed and the results presented in **Annex 2 A Petroleum Directorate for Vietnam**. That text looks at international examples of such directorates and analyses their typical responsibilities and operations. After considering diverse organizational structures it proposes three options and reviews their respective advantages and disadvantages. The document concludes by examining the possibility of including in the PD's mandate the regulation of the mid- and down-stream gas sector. The reasons for developing a particular organizational structure to regulate the upstream end of the gas chain are set out in Box 3.3

Box 3.3. Why and How to Regulate the Upstream Petroleum Industry

How to define the Upstream: This “link” in the gas chain extends from the identification of the resource which is to be exploited through the activities of exploration, development, production and processing to the point at which marketable pipeline gas is delivered to the gas transmission system. It includes activities such as: resource assessments; identification of those resources (or “blocks”) that are to be offered for development by state or private businesses; the selection of contractors to carry out that development, and the subsequent oversight of those contractors’ activities from initial geophysical surveys to eventual decommissioning of production facilities;

Why regulate the Upstream? Because it involves the temporary release to contractors for exploration and possible development of state-owned resources and includes the management in the public interest of Vietnam of the resources that are released for development. This kind of regulation must be distinguished from the economic regulation of natural monopolies in the gas chain that is addressed in Box 3.6.

How to regulate the Upstream: According to international best practices, this regulation should be carried out on a technical basis by a department, board or agency of the Government, subject to control by a senior policy level which, in Vietnam, could be the office of the Prime Minister. It should not be done by the National Oil Company (NOC), because to the extent the NOC is active in exploration and development (as PVN presently is), it should not be regulating itself or its competitors. Moreover exercise of this or any other regulatory function by the NOC distracts from its central role which is to carry out successful commercial operations in the national interest.

What is the nature of this regulation? It is essentially “technical” and concerned with geological, engineering and environmental issues rather than “economic” regulation which is required to deal with natural monopolies. However, it is normal for the Upstream regulator to deal with economic issues of rates (prices) and access terms in relation to gas processing matters.

The organizational locus for a Petroleum Directorate in Vietnam: In principle, the standard approach internationally appears to be for the upstream petroleum regulator organization to be part of an operational government department (see Annex 2). Thus, in Norway the PD is part of the Ministry of Petroleum and Energy, in the UK the function is carried out in the Ministry of Energy and Climate Change and in the USA it is part of the Department of the Interior. The recommendation here is therefore that, in principle a PD for Vietnam should be “housed” in the Ministry.

In practice, it may be necessary to consider some alternative approach for Vietnam where important, sensitive issues always need high level decision-taking. If the PD were to be located in the Ministry, that would require a delegation of authority by the Prime Minister to the Minister of Industry and Trade. That solution would not lead to an improvement in decision-taking compared to the present approach. State management would simply have moved from PVN to the Ministry. If the PD were to be placed under the direct authority of the Prime Minister, the decision-taking process might be shortened.

On the one hand, this would be an unusual solution compared to what appears to be international practice. On the other hand, the upstream petroleum regulatory function is typically a “freestanding” one within government and the solution of locating it in the office of the Prime Minister would not automatically create any inefficiencies. The need for the Minister of Industry and Trade to be kept informed of the PD’s activities and to be ready to advise the Prime Minister could be achieved by a “dotted-line” reporting relationship to the Ministry²³.

Consideration should therefore be given to the PD reporting to the Prime Minister. In that connection, it is recommended that at the same time as attention is given to implementing the PD concept, consideration should be given to improving the whole legal framework (the Petroleum Law, decrees and the decision-taking and approval system) to achieve greater consistency and more efficient state management of this vital sector.

Conclusion: The creation of a PD as the upstream regulator would bring Vietnam’s practice into line with that of the leading market-oriented petroleum producing countries. Normally, the PD would be located as part of the existing energy department, but consideration should be given to placing it in the Prime Minister’s office which would reflect the political importance of some of the PD’s activities and could lead to more speedy decision-taking than if it were situated in the Ministry.

3.7 Is there a Need to Consider Fundamental Institutional Change at the Policy Making and Implementation Level?

It is appropriate to pose the question whether to achieve sound gas sector planning there is a need for fundamental institutional change.

The Ministry is a relatively recent creation and appears to be comprehensively mandated to identify and implement an appropriate role for the gas sector within national energy planning and having regard to the close relationship between electricity and gas planning. The central responsibility of the Ministry for managing and directing the NSED of Vietnam was confirmed by the Decision approving that National Strategy as recently as December 2007.

This organizational design is similar to ones which are in use or have been used for extended periods in other countries. For example, in the UK for many years, the Energy Ministry was a subset of the super Department of Trade and Industry (it is now part of the Department of Energy and Climate Change). The organizational design reflects international practice and experience and should prove robust in relation to the further development and implementation of gas sector policy.

Conclusion: There is no obvious need to get into major government organizational changes in order to effectively address the gas industry issues. On the contrary, changes

²³ The “dotted-line” reporting relationship would reflect that the PD would keep the Minister of Industry and Trade informed of its activities and in turn could receive information from the Minister and his staff. The PD’s solid line relationship would be with the Prime Minister reflecting that the PD would report to and be directed and supervised by the Prime Minister.

in structures that are organizationally sound, relatively new and recently confirmed would likely be counterproductive. For the Government of Vietnam, this should be an important and reassuring conclusion. Having concluded that the broad government organizational design for energy planning is sound, attention is now given to the way the institution—the Ministry—functions to carry out gas sector planning.

3.8 Planning and Coordination of Activities within the Institution

It is entirely possible, indeed it is almost certain that all of the activities (objectives/policies/programs/strategies/tactics) listed in the following paragraphs are already the subject of discussion, analysis and decision in Ministry. This Report does not question that. What is proposed is, first, that existing human resources in the Ministry—strengthened if necessary—be organizationally matched to these activities in terms of a Gas Policy Development and Advisory Unit and a Petroleum Management and Regulation Unit—and, second, that those existing, probably-strengthened resources, then be used to address each of the policies, programs, strategies and tactics (and some of them will be new) that are needed to achieve the government’s gas sector objectives, identifying and eliminating weaknesses and inconsistencies and bringing to decision-takers changes in laws, regulations, programs and practices that are needed to reach these objectives.

In regard to strengthening the personnel team dealing with gas matters in the Energy Department of the Ministry the problem will have to be addressed of how to attract and retain good people in face of competition from the NOC and from private sector developers including IOCs. This is a problem that has arisen in other jurisdictions such as Alberta, Canada. There, special “retention bonuses” were paid to public servants in 2005-08 when high oil and gas prices resulted in high industry salaries.

Experience in other jurisdictions is that the best approach is to seek long term solutions to the problem. These include: reasonable public service salaries and benefits; special salary recognition for government employees who have skills that are in strong demand by the petroleum industry; varied and stimulating public service employment opportunities; learning opportunities sometimes involving training overseas; and opportunities to work in the petroleum industry on an exchange basis.

Conclusion: The most challenging task in relation to planning, coordinating and carrying out activities relating to natural gas is likely to be attracting, forming and retaining strong employees in the face of competition from state and private enterprises. Effective methods are available to address this challenge and should be part of long term planning in the Ministry.

3.9 The first step: correctly identify the main activities of gas sector planning, and then decide how and with what institutional support they are to be carried out.

The *activity blocks* for a robust and sustainable gas chain and the related *organizational structures* are as follows:

1. Elaboration of GoV *objectives* for the gas sector, namely development that is: rapid; integrated; effective; economically efficient; competitive; and comprehensive

(each of which can be appropriately elaborated), together with any co-objectives and constraints such as: building on existing strengths and retaining a decisive position for state enterprises. These objectives are supplied to the Ministry in general terms by the NSED. It is for the Ministry to provide clarification and elaborations as a step to specific policy implementation. *Organizational responsibility*: the Minister of Industry and Trade, advised by the *Gas Policy Development and Advisory Unit* from the Energy Department.²⁴ The creation, resourcing and activation of a policy unit would therefore be a necessary step. Its role is not to “make policy”, because energy and gas policy is already established by the NSED. But policy needs to be elaborated, implemented, monitored, reviewed, revised and reported back to the ministerial level and this would be the job of a policy unit. The unit would be under the authority of and would report to the Deputy Director of the Energy Department who is responsible for gas sector issues. The advice provided by the policy unit would be used by the Deputy Director in his reporting to the Director General of the Energy Department and to the Minister. The policy unit would therefore work within the established energy reporting relationships of the Ministry.

2. Expression of these objectives in *policies*, some of which can be derived from the NSED, such as: maintaining internationally-competitive fiscal terms; the use of the PSC as the principal form of petroleum contract (2006 World Bank diagnostic²⁵); the rate of release of new exploration blocks; the opening-up of the midstream and downstream components of the gas chain to investors other than PetroVietnam Oil and Gas (PVG); the signaling of a competitive approach to gas pricing (section 4 of this Report); and of a competitive market design (section 5). Evaluation of the upstream policy environment in relation to overall GoV policy objectives for the gas sector will necessarily involve consideration of that environment as a whole, therefore including its oil component. Generally speaking, interest in relatively little-explored basins such as those of Vietnam offshore tends initially to focus on their prospectivity for oil, because that commodity typically has a higher value and can be more quickly commercially exploited than can finds of natural gas. The international competitiveness from an oil standpoint of the resource-access and fiscal regime is therefore of interest and importance for the gas sector too. *Organizational responsibility*: the appropriate Deputy Director of the Ministry advised by the Gas Policy Development and Advisory Unit of the Energy Department.

²⁴ The following is taken from the previous, unpublished gas sector planning work:

Gas policy objectives—rapid development, integrated with power sector, effective and economically efficient, regionally and globally competitive and comprehensive.

Gas policy basis—build on existing strengths (national resources, regional resources, state enterprises, ability to attract foreign capital, technology and entrepreneurship).

Plus international cooperation—bilateral, multilateral.

²⁵ The term “2006 World Bank diagnostic” is used to refer to a diagnostic of Vietnam’s gas supply and other sector issues carried out by World Bank consultants in 2006 which built on earlier work such as the report “Establishing a Legal and Regulatory Framework for the Downstream Gas Sector in Vietnam, Final Report, 2003” (PPIAF).

3. Next is the development of *strategies and tactics* to successfully implement these policies (for which the NSED does not provide specific guidance) by means of a capable staff with strong administrative, information-gathering and analytical capability. *Organizational responsibility:* a *Petroleum Management and Regulation Unit*, appropriately overseen by the Deputy Director of the Energy Department who is responsible for gas sector issues. The creation, resourcing and activation of a petroleum management unit would therefore be a necessary step. It could probably be achieved by reorganizing and strengthening the existing Energy Department gas staff. The petroleum management unit would have no upstream regulatory role. There is therefore no overlap between this proposal and the proposal, supported in this Report, to create a Petroleum Directorate for Vietnam. If it is decided, at least as an interim measure, to use an existing Ministry organization to deal with downstream gas regulation, the petroleum management unit, suitably expanded, would be the correct instrument for this job. Eventually, however, as suggested elsewhere, it may be more appropriate to task an expanded ERAV with this responsibility. In the alternative a gas regulatory authority comparable to the ERAV could be created in the Ministry. In either case, downstream gas regulation would be carried out within the overall Ministry organization. If policymakers decided to deal with downstream gas regulation by expanding ERAV or by creating an organization comparable to the ERAV, then the petroleum management unit staff who had been dealing with downstream gas regulation would transfer to the expanded or new organization. But in either case, they would remain within the overall Ministry structure.

4. The examination of the objectives, policies, strategies and tactics that together comprise the planning framework for the gas sector can probably best be done in the context of the links in the gas chain. Therefore, in relation to each of the links of that chain (see Box 1.2), the question would be asked and answered “are each of the activities designed and implemented in such a way as to achieve the GoV’s objectives and if not, what steps are necessary to correct this deficiency?” Those steps might include changes to the institution’s organization, staffing and other resourcing as well of course as changes to the implementation policies, strategies and tactics.

This approach to organizing for gas sector planning mirrors the steps that are inherent in the NSED. That document posits development objectives, development strategies and presents implementation solutions, all of them in a sensible progression.

The Box 3.4 below exemplifies in simple terms the gas sector government activities, some of the detail of each and, underneath each, identifies the supporting organizational structures that are proposed.

Box 3.4: Building Blocks of Goals and Structures for Gas Sector Planning			
1. Broad Objectives→ • Rapid • Integrated • Effective • Competitive • Etc.	2. Policies-----→ • Project approvals • Coordinate with power • Open up markets • Fiscal & pricing terms • Etc.	3. Strategies-----→ • Methodology for approvals • Regulation & transparency • Generic gas pricing • Profit-sensitive fiscal terms • Etc.	4. Tactics and Programs • Industry input • Create pilot regulator • Replace subsidies • Identify and encourage new investors • Etc.
Organizational Support: Ministry Gas Policy Development and Advisory Unit		Organizational Support: Ministry Petroleum Management and Regulation Unit	

Result: the Ministry’s management and all other participants in gas sector planning and policy implementation will have a clear reference framework that situates particular activities in relation to high level objectives and to broad policies already established by the GoV and considers how effectively they are being achieved. Staff support could be reviewed, reorganized and strengthened in relation to the identified building blocks.

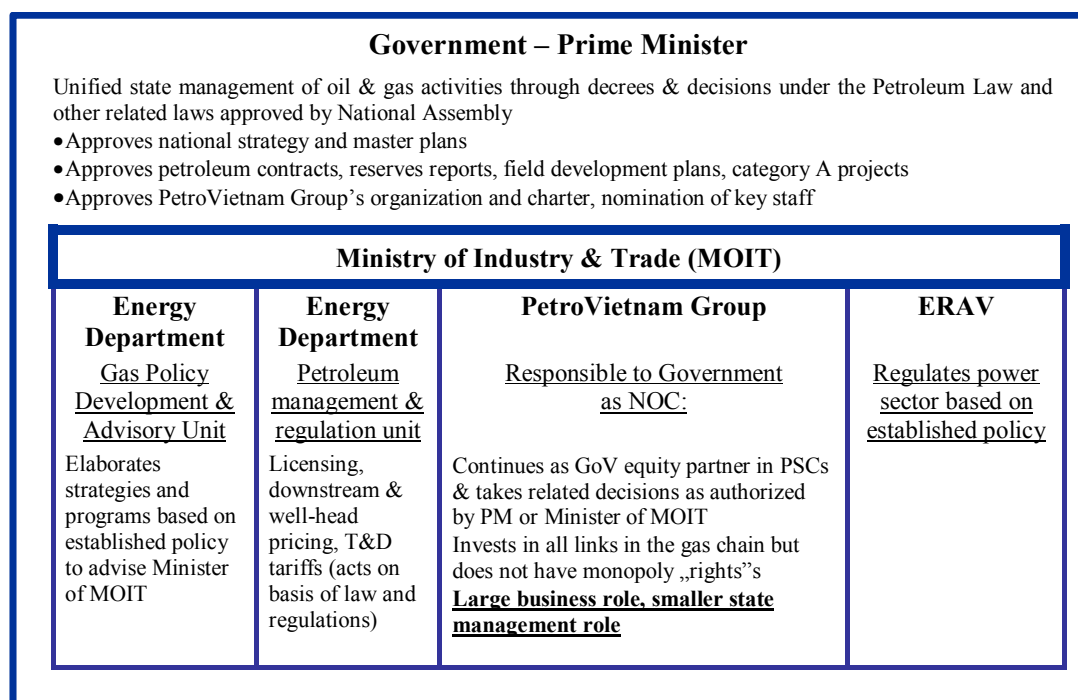
Gas Policy and Operations as a Separate Function: The natural gas sector is distinctive in terms of such matters as: engineering technology; economic characteristics; commercial relationships; and regulatory requirements. Because of these differences, it makes sense to have a separate organization to deal with gas matters in the Ministry’s Energy Department. Experience elsewhere suggests that there would not be any significant efficiencies or synergies from combining the oil products, LPG and natural gas responsibilities in one organization.

Does the Ministry have staff and other resources adequate to the gas sector planning task?: It is noted that there appear to be currently only four persons dealing with this subject matter below the level of the Deputy Director in the Energy Department of the Ministry and some of their time likely has to be devoted to oil matters. A first impression is that the Ministry may not presently have the personnel, skills and other resources to properly carry out the additional functions and responsibilities envisaged in this Report. Arguably, three or four persons are needed to understand, analyze and advise on each major “link” in the gas chain. Early, critical attention therefore needs to be given to the question of the quantity, quality, training and resourcing of the Ministry’s staff support in this very important area of energy planning. This “capacity building” must be a focus in the next stage of development of Vietnam’s gas framework:

this need and the importance of meeting has been recognized in the Bank’s internal review of the present Report.

In summary as to the matter of an institutional structure for Vietnam’s gas sector development, the recommended option is presented in box 3.5

Box 3.5 Recommended Option for Institutional Structure



3.10 The second step: use the Institution to address specific issues identified by World Bank consultants in previous work --- that earlier work provides an agenda for the recommended Gas Policy Development and Advisory Unit and the Petroleum Management and Regulation Unit. The following text summarizes its findings and suggests how they should be addressed

❖ **Issue-1: Gas versus Alternative Fuels--Finding:** *There is a gap in the approach to planning and there is insufficient analysis of alternative fuels and of the economic value of gas:*

- Assessments of the competitiveness of gas in power generation are of course highly dependent on the assumptions used as to e.g. capital costs of capacity, cost of capital, coal price, thermal efficiency and so on. An illustrative example of the estimation of the market value (and therefore competitiveness) of gas compared to internationally-priced coal is given in figure 4.4.
- Additionally the economic value of gas in power generation needs attention:

- Some trade-offs are not accounted for in the sort of simple economic analyses previously carried out, for example:
 - Adequate diversity of supplies as a policy aim;
 - Environmental impacts—the possible Clean Development Mechanism (CDM) aspect²⁶;
 - Inadequate demand in other sectors—if gas development is going to take place at all, it must have a power market to provide an “anchor” load for gas and support economic sizing of the production, mid- and down-stream facilities;
 - The cost of fuel-substitution capability; and
 - The life cycle benefits to the state from domestic gas development compared, for example, to a development based on imported energy.
- It is for consideration whether and how these factors regarding the economic value of gas can be taken into account in making power sector fuel choices.

Next Steps:

- Strengthen and then apply the Ministry’s analytical capability:
 - First, to direct analysis of the costs of generation by alternative fuels and
 - Second, to more sophisticated assessment of the economic value of gas in power generation,
 - In both cases, taking account of the expertise and processes being used in the power sector for generation planning and for least cost generation.

❖ *Issue-2: Role of PVN in Infrastructure--The validity of some key assumptions such as that PVN should be a major owner and financier of gas and power infrastructure requires examination.*

As an initial contribution to this consideration, refer to **Annex 3** to this Report *Is there a role for the National Oil Company (NOC) in the Gas Sector in the Context of sound National Energy Planning?* The annex concludes that, unless the GoV clarifies that there are links in the gas chain which should be reserved for PVN, the company should play a major role in the gas sector, essentially as one competitor among many. Put another way, the annex does not find that PVN participation is justifiable in economic terms simply because it is a state-owned enterprise.

²⁶ The Clean Development Mechanism (CDM), defined in Article 12 of the Kyoto Protocol, allows a country with an emission-reduction or emission-limitation commitment under the Kyoto Protocol (Annex B Party) to implement an emission-reduction project in developing countries. Such projects can earn saleable certified emission reduction (CER) credits, each equivalent to one tonne of CO₂, which can be counted towards meeting Kyoto targets. The CDM is a feature of the First Commitment Period (2008-2012) of the Kyoto signatories. There is to be a Second Commitment Period post-2012 but the commitments and the contents such as the CDM are not yet know. The web reference is: http://unfccc.int/kyoto_protocol/mechanisms/clean_development_mechanism/items/2718.php

Next Steps: Strengthen the Ministry policy analysis capability and apply an unbiased assessment as to whether PVN’s activity in the mid- and downstream of the gas chain “adds value”. It would do so, for example, if it provided a service such as risk-bearing for which consumers and producers would be willing to pay. Consider whether PVN investment in the mid- and down-stream is at the expense of the group’s capability to finance investments in “decisive areas” of the energy economy. Assess whether PVN’s role can realistically be supplemented or even supplanted by other sources of ownership and financing. Consider whether PVN’s activity may impair the operation of competitive forces in the gas market. Assess whether, long term, PVN’s presence, in its current unregulated form, may contribute to an undesirable lack of transparency in the mid- and downstream from the standpoint of government, producers and consumers.

❖ ***Issue-3: Regulation of the Mid- and Down-stream--Regardless of the ownership of gas infrastructure*** attention needs to be drawn to:

- Relevant portions of the NSED requiring state management functions over the petroleum sector to be concentrated in one agency and a legal basis provided for government’s petroleum sector activities, particularly in the mid- and down-stream; and to
- Previous WB recommendations called for a comprehensive regulatory regime, including third party access, to T&D pipelines etc and for establishment of an independent regulatory authority for the downstream gas sector (the 2006 World Bank diagnostic). Salient elements of such a regime are summarized in Box 3.6.

Box 3.6: Salient Elements of a Mid- and Down-stream Gas Regulatory Regime

- A “gas law” should be enacted responding to the NSED directive to establish a legal basis for, among other things, the price of gas transmission and distribution
- The “gas law” creates a decision-taking organization with the authority over a licensing system: licenses are available for transmission, storage, distribution and shipping operations
- The organization’s activities are governed by a set of procedures for dealing publicly with license applications etc. and processes relating to the internal handing of applications.
- The activities of the different classes of licensee are regulated by the decision-taking organization: transmission businesses’ rates and conditions of service are predetermined; shippers’ rights and responsibilities are similarly set out in license conditions; large gas buyers are licensed to enter into transactions with gas sellers.

Source: World Bank/China Institute for Economic System and Management. China: Regulatory Framework for Long Distance Gas Transmission and Urban Gas Distribution. Beijing and Washington DC, 2003.

Next steps: Turn these issues over for consideration and recommendation to a Task Force led by the strengthened Ministry’s policy unit and consult extensively with

other power sector stakeholders such as EVN, Vinacomin, other IPPs and potential investors and other gas sector stakeholders such as PVN Gas, gas producers and potential infrastructure investors. In regard to “third party access” to T&D pipelines, it must be recognized that this access has to be controlled to protect the interests of pipeline owners and of existing pipeline users. It does not mean that any party at any time can automatically and immediately access a pipeline’s services.

❖ **Issue-4: Gas Development Financing and Risk Apportionment**--In regard to *gas development financing and risk*, the main recommendation is for a more focused role for PVN to optimize financing needs:

- Overall: identify costs/benefits of delaying investments
- Upstream: consider the most appropriate fiscal terms for PSCs. This reflects as well the NSED development strategy “to conduct regular reviews and adjustments to fiscal terms to enhance the competitiveness of oil and gas exploration and development in Vietnam over competing countries” and the recommendation of the World Bank’s diagnostic in 2006 to make fiscal terms simpler and more competitive.
- Midstream: develop the rationale for selecting models (Joint Venture [JV], Build Operate Transfer [BOT], Build Own Operate [BOO], etc.) for each gas processing plant and each transmission pipeline; and carefully design-in third party access to all facilities that have natural monopoly characteristics.
- Downstream: if PVN makes further investments in the production of fertilizers and power, clarify PVN’s capacity to finance such investment, carefully design these markets for competition and present methods that would avoid potential conflicts in such areas as gas allocation in the event of supply shortfalls (the purpose would be to address situations where PVN owns and controls gas pipelines serving several gas consumers, some of which are owned wholly or partly by PVN).
- Risk apportionment: gas sector risks include: project completion risk; reservoir risk; other supply risk; technical risk; market risk; price risk; and volume risk. Analysis should be undertaken to determine whether the parties who are exposed to the different risks are in the best position to bear the risks.

Next steps: Refer these issues to the Petroleum Management and Regulation Unit of the Ministry which would then pass the results of investigation to the Policy Group to formulate appropriate recommendations for the Deputy Director, Director-General and ultimately the Minister of Industry and Trade.

❖ **Issue-5: Supply/Demand uncertainties**--As to *broad gas supply/demand issues*:

- Investigate gas supply availability, consider a third-party audit of reserves estimates, examine risks and costs (domestic/imports/pipeline and LNG).

It is appropriate at this point to reference **Annex 4 Liquefied Natural Gas (LNG) Issues**. This document has been provided in part to supplement consideration of LNG as a component of future gas supply for Vietnam in the context of

supply/demand uncertainties already identified. It also responds to requests in the context of the current Report for summary views on: acquisition of LNG; the effect on global markets of Vietnam entering the LNG import field; LNG pricing; markets for LNG in Vietnam; and the possible impact of LNG imports on Vietnam gas pricing policies and practices. The Annex concludes with a summary in the form of pros and cons of LNG imports at this stage in the development of Vietnam's gas industry and with some observations on a possible approach to further work by the Minister.

- Examine alternative gas demand projections
- Develop a scenario approach to supply and demand (S/D)

Next steps:

- Upon the NGMP becoming available, Ministry staff critically examine the supply and demand data in that Plan, consider alternative scenarios and alternative demand scenarios based, in regard to the power sector, on the advice of ERAV which in turn will take account of official growth parameters defined by the GoV
- Present alternative cases (base/high/low?) for gas supply and demand or, in the alternative, endorse and accept the cases presented in the NGMP.

❖ ***Issue-6: Decision-Taking Processes--there is a need to:***

- Provide decision-making criteria for purposes such as:
 - appraising options (e.g. such as gas imports) in case domestic discoveries or developments fall short of expectations;
 - addressing environmental costs and benefits of gas use, noting that power sector planning would typically already include allowance for the environmental cost of coal; and
 - designing appropriate criteria for selecting investments in which PVN should participate.
- And to develop key implementation frameworks such as appropriate fiscal and commercial terms for raising financing/sharing risks (see above), a regime for third party access to gas pipelines (above), a suitable gas pricing regime (section 4), and possibly criteria for subsidies, if justified (section 5).
- ***Next Steps:*** Refer these issues to the Petroleum Management and Regulation Unit of the Ministry which would then pass the result of investigation to the Policy Group.

Results: the recommended assessments such as: the economic value of gas in power generation (which will recognize that processes for selection of generation projects are already sophisticated); the place of PVN in the mid- and down-stream; the role of regulation in those links in the gas chain; and of financing issues, should all feed back into improved policy implementation and project decision taking.

3.11 The third step: use the Institution to achieve a structured approach to sector decision-taking that will be robust over time:

It may be a minimum of 10 years and possibly 15 before the Vietnam gas market has developed to the point where competitive forces of supply and demand can wholly and effectively take over from government the task of selecting which gas and power and, possibly, gas distribution projects should succeed (or fail).²⁷ That competitive condition is described under section 5 as the emergence of the WCGM.

In that interim period, the development of the gas sector could be supported and encouraged if the GoV were to institutionalize the *indicative planning* approach that is inherent in the concept of gas and power master plans and was alluded to earlier in this Report in the context of the proposed Vision for the gas sector.

A stepwise approach to the use of such planning is recommended and would require the following activities under the overall direction of the Ministry and involving the proposed Gas Policy Development and Advisory Unit and the Petroleum Management and Regulation Unit:

1. Salient components of the NGMP, namely Chapter III Assessment of the Potentials for Domestic Sources of Gas and Chapter IV Forecast of Domestic Market Demands for Gas are updated on a two-year cycle and on a rolling 15-years forward basis (2011 would be through 2026 etc). To facilitate this, the 2009 NGMP data acquisition, storage and manipulation processes should be designed to routinely handle updated statistical and other information and create the relevant outputs.
2. These assessments and forecasts would be combined into three alternative gas supply and demand scenarios such as: “business as usual”; “strongly favorable business environment”; and “negative business environment” (responsibility: the Ministry’s coordination unit).
3. These scenarios would then be used to develop indicative plans as to the potential share of gas in total primary energy supply, taking into account possible changes in fiscal and pricing terms, and the share of gas generation in power supply. These indicative plans would be expressed as “target” percentages which would of course take account of national energy planning in respect of energy, power, coal, hydro, nuclear, renewable energies etc., as well as of such factors as the economic value of different power generation fuels, environmental considerations and straight cost comparisons. There is no intention that this planning activity should “impose” certain gas volumes on particular consumption sectors.
4. The indicative plans would be forwarded to ERAV as potential inputs for power sector planning. It is recognized that this could not derogate from established power sector least cost planning principles: beyond 2012, the Single Buyer is to start

²⁷ In power, the wholesale competitive market is to start in less than 10 years time. It is possible that, before 10-15 years, decisions on gas-fired generation investment could be made outside a PMDP exercise by the Ministry.

procuring new generation following a least cost generation plan (which is updated periodically).

Box 3.7 below provides an example from USA practice of the integrated analysis of natural gas issues. Note that this work receives attention by senior policymakers even though the USA's energy and natural gas policies rely very heavily on the free working of well-developed markets. The value of this kind of work might be even greater in Vietnam which is in the process of implementing market solutions.

**Box 3.7: Integrated Analysis of Natural Gas Issues:
An Example from the USA**

Based on the work of the USA National Petroleum Council, an advisory body to the USA Secretary of Energy. The particular example is the Council's 2003 Report "Balancing Natural Gas Policy—Fuelling the Demands of a Growing Economy". This was provided to the USA government. It is a good example of the way in which a diverse private sector can be harnessed to become one source of analysis and advice to policymakers. In this case, the advice related to the whole gas sector—up and downstream, supply and demand.

<http://www.npc.org/>

Additionally, reference might be made to the work of the USA Potential Gas Agency (PGA) and its operating Committee. The PGA provides periodically-updated studies on the potential gas resources of the USA. Again, this is one independent source of advice for policymakers. It will be supplemented by internal sources such as the USA Geological Survey in providing information about what might be the size of the gas resource from which reserves are created and ultimately production is derived.

<http://geology.mines.edu/pgc/index.html>

<http://www.aga.org/Newsroom/news+releases/2007/PotentialGasReportShows.htm>

5. These plans would similarly be taken into account in the project approval processes for new gas developments, including related infrastructure, both project-specific and the common-use facilities (the "trunk pipeline concept") that are needed for reasons of supply security and as a necessary condition for a functioning gas market.
6. Throughout the recommended process, particular difficulties and dangers would have to be recognized. First is the difficulty of getting realistic demand scenarios for the power sector whether from the Ministry or the state-owned enterprises SOEs. The danger is that the process could lead to plans that are consistent but not necessarily realistic. Second is the difficulty that for a particular demand scenario to be realized there will have to be generation investors willing to build gas fired plants. That will only come about if the investor's own analysis yields the conclusion that gas will lead to least cost generation and that the danger of owning a stranded asset will be minimized.

Result: There will be a continuous integration of realistic gas supply and demand scenarios with a special focus on the power sector. This should lead to more realistic gas sector investment planning and provide valuable guidance for project review and approval. Box 3.8 suggests the salient inputs for a gas/power coordination function.

Box 3.8: How the Gas/Power Coordinating Function Could be Exercised
Inputs, drawn from, respectively, ERAV and the Petroleum Management and Regulation Unit

Gas:

- Forecasts of gas supply, based on reserves and resources estimations, indicating varying degrees of confidence going out into the future, under varying gas price assumptions (GMP Ch. III) – from time to time an ‘external audit may be wise
- Forecasts of gas demand outside power sector (to some degree” co-demanded” with power that provides anchor market)—including potential export demand for the very long term (GMP Ch IV)
- Forecasts of supply (including potential import supply for long term) and demand (power + other) integrated and fed into the planning for:
 - development of existing oil and gas rights and
 - release of further rights (incl. fiscal terms)
 - in both areas, decide to accelerate/defer
- Applying principles that include recognition that:
 - Present-worth considerations in terms of investment and employment are powerful and need to be accommodated;
 - Integrated gas development projects’ lead times tend to be longer than consumption projects’ lead times: therefore on both grounds, take steps to minimize policy and regulatory approval lead times
 - Adequate upstream gas investment, entrepreneurship and technology is foundational for a robust gas chain²⁸: ensure in pricing policy (see below) that upstream regime is internationally competitive in terms of structure and potential reward-opportunities for investors
 - Integrated gas development involves a variety of risks (examples: reservoir, completion, technical, price and volume): it is important to ensure that ownership structures and commercial relationships along the chain suitably apportion risks, particularly the price and volume risks
 - Take account of economic value of gas particularly in the power sector (including: diversity of supply; environmental advantages; critical importance of anchor market; life cycle benefits to the state):because “cost pricing”, including elements of opportunity cost-pricing (export or import opportunity) does not reveal the whole picture

Output: gas volumes/scenarios of availability for the power sector under varying price assumptions

Electricity (outside the scope of this paper) :

- PMDPs updated annually See ERAV
- Basis uses least-cost generation planning
- Additional to capital, operations and maintenance (O&M) costs, include provision in analysis of costs of alternative fuels for environmental externalities, for various forms of risk including, in the case of imported fuels, security of supply (E.g. add-in x months stockpile cost. Regulation exists on stock of fuel the power plant should have. This is not a significant cost in an expansion plan.)

Output: gas volumes for power generation (under different hydrological scenarios) under varying assumptions as to gas price and maximum gas volume available for the power sector at particular locations and assumptions for power sector including demand growth scenarios. These assumptions, which are inputs for power sector planning, would be provided by the appropriate unit of the Ministry.

Initial output of coordination process

- A range of scenarios (“plausible futures”) and indicative forecasts of gas supply and requirements for power
- Make explicit the specific sectoral policies and their implementation underlying each of the scenarios

Iteration:

- Review outputs in relation to gas from power expectations, consult with gas and power sector actors, make mutual adjustments as far as can be done without derogating from established power sector planning requirements
- Forward for critical examination by gas policy unit of the Ministry, ERAV
- Revise and publish as indicative plans of alternative gas futures for the energy, gas and power sectors.

²⁸ The “gas chain” is defined and described in Box 1.2

- Update every two years.

3.12 The place of better planning and decision-taking in achieving GoV goals for the gas sector

The institutional, organizational and analytical steps that are outlined above can contribute importantly to better planning and decision-taking for Vietnam's gas sector.

However, these are “necessary but not alone sufficient” conditions for achievement of the GoV's goals for the natural gas sector, as expressed in the objectives of the National Strategy. In addition what is needed is: a clearly-expressed vision for the sector; a strong commitment to a related implementation road map; the effective communication, in Vietnam and abroad, of the GoV's intentions; clarity as to the Ministry's amended structure (gas policy unit and petroleum management unit), and the issue of organizations to effect coordination across different energy sub-sectors.

Conclusion: Acting within the existing, comprehensive mandate of the Ministry's Energy Department, there is significant work to be done. First there is a need to supplement the present organization by creating a sub-structure which, properly staffed and resourced, can more effectively address sector planning issues in the context of national energy planning. Second, the new structures can then be put to work to respond to outstanding and developing issues such as the pending NGMP and this Report. Thirdly, there is a need to achieve a more structured approach to sector decision-taking. What is needed is a scenario approach from which indicative plans can be routinely developed and updated to provide an improved, integrated, realistic basis for both gas and power sector planning and decision taking by public and private entities.

3.13 Pros and Cons of what is proposed

Pro

- Builds on the sound policy foundation laid out in the NSED;
- Employs economic principles that are consistent with GoV policy directions for the energy and other sectors;
- Can be achieved using existing institutions (essentially the Ministry) which have only relatively recently been organized and mandated;
- Will not disrupt the important task already well in hand of power sector reform;
- Identifies and suggests solutions to the problem of lack of coordination between the gas and power sectors, while respecting established generation planning and least-cost generation policies that are being implemented;
- Contains international examples (International Energy Agency [IEA] and other) and viable proposals (create a gas network) to achieve the desired improvement in security of energy supply.

Con

- Introduces indicative planning concepts which seem to have elements of the now discredited “command and control” approach (but indicative planning as presented here is completely consistent with market solutions for this sector);
- Requires allocation of more scarce human and other resources for the Ministry’s gas sector planning (but the amounts are proportionately small);
- Introduces what for Vietnam is the novel practice of modern regulation of gas sector natural monopolies (but this network-regulation issue is going to be dealt with anyway in the power sector by ERAV);
- Does not address energy regulation, including all fuels (but this Report intentionally relates only to natural gas); the oil and coal sectors do not present the same regulatory issues as the “energy network industries”, namely gas and power; and the possibility is raised of using the existing ERAV, re-mandated, as the downstream gas regulator);
- Does not describe a comprehensive energy security policy and implementation program for Vietnam (nor was it intended to).

4. Pricing Methodology for Natural Gas

This main section argues that Vietnam’s urgent need for a generic approach to gas pricing must be addressed by first implementing a competitive gas pricing methodology linked to internationally-priced coal in the power generation market (possibly within a government-recommended band). This methodology will not only allow gas to compete against coal as a fuel for base-load power generation but will also lead to economically efficient development of Vietnam’s gas and coal resources. Once a wholesale competitive gas market is introduced and workable competition is established, competitive gas pricing can transition to pricing negotiated between gas buyers and gas sellers without government constraints.

Arrangement of Material

Section 4 starts by considering the need for a generic pricing methodology under **heading 4.1** and goes on in **4.2** to examine principles for such a methodology, particularly the need for gas prices to be competitive with and properly linked to fuel prices in power generation markets. The recommended “competitive pricing methodology” is presented in **4.3**. The calculation of that competitive price is demonstrated in **4.4** and the argument connecting competitive pricing and efficient gas resource development is made under **4.5** while the implementation of the relevant methodology follows under heading **4.6**. The recommended method of giving policy and administrative form to competitive pricing is dealt with in **4.7** and the related trade-offs between pricing policy and upstream fiscal terms are discussed in **4.8**. Under heading **4.9** is an examination of options for distributing “rents” along the gas chain, concluding that they are best concentrated in the upstream end. Finally, the recommendations are recapitulated and the anticipated benefits of competitive pricing methodology are summarized under heading **4.10**.

4.1 A generic gas pricing methodology is a policy priority

The creation and implementation of a gas pricing methodology would have an early, positive effect on investment and activity in the sector. It is therefore recommended as the first priority for change in the state management of this industry.

Vietnam’s gas sector urgently needs a generic gas pricing methodology for two principal reasons.

First and most important, its absence seriously handicaps gas development in Vietnam. It leaves producers and consumers without guidance for price estimation. This estimation is a central element for the economic evaluation of their projects. Without this guidance, upstream investors cannot confidently evaluate their probable returns from exploration and development, the GoV cannot assess and optimize its fiscal revenues from gas development, and gas consumers have no basis to estimate their costs for gas supplies.

Without a generic pricing framework, it is also difficult for Vietnam to guide economically efficient development of its energy resources, particularly natural gas and coal which are critical for power generation and continuing economic growth.

Second, a generic gas pricing methodology can be designed to simulate probable competitive market behaviors. Presently, there is insufficient gas seller and buyer competition to create the functioning market which is the government's long-term policy objective. However an appropriate gas pricing methodology can achieve some of the benefits of market competition and help pave the way towards that objective.

As Annex 5 presents in detail, the international experience with gas pricing suggests that Vietnam can benefit significantly from a generic pricing methodology. Vietnam currently follows an approach to gas pricing which generally involves separate negotiations for each project²⁹. The experience of Pakistan and Bangladesh in the 1990s and Canada in the period 1975-85 shows that shifting to generic gas pricing linked to international fuel prices can help increase upstream investment to meet gas demand. This would allow all stakeholders, particularly upstream developers, to gauge risk using their own projections of these fuel prices.

In Vietnam, the nature of such a generic gas pricing policy is to be shaped by the NSED's guidance on this topic in two areas: market-based pricing and integration of domestic energy resource development with international energy market trends. Under Heading 4 "Implementation Solutions", the NSED states:

b) "Energy Price Policy": "Energy price policy is considered one of the breakthroughs which rapidly eliminate monopoly [and] subsidy in both manufacturing and consumption of energy. Energy prices must be determined in accordance with market mechanisms."

Moreover under Heading 1 "Development Viewpoints", item b), the NSED states that:

"National development of energy should be harmonized with the international integration tendency..., effective use of domestic natural resources in combination with the appropriate exploitation and use of foreign natural resources."

The practical implications of these statements are that Vietnam's policies on energy market design and energy pricing should be created with a careful eye to international trends partly with the possibility of integrating Vietnam into those trends. This section of the Report proposes a generic gas pricing methodology based on the NSED's guidance and the experience of a number of countries, appropriately adapted to the particular situation and needs of Vietnam's gas sector.

²⁹ The exception to this generalization is gas from the PM-3 development. There, the gas price, which is calculated as a ratio to the price of Medium Fuel Oil (MFO), is derived from an earlier negotiation for the sale of a proportion of that gas for power generation in Malaysia.

4.2 Principles for a Generic Gas Pricing Methodology for Vietnam

A gas pricing methodology for Vietnam must serve twin objectives:

1. At the supply end, in combination with the upstream fiscal regime, it has to provide the appropriate financial incentives to gas developers to invest in exploration, development and production activities; and
2. In gas-consuming sectors, it has to provide the right signals to investors to choose gas as the economic, lower-cost fuel when supply increments become available.

The first role should lead to optimal investments in the upstream sector, i.e., at any given time, only those gas fields should be developed which are economically competitive in Vietnam's main gas consuming sectors.

And the second role should lead to optimal investment in the consuming sectors, i.e., gas should only be used in those gas-consuming projects in which is it competitive against its alternatives.

This dual role means that a gas pricing methodology for Vietnam has to ensure that the gas price captures the highest possible value of gas in its main gas-consuming sectors (downstream) while avoiding the development of uneconomic gas fields (upstream).

For large-scale gas development to take place, Vietnam's gas has to be competitive in power generation:

The power generation sector currently consumes 88 percent of the nation's gas production. All projections for the development of Vietnam's gas sector show that rapidly expanding power generation will remain the dominant wholesale consumer of natural gas in Vietnam at least until 2025. Vietnam plans to adopt a competitive power generation market during 2009-2014. This is a major opportunity for the nation to further develop its gas sector because, in an economy which does not have a significant space-heating requirement or concentrated industrial loads, large-scale gas resource development can best be anchored by major new power plants. By contrast, individual projects in other consuming sectors, such as fertilizer production, transportation (CNG), ceramics, etc., do not possess large enough scale to become "anchor tenants" which can provide the volume to support major gas projects. For these reasons, if further large-scale gas development is to take place, natural gas will have to be competitive as a fuel in Vietnam's power generation sector.

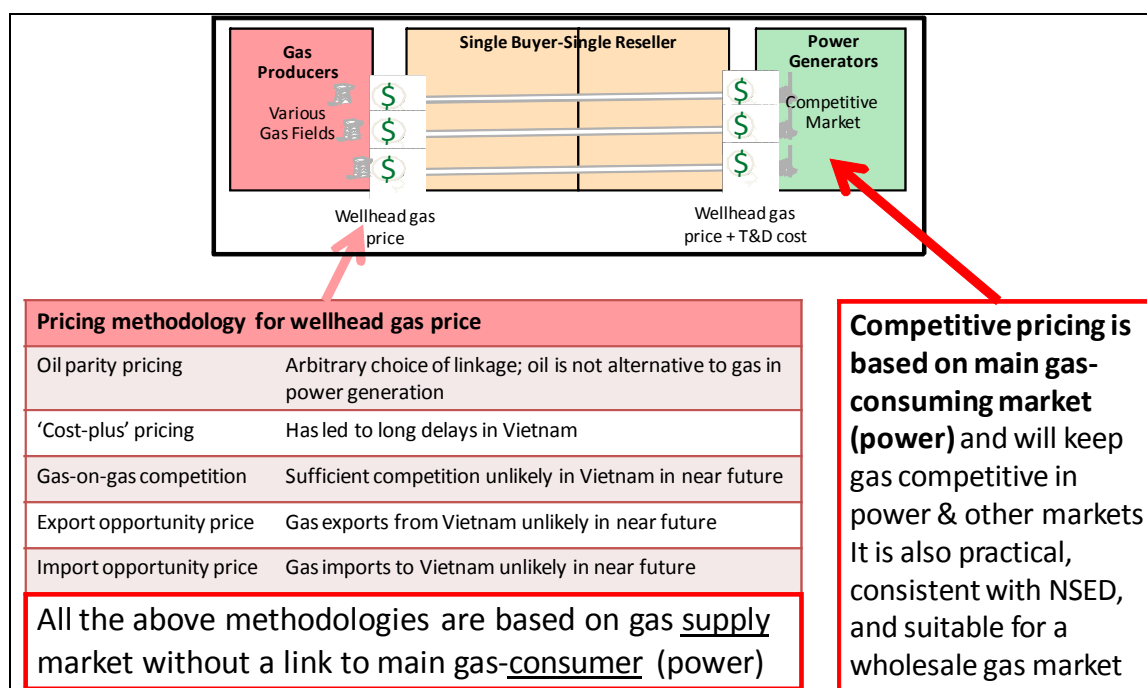
Vietnam must select a pricing methodology for processed natural gas that links to the power generation market:

So far, the methodologies utilized for pricing gas at the tailgate of the processing plant³⁰ in Vietnam (fuel oil-related pricing for PM3, cost-plus pricing for Nam Con Son and

³⁰ This is the point at which the gas production operation is completed and marketable gas normally enters the transmission system for its first commercial sale.

Bach Ho³¹) are not linked to the dynamics of the power generation market. These gas pricing methodologies are focused only on the gas supply component of the gas value chain (figure 4.1). In developing an appropriate pricing methodology for Vietnam, the following alternatives were considered and found to be unsuitable:

Figure 4.1 A Gas Pricing Methodology for Vietnam Linked to the Power Generation Market



“Oil parity pricing” (example: $0.46 \times \text{Medium Fuel Oil (MFO)}$ for PM3): the choice of multiplier (such as a fixed 0.46 for PM3) or other linkage to the oil price is necessarily arbitrary and may not ensure that gas is competitive in the power sector at all times. Further, oil is not an alternative to gas in power generation for Vietnam base load supply. Therefore, oil-linked pricing will not necessarily keep gas competitive as a power generation fuel (note: it appears that the Ca Mau power generation plant supplied by PM3 gas was often not dispatched in the power market during periods of high oil prices in 2008);

“Gas on gas competition” (example: North America): there is unlikely to be sufficient competition among domestic gas sellers for this option to be viable in the foreseeable future;

³¹ A new gas pricing structure for Cu Long Basin fields was approved by the Prime Minister in May 2009, as a result of a joint proposal of the Ministry of Finance and the Ministry made in April. Prices are to rise from approximately \$US2 per MMBTU to \$2.98 on June 1, 2009 and to \$3.55 on March 1, 2010. PVN had sought approval for the higher prices to cover increased gas field maintenance costs and to pay for needed infrastructure investment. (Source: Viet Nam News Service May 26, 2009. <http://vietnamnews.vnagency.com.vn/showarticle.php?num=03BUS260509>)

“Cost of service” of gas production (example: USA in the 1960’s and in Canada until 1975): this is inconsistent with the NSED’s stated policy direction and it failed to attract sufficient upstream investment when it was tried for a decade or so in the USA in the 1960s and in Canada until 1975; it has also led to lengthy price negotiations in Vietnam, resulting in project delays;

“Export opportunity price” (example: Netherlands): large volume gas exports from Vietnam are unlikely to occur in the foreseeable future;

“Import opportunity price” (example: Mexico): large volume imports of pipeline gas to Vietnam are unlikely to occur in the near future.

The possibility was also considered of deriving a gas price by working back from an average electricity “pool price”. This resulting price would reflect a composite of the costs of all the sources of generation used at any one time. As an average, it would conceal some inefficiencies such as the use of fuel oils and some fundamental differences in cost structures such as the very low operating costs of hydro-electricity. This idea was not pursued for these reasons and because it would not provide the necessary link between the gas price and the economics of the incremental supply of power generation.

Another possible pricing methodology, which usually has a political rationale, is “an economically and socially acceptable electricity price”. But this is not the competitive energy market solution directed by the NSED. The prices of energy commodities should be driven by competitive values in the markets they serve, not by what might be termed “affordability” criteria for any secondary energy generated by these commodities. Ideally, affordability considerations should be addressed not through pricing but through targeted support programs for those members of the community who are least able to meet their minimum electricity needs at market prices. Wherever there is a demonstrated social need for subsidy, the government should directly subsidize the target group rather than subsidizing the gas commodity itself.

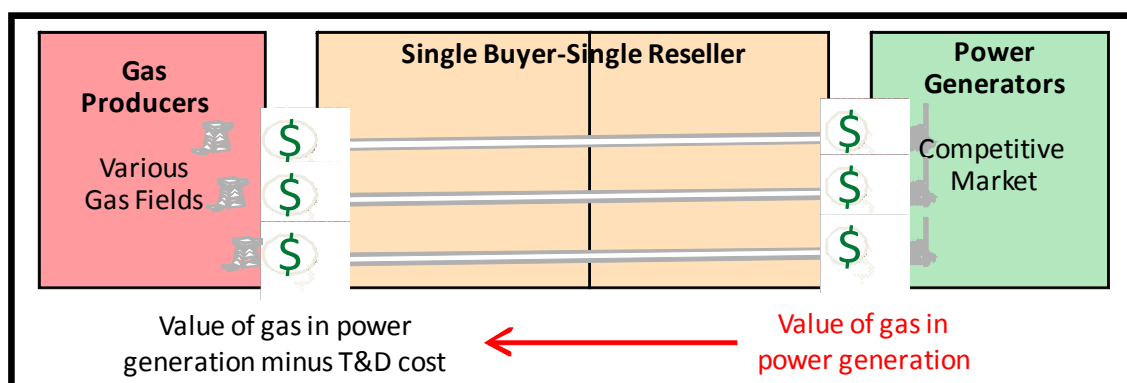
If Vietnam adopts any of the above methodologies for pricing sales gas at the tailgate of the processing plant, there would be no assurance that gas would be competitive in the power generation market in the long term. The main shortcoming of these methodologies in Vietnam is that they fail to link the upstream gas sector to conditions of competition in the market for power generation fuels. As figure 4.1 states, a gas pricing methodology based on the power generation market can make gas competitive in its consuming markets.

4.3 Recommended methodology for Vietnam: ‘competitive pricing’

A ‘competitive pricing’ methodology will allow gas to secure its place in power generation: Under competitive pricing, a gas price at the exit of the gas processing plant is developed by starting in the power generation market. *The aim of competitive pricing is to estimate the gas price which will make a unit of electricity generated by a gas-fired power plant competitive against a unit of electricity generated by a power plant using the first choice of alternative fuel.* This would be the price at which wholesale gas should be offered in the power generation market. This approach to discovering the wholesale gas

price will allow gas to compete in power generation. This concept is illustrated in Figure 4.2.

Figure 4.2 Under Competitive Pricing, the Wellhead Price is derived from the Value of Gas in Power Generation



The pricing methodologies shown in figure 4.1 develop the price of gas at the power plant gate by discovering a price for processed gas in the upstream gas sector and adding to it the T&D cost of delivering that gas to the power plant. Under competitive pricing, the logic of price formation runs in the opposite direction. As figure 4.2 shows, the competitive price of gas at the power plant gate is discovered in the power generation (i.e., gas-consuming) sector and the price for a specific field is developed by deducting from that competitive price the regulated T&D cost of delivering gas from that specific field to the power plant (if, as is often the case, the power plant’s gas supply is delivered at high pressure off the transmission system, there would be no distribution cost to account for).

In figure 4.2 and elsewhere the term “wellhead price” is used as a short form for the price at the point of production. The production operation is completed when the “raw gas” coming from the wells leaves the processing plant as “sales gas” into the receipt point of the transmission system. That geographical point is sometimes described as the “tail-gate” or “exit” of the processing plant.

Canada furnishes an example of the way that competitive gas pricing was used by the government to break away from outmoded “cost of service” pricing following the 1973-74 “energy crisis” and to ensure that gas would be competitive in industrial markets that anchored gas demand at that time. Box 4.3 below outlines how what in Vietnam would be considered PSC terms, were amended by governments to achieve competitive gas pricing in Canada during the period 1975-85.

What “competitive pricing” does and does not mean: This expression was carefully chosen to be meaningful to the broad audience of this Report. It means pricing that will ensure gas is competitive against the most likely alternative fuel in power generation which is the only market that can anchor large-scale gas development. It therefore has the same meaning as “market-value pricing”, but the term “competitive” is preferred because

it better conveys the purpose of the proposed pricing method. The expression does not mean “prices determined by supply and demand” because prior to the final establishment of the Wholesale Competitive Gas Market (Phase 3 of the transition, see Section 5 below) those forces will not be strong enough to determine the level of gas prices.

In Vietnam’s power generation market, coal is the competing alternative fuel to gas:

Under competitive pricing in the power generation market, gas has to be priced such that it competes with the most likely alternative fuel to gas in power generation. Vietnam has a handful of fuel choices for power generation: various grades of fuel oil; LNG imports; nuclear; hydropower; other renewables; and coal. Section 4.2 argues that large-scale development of gas resources can be achieved only through large-scale gas-fired power generation. This imperative provides the basis for selecting an alternative fuel to gas for competitive pricing.

When a power generation investor is making a decision about whether to use gas for a large-scale base-load power generation project in Vietnam, which fuel is likely to be the key alternative to gas in this decision? *It has to be a fuel that is suitable for incremental base-load power generation, is most likely to be considered by power generation investors, and will be abundantly available to allow large-scale exploitation for power.* In presenting these criteria it is recognized that generation investor’s decisions will be taken in the context of the policy environment existing at that time. Government policy might relate to such matters as: geographical location; type of plant (in the case of coal, sub- or super-critical); thermal efficiency; clean technologies etc. These are presently unknowns. The following fuels were reviewed against the above criteria to select the most likely alternative fuel to gas in power generation:

Fuel oils: not suitable for base-load generation because, compared to alternatives, prices tend to be high and volatile;

LNG imports: will drive Vietnam’s domestic gas price up to the range of international LNG prices, which in East Asia are related mainly to oil prices; this approach would be without any obvious economic benefit; large volume imports of LNG to Vietnam are unlikely in the near future; there is no international example of domestic gas prices driven by LNG import prices;

Hydro-electricity: in Vietnam is generally not suitable for base-load because of the seasonal nature of river flows; hydro-electricity has different economic characteristics than thermal power (generally, much higher capital costs, virtually zero operating costs); hydro-electricity is not the incremental source of base load power supply;

Nuclear: the NSED envisages bringing the first nuclear power unit into operation in 2020; typically, a nuclear plant would supply the base load; nuclear electricity has some of the cost characteristics of hydro-electricity referred to above; there is no international example of domestic gas prices driven by nuclear costs;

New renewables: electricity supplies from small hydropower plants, wind and biomass of less than 30MW are to be priced based on the price of the electricity these sources displace from gas-fired power plants (avoided cost methodology adopted by GoV);

“Basket of fuels”: when selecting the technology for a new plant, investors in power generation do not look at “baskets of fuels” but make choices among particular fuels;

Coal: Coal is the obvious fuel alternative to gas for power generation in Vietnam given its suitability for base-load generation, its abundant supply from

domestic and import sources and its low price per unit of energy relative to fuel oils or LNG.³²

While coal is the obvious alternative fuel to gas in power generation, an important distinction has to be made between current domestically-priced coal and internationally-priced coal in Vietnam.

The current low price of domestic coal relative to coal's international price in Vietnam does not reflect its economic opportunity cost (which is reflected by internationally-priced coal) and therefore contains an implicit consumer subsidy. This means that for providing fuel to a power plant in Vietnam, a coal mine that is expensive to develop could compete well with a gas field that is cheap to develop because the current domestic pricing of coal hides the true economic cost of developing that coal mine. This can lead to sub-optimal investment decisions to develop more expensive coal mines when there may be gas fields that could be developed at a lower cost for power generation. Moreover, subsidies and non-market pricing are contrary to the principles and policy objectives of the NSED. In the summer of 2009, there are indications that the Government is moving to raise coal prices towards international levels to conserve coal and to discourage illegal exports.³³

Some basic information about the coal industry in Vietnam, including intentions to import coal, is set out in Box 4.1.

³² The English-language Vietnam News on June 22, 2009 published an interview with a senior PVN official regarding issues surrounding the allocation to PVN by the GoV of responsibility for five large new thermal electric plants. The official commented that "PVN has established a coal import and export company, which is responsible for purchasing imported coal and negotiating long-term coal use contracts from mines to fuel the thermo-electricity plants We are also chalking out a plan to buy shares or co-operate with foreign partners to exploit coal mines in Indonesia and Australia" <http://vietnamnews.vnagency.com.vn/showarticle.php?num=01COM220609>

³³ An August 12, 2009 press report stated that "National coal monopoly Vinacomin will no longer be allowed to sell coal domestically at the cheap prices it has been offering, according to a statement posted on the government website Wednesday. According to the statement, the price of coal for domestic consumption will be 10 percent cheaper than export prices at the lowest. The move aims to establish market-oriented prices for the domestic coal market, the statement reported, citing a note from Prime Minister Nguyen Tan Dung. Coal sold to domestic users, excepting coal sold to power plants, must cost closer to market rates to conserve coal and prevent the illegal export of the resource, the website said. Dung also ordered Vietnam National Coal-Mineral Industries Group, known as Vinacomin, to begin selling coal to power plants, the biggest coal users, at market-oriented prices next year, according to the website. <http://www.thanhniennews.com/images/newsimages/khaihac-than-003-06.gif>

Box 4.1 Basics of the Vietnam Coal Industry

Ownership: Domestic production is a monopoly of a state company Vinacomin, which was created by Prime Ministerial Decision of 1994. Only 1% of Vietnam's production is produced by other companies.

Resources and Reserves: proven reserves in 2005 were put at a modest 130 million tons. Resources are assessed at several billion tons.

Quality: the coal presently being produced is almost all anthracite.

Production: the production target for 2009 is 43 million tons and 62-65 million tons for 2015.

Domestic Consumption: about half of the national production is consumed in the domestic market. In 2009 the power industry is expected to use 8.4 million and the cement business 5.6 million tons with the rest being consumed mainly by the fertilizer and paper production industries.

Exports: about half of the national production is exported, mainly to China. A senior official of Vinacomin has stated that exports will be reduced in 2010 to meet rising domestic demand.

Imports: There are presently no substantial coal imports. The energy press reports statements that large volume coal imports will be needed from 2012. It was reported in June 2008 that Vinacomin has contracted 3.5 million tons of imports from Indonesia to supply the Vinh Tan 1 thermal power plant in southern Vietnam and that Vinacomin officials have also been seeking coal import contracts for other power plants. In June 2009 PetroVietnam announced that it has established a Coal Investment, Import and Trading Company to supply fuel for five coal-fed power plants to be built by the PetroVietnam group. The announcement said that PetroVietnam is seeking long term coal supplies, especially from Russia.

Pricing: In 2006 when production was about 25 million tons, 11 were exported at international prices which were then about \$40/ton. 14 was sold on the domestic market, of which 8 million tons at the international price and 6 million tons to power and cement users at lower prices which did not cover the cost of production of domestic coal.

Expectations for Growth: In July 2009 a senior official of Vinacomin stated that Vietnam will need 43.7 million tons of coal in 2010, 61.4 million in 2015 and 76.9 million in 2025.

It is concluded that, in any long term perspective, internationally-priced coal, whether it is domestic or imported, is the appropriate alternative fuel cost for incremental base-load power generation in Vietnam. Consequently, *gas has to be priced such that it is competitive against internationally-priced coal for power generation.*

The question may be raised whether international coal prices are sufficiently transparent for this purpose and, if they are, are they likely to remain so? Box 4.2 is intended to supply an answer to these questions.

Box 4.2 Are International Coal Prices Sufficiently Transparent for Use in a Competitive Gas Pricing Methodology?

What is price transparency? It is information about prices in a market situation: prices that you and your competitors as sellers or buyers of a commodity will receive or have to pay.

Why is it important? Price transparency is an indication that a market is functioning competitively. The ability to “discover” prices accurately, easily and cheaply is important for market participants and for businesses which are using that market information for other purposes.

Are international coal prices transparent? Yes, there is a wealth of information available about coal prices and related ocean freight rates. For example, there is continuously updated material about the prices of standardized grades of coal, expressed at FOB {“free on board” ship} at Newcastle in Australia, one of the world’s largest export points. Some of these data can only be accessed for a fee at: <http://www.globalcoal.com/default.cfm>

Other data are available from international trade statistics for major importing countries such as Japan, Korea and Taiwan. The USA Energy Information Administration’s website contains much information about coal prices in the USA and world-wide.

Do international coal prices relate to a standard specification? Yes. Standards are defined by several organizations, for example standards relating to nine criteria are published by globalcoal (see website address above) for purposes of its Standard Coal Trading Agreement (“SCoTA”) see <http://www.globalcoal.com/scota/scotaSpecs.cfm>

Are international coal prices likely to become more or less transparent? Coal is currently the second most important source of energy in the world. Its use is growing more rapidly than most other conventional energy forms. The share of internationally traded coal in total coal consumption appears to be increasing. In view of these trends, international coal prices are likely to become more rather than less transparent.

Conclusion: International coal prices are sufficiently transparent to be confidently used in the proposed competitive gas pricing methodology for Vietnam.

Consideration was given to the possible objection that the international coal price is volatile and that it may tend to follow international oil prices.

Regarding volatility, observation of relative trends shows that coal prices are less volatile than those of crude or fuel oils. To some degree volatility in the coal spot market can be managed by long term contracts and by the use of instruments to “lock-in” prices.

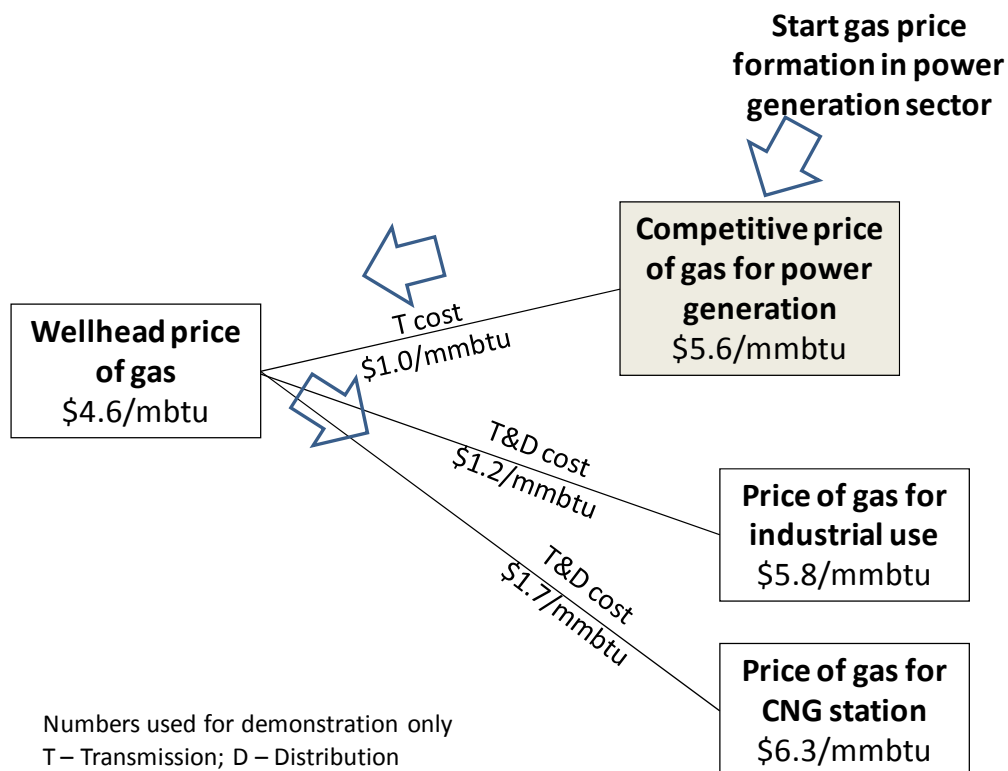
Regarding the relationship of coal to oil prices, the consensus view appears to be that each commodity now responds to its own market dynamics. Coal and oil markets affect each other only marginally because these fuels compete against each other only in a limited and shrinking proportion of the global energy market. Where coal and oil prices appear at times to have moved together, as they seem to have done in 2007-09, this reflects the influence on each of the general commodity price cycle rather than an explicit interaction between the two commodities.

If gas is competitive in power generation, it is likely to be competitive in other uses:

It is important to note here that if gas is priced to be competitive in a bulk (or wholesale) energy market like power generation, it should be highly competitive in industrial and commercial gas distribution markets. In those markets, because of smaller end-use volumes and higher transportation costs, the end-user prices of competing fuels (coal, fuel oil, LPG) will tend to be higher than in thermal power generation, the largest bulk energy market for those fuels. And they will tend to be higher by more than the cost of gas distribution which has to be added to the price of gas in the power generation market.

Figure 4.3 presents a numerical demonstration of this logic. Under the recommended competitive pricing methodology, gas price formation would start in the power generation sector (gray shaded box: \$5.6 per million BTU, which is the competitive gas price in Figure 4.4). It is assumed that the generator would receive its gas supply at high pressure from the transmission system and would therefore not have to pay the costs of low pressure distribution. Therefore, from the wholesale gas price discovered in the power generation use, only the transmission cost of \$1.0 would be deducted to arrive at the price to the producer for processed gas about to enter the transmission system (\$3.9). This gas price would be used to arrive at the prices for industrial and transport uses by adding back T&D costs (illustratively: \$1.2 for large industrial users, \$1.7 for smaller volume commercial users, in this case CNG). If gas is competitive against the bulk supply of a low cost fuel (internationally-priced coal) in power generation, it is likely to be competitive against fuel oils, LPG and coal in other uses as well, even though those other uses would face the added cost of gas distribution.

Figure 4.3 Formation of a Competitive Gas Price



The recommended gas pricing methodology that ensures competitiveness of gas against coal in the bulk fuels market represented by the electric generating sector should therefore ensure that gas is strongly competitive in other markets. Nevertheless it will be necessary to monitor for and correct any distortions that may be created by this methodology in those other markets--industrial, commercial and residential. In most cases potential distortions can be managed by adjusting distribution tariffs and pricing.

4.4 Calculating the “competitive price” of gas

Once the competitive gas pricing methodology has been selected, the calculation of the gas price requires certain assumptions. The specific recommendation for calculating the competitive price of gas in Vietnam is:

The competitive price of gas in Vietnam’s power sector is that at which a generator invests in a combined-cycle gas (CCGT) plant rather than in a modern steam plant burning internationally-priced coal. By “modern steam plant” is meant the type of plant which, based on then-current economic and technical analysis, would likely be selected by investors to meet the incremental needs of the Vietnam power market. The choice would not necessarily be in favor of a super-critical plant.³⁴

In other words, the competitive price of gas in power generation relative to internationally-priced coal is the highest gas price a power investor would be willing to pay before switching to coal as the power generation fuel. Figure 4.4 shows one way of calculating the competitive price of gas using the cost per kilowatt hour of electricity at the power plant bus bar³⁵. The gas price is: the total cost of delivering a unit (kWh) of coal-fired power (namely coal capital expenditure (capex) cost plus coal operations & maintenance (O&M) cost plus coal fuel cost) minus the cost of gas O&M and capex. A typical coal-fired steam power plant’s capex costs are higher than the capital costs of a typical combined-cycle gas-fired plant (CCGT). This favors gas as the fuel for power generation. A typical CCGT plant’s O&M cost is higher than that of a typical coal-fired power plant, which therefore works in favor of the latter. However, a typical CCGT plant also consumes less of its generated energy (own use) than a coal-fired steam plant.

This methodology correctly confers on the gas price the greater capital cost efficiency, higher thermal efficiency and the lower own-use of the gas fired plant but subtracts its higher O&M costs. Beyond these parameters which rarely change from month to month, the international price of coal (which changes daily according to market conditions) determines the price of gas under the competitive pricing methodology.

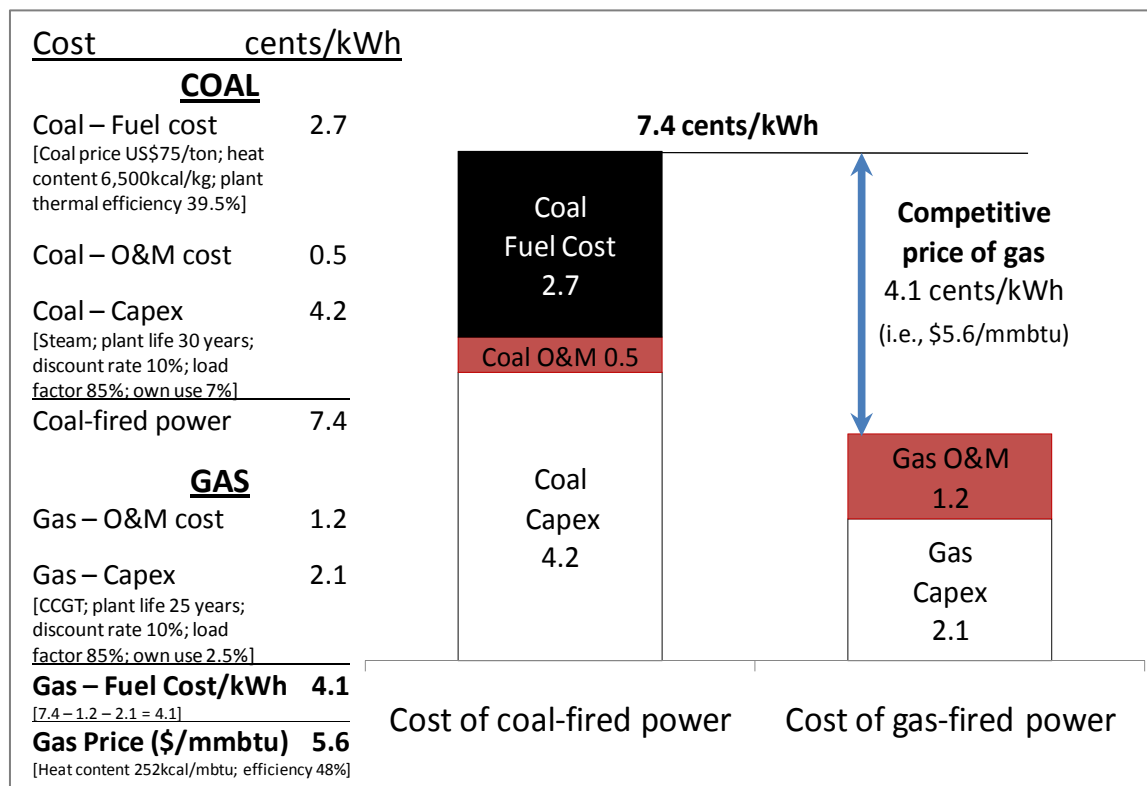
In accordance with the NSED, Article 2 “Implementation assignments to relevant agencies”, the MOIT would be responsible for elaborating this competitive pricing methodology and obtaining the Prime Minister’s approval for it. In order to shield the actual price calculation from political influence, the technical outworking of the price level, indexing, floors and ceilings and so on would be left to the Ministry with or without the advice of an independent third party (See below Section 6 The

³⁴ The Japanese journal The Denki Shimbun (Electric Daily News) reported on August 4, 2009 that the Toshiba Corporation has won an order to supply two 600MW steam turbine generators to a new coal-fired power plant to be built by PetroVietnam. The units will operate at sub-critical steam conditions. <http://www.shimbun.denki.or.jp/english/article/2009080401.shtml>

³⁵ Bus bar: the point at which the power is available to the electricity transmission system from the power plant. Power delivered to that point therefore must reflect all the direct and indirect costs of generation including the cost of power generated but used internally by auxiliaries such as coal handling equipment, coal pulverizing mills, pumps and the like. Figure 5.4 presents a simplified demonstration.

Implementation Road Map for the Gas Sector and specifically part B1. dealing with Gas Pricing Principles)

Figure 4.4 Calculating the Competitive Price of Gas – Simplified Demonstration



4.5 How competitive gas pricing can lead to efficient development of Vietnam's resources

The NSED strongly emphasizes market-based development of Vietnam's energy sector with efficient use of domestic energy resources. "Competitive gas pricing" serves both these themes of the NSED by linking the development of two major energy resources of Vietnam for power generation: natural gas and coal.

Competitive pricing methodology links the gas price to internationally-priced coal for power generation. With this link, coal producers who plan to bring coal from new mines to power generators will compete directly with gas producers intending to bring gas from new fields to power stations. With competitive gas pricing, the producer of incremental coal and the producer of incremental gas should receive prices for their fuels which reflect their full economic value.

If a gas-to-power project displaces a coal-to-power project in terms of the sequencing of future generation choices, it will be because the gas project is economically superior and should therefore proceed. That is what has happened in the United Kingdom power market over the last 10-15 years where gas has captured essentially all of the incremental generation market in competition against domestic and (mainly) imported coal.

In any assessment of the consequences of domestic gas displacing an alternative power generation fuel source such as domestic coal, imported coal or imported LNG, it would be appropriate to examine the GoV's fiscal takes from each. There would of course be no fiscal benefit to the GoV from the use of imported coal or imported LNG and the take from domestic gas will be found to be higher than that from domestic coal.

4.6 Implementing the Competitive Gas Pricing Methodology in Vietnam

This report recommends a broad three-phase evolution for the development of Vietnam's gas sector with particular reference to market design and pricing within that design (refer to section 5, under heading 5.3).

Phase 1 is a preparatory period in which the Ministry's analytical and operational capabilities are improved, further work is done in areas such the competitive pricing methodology, the embodiment of that methodology in PSCs and the regulation of T&D rates and necessary approvals are obtained from the policymakers.

Phase 2 is an interim period in which the single-buyer model continues but with the introduction of competitive gas pricing and regulation of T&D.

In Phase 3, a wholesale competitive gas market is introduced with gas prices eventually negotiated between gas buyers and gas sellers without government constraint. This progression is not fundamentally dissimilar from the direction taken by Canadian gas pricing policy in the period 1975-85 and which is summarized in box 4.3.

Box 4.3 Implementing competitive gas pricing in Canada 1975-85

The equivalent in Canada of the PSC in Vietnam is the "Petroleum and Natural Gas License (formerly 'lease')". Traditionally, the lease provides that the price to be used for purposes of royalties and taxes is that which results from arm's-length negotiation

- Pre-1975: gas prices established under long term contracts with the pipelines were low, stable and enabled rapid market growth;
- ~1975: oil prices tripled; inflationary economy; gas prices flat; gas development stalled; shortages loomed;
- 1975/76: initially, the Alberta provincial government that owns and leases the mineral rights stipulated that the gas price would be the competitive value as established by its regulator, not by the long term contracts;
- 1975-85: subsequently, the Federal and Alberta governments agree to competitive gas pricing based on a 0.75 ratio to oil prices (gas price at 'city gate' was set at 0.75 of 'refinery gate' price of crude oil); this price ensured gas competitiveness against industrial fuel oils in its major consuming markets (gas had to be competitive with heavy fuel oil in large-volume industrial uses since power generation was not a major gas-consuming market in Canada at the time and fuel oil was the alternative fuel to gas in industrial uses)
- Result: higher gas producer revenues stimulated supply and shortages were avoided; this methodology yielded highly competitive gas prices in small industry, commercial and household uses where end-user fuel oil prices were higher than the wholesale gas price calculated for high-volume industrial uses;
- Post-1985: a Wholesale Competitive Gas Market is established; gas prices are freely

negotiated between sellers and buyers; no government interference with pricing.

It must be emphasized that, for competitive pricing of gas related to coal in the power generation market to “work”, the effects of fuel price fluctuations in the generation market must be allowed to “flow through” to electricity tariffs. As already noted, electricity tariffs are subject to ERAV’s oversight and regulation and annual increases of more than 5% require the Prime Minister’s approval. However, a competitive generation market enabled and supported by a competitive market for generation fuels, requires flexibility of electricity tariffs to accommodate market-related variations in the cost of generation. The rules and regulations on the establishment, procedures for establishing, evaluation and approval of the various electricity tariffs are yet to be developed pursuant to the Road Map for the Power Market in Vietnam, approved January 26th 2006. However, there is nothing in that Road Map or in the NSED to lead to the conclusion that policy will not allow the required “flow through”.

Implementing competitive pricing

(1) Review current pricing methodologies (recommended time period: next 12 months)

Currently, there is no established generic pricing methodology. Up to this stage in the development of Vietnam’s gas sector, pricing has been negotiated with government supervision in respect of two gas-to-power and fertilizer projects. In respect of the third, the PM-3 Ca Mau project, as already noted the gas pricing mechanism was “imported” as a term of the sale of gas from the same source to power generation in Malaysia. The first step therefore is to review current pricing methodologies and their impact on the performance of gas producing projects as well as gas consuming projects.

(2) Introduce competitive gas pricing techniques to identify “guidance prices” (recommended time period: next 12 months and continuing if necessary)

Given the NSED’s clear direction on market pricing, it is appropriate to propose the competitive market pricing approach for new gas supplies. Therefore, on an illustrative, pro-forma basis, the following steps should be taken:

Consider positing a range of “competitive gas prices”:

- a. As the lower bound, a “straight heating value” price (as demonstrated under heading 4.4 above) that takes account of the differences in thermal efficiency of the steam plant and the CCGT plant as well as the difference in capital costs and in allowance for funds used during construction as they would be reflected in demand charges per unit of capacity;
- b. As the upper bound, calculate a “shadow price” for gas which credits the gas price in “a” above with allowances for such items as revenue flows to the GoV resulting from domestic gas production, a security premium for domestic supply (reflected in a shadow penalty for imported coal, being the cost of stockpiling 90 days’ supply above commercial inventory needs), and possibly a premium for the lower carbon emissions per kWh of output.³⁶

Table 4.1 below provides a comparison of the possible lower and upper bounds.

³⁶ It is recognized that once a competitive generation market is created in Vietnam it may not be possible to incorporate shadow prices in generation-fuel choices. It would only be possible to “credit” gas for its security and low-carbon qualities if they were to be embodied in cash penalties applied to imported coal (a “carbon tax” and/or a “security tax” or some form of carbon-emissions “caps” and related trading of carbon credits and debits).

**Table 4.1 A Competitive Gas Price: Heating Value vs. Shadow Pricing
\$/MMBTU—for illustrative purposes only**

(1) Straight Heating Value Price	(2) Shadow Price: with adjustments to reflect “value” not included in Column 1
Value of natural gas delivered to the power plant: 5.6	Heating value price 5.60
	Plus:
	Government take: 1.33
	Security premium 0.03
	Net of carbon emissions
	Compared to coal 0.47
	Equals:
	Shadow price 7.43
<i>Source: Figure 4.4</i>	<i>Source: Table 3.1</i>

Next, deduct from this competitive price range the regulated gas transmission (and, if applicable, distribution) tariff for a “typical” prospective length of haul, to determine the price or price range of pipeline quality gas at the outlet of the gas processing plant;

Set the values at the outlet of the gas processing plant as benchmarks for producers and consumers and obtain their feedback.

Note, of course, that these values would vary over time, mainly in relation to variances in the CIF price (=Cost of the commodity, Insurance and Freight) of imported coal.

Anticipated result of these steps: There is agreement in principle on the competitive market value(s) of natural gas in the end use level and, by deduction of distribution (if applicable) and transmission tariffs from the market value(s), agreement on how to establish the value(s) at the point where pipeline quality gas enters the system.

(3) Establish parameters for gas commodity price negotiations and define the role of regulatory oversight in advance of the next gas development project (recommended time period: through the end of 2010/2011)

Refine the methodology for competitive gas pricing by considering such elements as: the concept of a floor to protect gas producers on the downside and a ceiling to safeguard gas consumers on the upside of market fluctuations. Consideration of the level of any price floors and ceilings would have to be integrated with consideration of the net effects worked through the fiscal system to ensure continued international competitiveness of Vietnam as a host for gas development.

[Refinement of the competitive gas pricing methodology will have to take account of the legal requirements for the Competitive Generation Market (CGM) in the power sector, where the price range for contracts will be set by ERAV. The Authority’s approach is to develop and issue regulations to avoid case by case decisions. The generation pricing

methodologies for the standard contracts to be signed by the Single Buyer during the CGM period through about 2014 are being developed. These methodologies will establish principles and a formula for calculating the price range (for contract negotiation) and annual indexation of contract prices. The proposed approach differentiates types of generation technology (benchmark costs) and fuel.]

In light of the foregoing, publish a price or an acceptable range of prices of pipeline quality gas at the outlet of the gas processing plant as the competitive price(s) at which new sales and purchases of gas would take place in the interim Phase 2 of gas market design implementation and in Phase 3 prior to a finding that a condition of workable competition exists and competitive pricing can be replaced by freely negotiated prices.

Define regulatory oversight, dealing with: what body is to provide that oversight; with what authority it is to act; and under what market circumstances a condition of workable competition might exist in which competitive gas pricing might be succeeded by freely negotiated pricing.

The Ministry would be charged with the responsibility of working out the scheme proposed here, doing so in close consultation with PVN and other gas and power industry representatives.

The Ministry's authority for these tasks may be found in the NSED provision under Heading 3 "Development Strategy", c) Petroleum Sector to "Establish a legal basis for...economic...management in the gas sub-sector such as... approving gas price."

Anticipated Result of these above steps: The generic system for gas pricing in new developments will provide predictability and encouragement to developers and consumers of gas from new projects.

4.7 Giving policy and administrative form to "competitive pricing" of natural gas

This Report focuses on economic and policy aspects of the gas sector development framework. It has not included a review of related legal issues. There may therefore be legal constraints to what is proposed here.

Currently, upstream gas pricing is determined by the following terms of clause 8.1.5 in Vietnam's model Production Sharing Contract (PSC):

8.1.5 Natural Gas shall be sold at agreed price in accordance with producing principles applicable to Natural Gas sales, prevailing international market at the time of calculation, taking into account market location, quality, quantity and other relevant factors.

The provisions of this clause leave much scope for discussion and negotiation of the gas price for each field. This room for negotiation translates into uncertainty for upstream investors. As previously noted, this has contributed to delays in the development of Vietnam's gas resources. The competitive gas pricing methodology is intended to eliminate this uncertainty.

Administratively, the competitive gas pricing methodology could best be implemented as a term of the PSC. In the alternative it could be implemented by the Ministry (with the cooperation of PVN—the present governmental counterpart to the PSC contracting party). If there are no legal obstacles, the former approach is recommended because of the certainty that it would provide for investors.

In regard to the method of incorporating competitive gas pricing in the PSC, there are at least two possibilities:

Option 1: Competitive gas pricing could be stated as a condition for the sale of gas under new PSCs, or new PSCs and existing PSCs where sale arrangements had not yet been entered into. Legal aspects of such a change would need to be clarified.

This could still result in disputes between PSC contractors, PVN and the GoV regarding the application of such a provision. It is therefore recommended that consideration be given to a further provision that the calculation of the competitive gas price should be made by an internationally recognized third party which has no economic interest in the outcome, with the cost of engaging this third party to be divided equally between the PSC contractor and the GoV.

The PSC terms could possibly be as follows:

“Natural Gas of pipeline quality shall be sold at the outlet of the gas processing plant at a unit price equal to its value for the generation of electricity in a new CCGT plant where the alternative source of such generation is a new steam plant using coal purchased at the international market price, after deduction of the price of T&D of that gas from the outlet of the processing plant to the gate of the CCGT plant. The price of the natural gas according to this methodology (“the base price”) shall be established by an authority which has no financial or other interest in the outcome.”

Option 2: The competitive gas price could be calculated by the Ministry, with or without the advice of an independent third party, and that price inserted in the PSC. If this approach were followed, then in the above example, the last sentence might read “The price of the natural gas according to this methodology shall be \$XX per million BTU (“the base price”).”

Compared to Option 1, which defers the identification of the competitive gas price until a sale arrangement is going to be entered-into, Option 2 would give greater certainty to investors in gas exploration and development, to the government and to other stakeholders such as potential gas users.

In addition to a formulation of PSC terms along either of these lines which would lead to identification of the base price, some additional issues would also have to be resolved in further work on gas pricing:

- Indexation of the base price: It is implicit in the methodology that an indexation provision would be needed to adjust for fluctuations in international coal prices and possibly in other parameters of the methodology;

- Effective date: The price would possibly become effective on the date of the first sales gas reaching the buyer;
- Price ceilings and floors: If it were a policy objective to protect the seller on the downside and the buyer on the upside of price, further provisions would have to be built into the PSC terms;
- What if the seller is prepared to accept a lower price than results from the application of the competitive pricing methodology? Would royalties and taxes be calculated on the higher of the actual selling price or the price determined according to the methodology?
- What if the PSC partner is unwilling to sell at the price that results from the application of the methodology? The gas will not be produced until such time as more favorable market conditions develop. Or, in the case of predefined “types” of gas, it will not be developed for production until adjustments are made to the fiscal terms that enable the gas to be profitably sold.

In either case, it would have to be provided that, when a condition of workable competition has been found to exist, competitive pricing would be replaced in new contractual arrangements by freely negotiated prices (which, of course, could include prices based on competing fuel values).

4.8 The Trade-off between Gas Pricing Policy and Upstream Fiscal Terms

The GoV is committed to maintaining an internationally competitive petroleum fiscal regime. This is clear from the NSED which states in relation to 3, “Development Objectives”, c) “Petroleum Sector” that there is to be “...regular review and adjustment if required (to) the financial terms to enhance the competitiveness of oil and gas exploration and development in Vietnam over other competing countries.”

The competitiveness of the regime as regards natural gas is affected not only by the fiscal terms under which gas is produced, but also by the country’s gas pricing policy. There is, therefore, a potential trade-off between the two: to the extent that gas prices are free to move to international levels, the competitiveness of the regime will be enhanced and vice-versa. Therefore, a restrictive pricing regime may have to be balanced by more generous fiscal terms in order to maintain the desired international competitiveness.

At this point, some general observations on the fiscal regime may be appropriate. The GoV has by law and contract certain claims on the total revenues from the sale of gas. Several revenue streams accrue to the GoV: income tax as defined by legislation; royalty as prescribed in the standard PSC; profit gas; and cost recovery gas which is a variable that affects the revenue shares arising elsewhere. The latter two elements result from the negotiation of the particular PSC. Together, these revenue streams constitute what is generally referred to as “the government’s take”. Leave aside income tax which results from the effects of legislation of general application. Two important points need to be made about government take:

First, from the perspective of the gas developer, it is a large element of his full-cycle costs and the only one that the GoV can significantly vary at its own discretion. The

GoV may choose, as do some other governments, to adjust these costs in order to achieve resource development objectives such as making economic gas fields that are sub-marginal by virtue of their size, reservoir characteristics, water depth or the quality of their gas.

Second, from the perspective of the GoV this is not a “free good”. Government take has value conferred on it by the gas market. There are sound reasons in terms of public policy, economic principles and fiscal prudence for maximizing that value in cash terms to the GoV by achieving a competitive market price rather than in conferring a benefit on a particular class of consumers, such as fertilizer manufacturers, by way of concessionary prices for the gas they use.

Ideally, competitive gas pricing and upstream fiscal terms in PSCs should complement each other. Among fiscal terms, income tax should remain non-negotiable with specific upstream investors. But if the GoV were to announce ranges for cost recovery and profit share, it could give itself room to adjust these proportions to allow more and varied types of gas fields to be developed while meeting the investor’s threshold internal rates of return (IRR). Much further work needs to be done before arriving at recommendations in this area. However Vietnam’s gas resource base seems to present potential developers with a wide range of cost conditions. For example there are large fields that can be produced with a small number of wells and platforms while there are others which consist of a large number of pools with rather poor reservoir characteristics requiring numerous wells and producing structures. The potential to selectively adjust government take to help bring as much as possible of the resource within the economic threshold deserves further careful analysis. This analysis could usefully be combined with consideration of the shadow pricing elements already discussed.

Box 4.3: How Talisman Energy Publicly Addresses High CO2 Gas Issues

- Offshore Vietnam and Malaysia accounts for about 60% of Talisman’s global CO2 emissions, but for less than 10% of its global oil and gas production
- Standard industry practice is to vent CO2 to the atmosphere, but the growing CO2 volume is recognized by Talisman as a significant issue
- Reinjection is technically complicated and uneconomic without significant offsetting revenue from carbon credits
- Existing fiscal and regulatory regimes in the region make no provision for CO2 reinjection but reinjection may qualify as Clean Development Mechanism (CDM) projects in the international climate change framework
- CDM projects generate Certified Emission Reduction (CER) credits which can be sold or used to retire regulatory obligations elsewhere.
- Talisman continues to monitor both carbon sequestration options to manage PM-3 emissions and the development of the CDM framework.

The Special Case of High CO₂ Content Gas in Vietnam: The issue of the high CO₂-content of some of Vietnam's gas resources has been identified in this report as a challenge, as an obstacle to the development of a gas market, as possibly involving additional investment and as perhaps requiring recognition in the fiscal system. This "special case" therefore involves resource development, market, pricing and fiscal issues. As well, in a world where global climate change is an important consideration, dealing with high CO₂-content natural gas whether by burning it or by recovering and venting the CO₂ prior to combustion is an important environmental policy matter. The position recently and publicly taken on this issue by Talisman Energy, the operator of the PM-3 oil and gas development in the offshore area jointly administered by Vietnam and Malaysia, is summarized in Box 4.3.³⁷

High CO₂ gas is also found in some other countries and CO₂ venting is therefore a policy and industry issue elsewhere. In Norway's Sleipner field, Statoil has already been recovering CO₂ for a decade and has sequestered about one million tons in an aquifer³⁸ The largest carbon sequestration project in North America is being undertaken starting with CO₂ injection in 2009 by the 35-member Alberta Saline Aquifer Project (ASAP)³⁹ Carbon capture and sequestration is particularly important in Canada because of the very large amounts of CO₂ that are emitted from fuel use in the commercial development of her oil sands.

Given Vietnam's ambitions for the gas sector, given too that a significant portion of Vietnam's gas appears to have an high CO₂ content, it would make sense for the GoV to start now to consider the fiscal and technical means to address this issue. The purpose would be to ensure that the development of high CO₂ gas resources is commercially attractive that possible international global warming concerns are dealt with, and indeed that they can be used to Vietnam's advantage through such means as the CDM.

4.9 Options for Distributing "Rents" along the Gas Chain

Should rents be distributed upstream, in T&D or among gas consumers? Developers assume significant risk in exploration activity since not all wells drilled can eventually be developed for profitable production. Therefore, from successful upstream gas projects, developers expect to capture economic rents over and above their technical costs for those projects. This is the reward for exploration risk-taking (box 4.4). The developer expects to share those rents with the resource owner (the state) through the upstream fiscal system. A finely-tuned fiscal system will afford the developer the opportunity for an internationally competitive reward from a successful development but will at the same time recover for the state a share of the rent which will tend to be higher when commodity prices are high and vice-versa. The design of the fiscal terms relating government fiscal take to gas price should be such that changes take place automatically.

³⁷ The website reference is: http://www.talisman-energy.com/upload/important_links/16/08/talismancrreport.pdf

³⁸ Information about the recovery and sequestration of CO₂ by Statoil in its Norwegian operations is available at: <http://www.statoil.com>

³⁹ Further information about ASAP can be found at: <http://www.albertaasap.com/pdf/ASAP-News-Release-Sept17.pdf>

Box 4.4 What is economic rent?

Economic rent is the income over and above a normal return on invested capital, which may accrue to the risk-taking investors in a successful gas or oil or mining development. Economic rents arise especially when the prices for the commodity in question are unusually high. For example, when international oil prices reached about \$US140/barrel in the summer of 2008, very large rents were created for owners of oil producing assets. When international prices are around \$US40 per barrel as they were in March 2009, the rent generation is, of course, much smaller.

This approach is supported by the international experience with gas pricing (see Annex 5). If upstream producers are financially impaired by low prices, exploration and long-term supply are likely to suffer (Bangladesh). It is better for upstream rents to be harvested by gas resource owners (governments) and gas resource developers (IOCs, NOCs) which means no subsidies in downstream pricing (Canada). Passing upstream rents down the gas chain to end-consumers along with subsidized pricing of T&D starves these service providers of investment funds needed to maintain and expand networks (Bangladesh).

Price-sensitive upstream fiscal systems: Particularly in the aftermath of the very high oil prices experienced in the 2006-2008 period, attention is being given internationally to fiscal systems that capture an increasing share of available rents as prices rise (and vice-versa). Consideration might be given to blending gas price floors and caps, intended to protect producers and consumers respectively, with upstream fiscal systems that protect the state's interest in capturing a fair share of available rents for the national patrimony. As already noted, pricing and fiscal systems for gas cannot be separated in assessing the overall effect in terms of attractiveness or otherwise of what the NSED calls “the competitiveness of oil and gas exploration and development in Vietnam over other competing economies”.

Fine-tuning of fiscal systems to deal with exceptional cost situations: In many extractive industries, situations may arise where cost conditions are such that little or no rents are available to be captured by the resource-owner. Examples of these situations are gas fields where costs are high because the accumulations are small or remote or contain a high proportion of CO₂ and other contaminants. If these gas fields are going to be developed, then special fiscal measures may be needed, even to the extent of eliminating all taxes on the value of the produced gas and retaining income taxes which are only payable when the development proves to be profitable. This is a technically complex subject matter and sound policy recommendations are likely to come only from expert analysis involving probably-extensive international comparisons. The important principle to be upheld is that developers should know at the earliest possible stage in the investment cycle what will be the fiscal terms applying to exceptional cost situations. Box 4.5 summarizes a case where the government of a globally important oil and gas producing jurisdiction has predefined the conditions under which special fiscal treatment can be requested to address exceptional cost conditions, in this case having to do with avoiding gas flaring.

Box 4.5: Fiscal Adjustments to make Gas Projects Economic

Alberta, Canada is one of the world's most important petroleum jurisdictions. In 2008 natural gas production totalled about 135 BCM. The province's regulator responsible for the upstream industry is the Alberta Energy Resources Conservation Board (ERCB or "the Board"), which has been in existence for 70 years and is considered a world leader.

One of the ERCB's objectives is to "conserve" energy resources and it aims to progressively eliminate the flaring of raw gas.

The Board sets out criteria that an operator must use to evaluate a project to conserve (rather than flare) gas and they include instructions about how to assess gas reserves, gas and electricity prices, capital and operating costs, inflation and they state the discount rate that is to be used in a calculation of the net present value (NPV) of a conservation project.

These criteria are set out in a 2006 Directive. See Section 2.8 and 2.8.1 in particular:

<http://www.ercb.ca/docs/Documents/directives/Directive060.pdf>

If the calculation results in a positive NPV plus a small margin, the operator must invest in the project. If the calculation results in a negative NPV, the operator must still proceed with the project but can apply to the government for a royalty waiver.

The 1999 announcement of this royalty waiver is at:

<http://inform.energy.gov.ab.ca/Documents/Published/IL-1999-19.PDF>

A World Bank summary of Alberta's efforts to reduce gas flaring is found at:

<http://siteresources.worldbank.org/INTGGFR/Resources/albertacanada.pdf>

This is a good example of a government regulatory initiative that clarifies in advance what are the rules for dealing with what might otherwise be an uneconomic project.

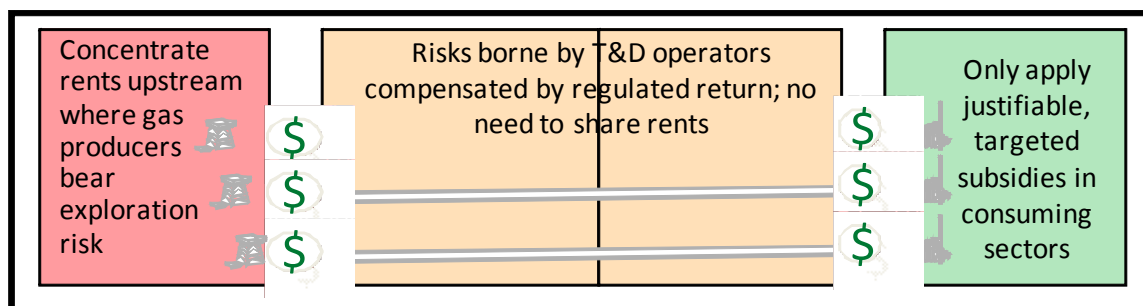
How are rents distributed along the gas chain? Rents can be shared in terms of lower-than-competitive pricing for consumers of gas or higher than normal returns for transactors of gas. They may be shared by design, for example by government-mandated below-market pricing for consumers of gas-generated power (primarily for social reasons) or manufacturers of gas-based fertilizers (primarily for industrial development and security of supply reasons). They may be shared inadvertently, for example if the owners of natural monopoly gas T&D systems are able to obtain above-market returns from their investments thereby capturing some of the rent and returning a lower than otherwise netback for the gas producer and the state as the resource owner.

Relating official pricing policy to rent collection in the gas chain: It is appropriate to draw attention to the NSED's repeated references to: competitive energy markets; to the elimination of monopoly and subsidy (under b) "Energy Price Policy" in 4. "Implementation Solutions"); and to creating a legal basis especially for mid- and down-stream petroleum activities including approving the price of gas T&D (under c) "Petroleum Sector" in 3. "Development Strategy"). Properly regulated T&D pricing would not allow the interception of any flows of rents from market prices back to producer netbacks. The elimination of subsidy would not allow conferring concealed subsidies, drawn out of economic rents, on particular consumer groups through below-market pricing of gas.

Conclusion on rent distribution in the gas chain: Correct pricing at different stages of the gas chain, as proposed above (competitive pricing in the consumption market; regulated pricing of natural monopoly network services; downstream generic price minus the regulated T&D cost to yield the producers' price at the processing plant tailgate) will concentrate rents at the production end of the chain where they are appropriated through the gas pricing and fiscal systems by the producer and by the state as the resource owner.

If the state wishes to confer some of these rents on particular consumption sectors for social or economic reasons, then the correct way to do so is to provide targeted, overt subsidies to specific consumer groups as part of the national social safety net. In making this recommendation, it is noted that there may be international trade implications in relation to the World Trade Organization (WTO) if direct subsidies are provided to particular industrial sectors such as fertilizer manufacture.

Figure 4.6 Rents are best concentrated upstream to compensate for exploration risk



4.10 Recommendations and Anticipated Benefits

Pricing recommendations: This report principally recommends that Vietnam adopt a generic gas pricing methodology which expresses the competitive price of gas in relation to its alternative (internationally-priced coal) in its essential anchor market (power generation). This is because it is the most suitable way for gas projects to be competitive in the sector in which their demand is anchored (i.e., power generation as well as in other uses of gas). The producers' price of gas would be calculated from this competitive price of gas in the power generation market. The regulated costs of T&D would be deducted from this competitive gas price to yield a price for pipeline gas of uniform quality at the outlet of the gas processing plant where the gas production operation is completed. This is fully consistent with the NSED requirement that energy prices must be determined in accordance with market mechanisms.

Within this methodology, it would be possible to safeguard consumer interests on the upside and producer interests on the downside of price by a policy decision to introduce price ceilings and floors. Initially, price negotiations between the NOC single seller of gas and various users would be conducted on the basis of the predetermined price bands which would embody appropriate market-based escalation factors. This process would be subject to regulatory review by Ministry staff or by the downstream regulator if that organization had by then been established.

These price ceilings and floors will have to be related to gas production fiscal terms in order to maintain the desired overall competitiveness of Vietnam's upstream gas regime relative to other gas-producing countries. In considering policy choices between gas, coal and oil, other refinements can be embodied relating to the value of domestic gas production to the national economy as compared to, for example, coal imports for power generation.

The competitive pricing methodology can best be implemented as a condition of the PSCs, which would be amended to include a description of the methodology. The determination of the competitive price could either be left to a later independent assessment or it could be calculated and inserted in the PSCs, subject to indexation.

This competitive pricing methodology is to be used until such time as a wholesale competitive gas market has been introduced, workable competition emerges in Vietnam's upstream gas market and prices can then be freely negotiated between sellers and buyers. While implementing the competitive pricing methodology, Vietnam's overall gas regime remains internationally competitive while maximizing GoV's revenues, recognizing that in doing so, gas pricing & fiscal terms must complement each other.

Anticipated benefits from recommended pricing methodology: The principal benefit is that the recommended approach to competitive pricing will provide predictability and encouragement for suppliers to invest in upstream gas development. Additionally, when combined with regulated pricing of T&D, it will help to concentrate gas resource profits where they belong—at the upstream end of the gas chain—thereby enhancing GoV's revenue from Vietnam's gas resources.

The recommending methodology should ensure that gas is competitive in its main market—power generation—such that it becomes a fuel of choice for large-scale as well as retail consumers of energy. Gas could be made uncompetitive either (1) because the recommended methodology results in prices that are unattractive to new investors in electric generating plant or (2) because it results in prices that do not provide sufficient incentive for gas development projects to proceed.

The methodology is carefully designed so that the circumstance in (1) is unlikely to arise. If as a result, for example, of low international coal prices, the circumstance in (2) threatens to arise, the GoV has substantial scope to affect the economics of gas development by adjusting its upstream fiscal terms. If the circumstance in (2) continues despite the full adjustment of fiscal terms and despite a proper accounting of the externalities associated with power development based on domestic gas compared to imported coal, then either an alternative use such as export should be found for the gas or that specific gas development should be deferred pending a change in international market conditions.

Resource rents are properly concentrated in the upstream by this methodology, there to be shared between the state and the gas producer by means of the overall fiscal system. Rents are not to be conferred on mid- and down-stream market participants: their returns would be fairly regulated in relation to risk-adjusted costs of capital. Consumer rents would also be minimized by value pricing of gas in relation to competing fuels,

eliminating any significant hidden subsidy for power consumers by gas producers and the state as resource owner.

To summarize: the recommended methodology will encourage economically optimal development of Vietnam's energy resources—particularly gas and coal—for a critical energy use (power generation) and will ensure a fair sharing of overall benefits including GoV fiscal benefits.

5. Development of Gas Market Options

Vietnam’s current gas market design—single-buyer, no generic pricing methodology, cost-plus pricing of T&D—is a significant handicap to gas sector development. It discourages current investment and, if it continues, it will retard future project implementation. This section argues that, in the long run, Vietnam must implement a competitive gas market to reduce inefficiency, encourage private investment, and support the evolving competitive power generation market. But this will take time, Vietnam’s gas sector is currently at an incipient stage of development, and an interim step is recommended before a WCGM can be established. This interim step would continue the single-buyer model but with the introduction for new projects of competitive gas pricing and the regulation of T&D. Later, as additional new supplies become available, the WCGM should be implemented, initially using competitive gas pricing and then, as and when a condition of “workable competition” develops, freely negotiated pricing.

Arrangement of material

Section 4 of the report starts by putting the case for creating a functioning gas market under **heading 4.1**. It then describes the requirements and conditions for such a market in **4.2**. The recommended two-phase evolution is presented in **4.3** and on the basis of international experience, the potential policy alternatives are described in **4.4**. The transitions, from the current state to the interim (Phase I) model is described in **4.5** and in **4.6** the same thing is done for the transition to the WCGM (Phase II). The four implementation steps are set out under heading **4.7** and comments are provided on relevant regulatory methodologies, including their relation to power sector reform, in **4.8**. Finally the recommendations for gas market design are resumed in the anticipated benefits are summarized under heading **4.8**.

5.1 The need for a competitive gas market

There is no functioning gas market in Vietnam today: PVN is dominant in processing, in unregulated T&D operations and in gas purchase and sale transactions. This gives rise to understandable concerns among other investors about lack of transparency and about possible abuse of monopoly positions.

It is assumed that the GoV plans to develop the gas sector along market principles for three major reasons: to capture the economic efficiency afforded by market-based sector development; to allow the gas sector to rapidly benefit from private participation across the gas chain; and to align the gas industry with the evolving competitive market in the main gas-consuming sector—power generation. Indeed, the establishment of a competitive energy market is a stated GoV policy goal of the NSED.

Benefits of market-based solutions: Market-based sector development can reduce costs, eliminate inefficiencies, encourage investment, and eliminate delays due to discretionary decision-making. Many countries over the past 20-25 years have had positive experiences of market-based solutions to gas sector issues and this has led to something of an international consensus in favor of such solutions⁴⁰. And Vietnam has already had favorable experience with market solutions in the oil products and LPG sectors: true, these sectors in 2007-09 had to deal with price volatility which has caused social stresses, but supplies remained adequate and consumers have started to benefit from competition. Moreover, Vietnam is committed to market solutions in its rapidly growing power sector where adequate and reliable supply is a key policy objective. Further, market-based solutions allow the sector to adjust to supply shocks and price volatility better than “command-and-control” solutions. To capture these benefits, the gas sector’s market design will have to evolve in the long term from the current single-buyer arrangement to a competitive wholesale market.

Need for private investment: The forecasted investment requirements for Vietnam’s energy infrastructure, including the gas sector, are large. The Ministry has publicly indicated that both domestic investors and foreign direct investment will be required.⁴¹ PVN itself can only fund part of these needs. There is insufficient rent generation from Vietnam’s petroleum resources to enable PVN alone to finance the necessary growth of the gas sector. Therefore, greater private investment will be needed, probably in all links of the gas chain. Steps must be taken to ensure that eventually all the links in the chain are open to investors of all kinds—public and private, Vietnamese and foreign—on a non-discriminatory basis.

Improved environment for private investment: In view of PVN’s current dominance of the gas sector (and its developing cross-holdings in power generation), private investors may be concerned about the risk of possible monopolistic behavior by an unregulated T&D operator. This calls for a market design that allows all market participants, including PVN and private investors, to operate and compete on an equal, non-discriminatory footing. Of course, this new way of doing business does not mean that current players will disappear. But it means that players will have to respond by adapting to competitive market behaviors in respect of the gas commodity and to modern economic regulation of the natural monopoly components such as T&D.

⁴⁰ The case for market solutions is repeatedly made and endorsed in international forums such as Asia Pacific Economic Cooperation (APEC), the International Energy Agency, the World Energy Council and the World Forum on Energy Regulation. One brief example is this extract from the 2007 meeting of APEC Energy Ministers in Darwin, Australia in which Vietnam participated:

“5. We determined that addressing the challenges of energy security and sustainable development should be based on well-functioning markets that are progressively characterised by free and open trade, secure and transparent frameworks for investment, market-based price signals, market transparency, good governance and effective competition.”

Source: http://www.ewg.apec.org/assets/documents/apecinternet/EMM8_Declaration20070608151139.pdf

⁴¹ Viet Nam News, June 16, 2009, article entitled “Hefty price for more power”

Coordination with the power market: the GoV is committed to the development of a competitive power market. The ERAV is currently developing the regulatory framework, technical codes, methodologies for tariffs and transmission charges, least cost planning code, and the regulations and procedures for the Competitive Generation Market. The principal stages of the market and the indicative timetable are:

- 2009 through 2014: A complete Competitive Generation Market (CGM-see box 5.1)
- 2015 through 2016: A pilot Wholesale Competitive Market (WCM)
- 2016 through 2022: A complete Wholesale Competitive Market
- 2023 through 2024: A pilot for the Retail Competitive Market (RCM)
- 2024 and beyond: A complete Retail Competitive Market

Box 5.1: Power Market Terms and Implementation

- **Competitive Generation Market:** Generators sell to the Single Buyer (EVN) in a cost-based gross pool with net settlement. The Roadmap requires a two-phase approach, starting with not more than 25% of system capacity taking part in the pilot stage.
- **Wholesale Competitive Market:** Generators sell to wholesalers, distributors and large consumers. Wholesalers and generators compete for sales to distributors and large consumers. The WCM begins with a pilot stage where some distribution companies, new wholesalers and large consumers are selected to start the market.
- **Retail Competitive Market:** Retail consumers are allowed to choose their suppliers. Again the market starts with a pilot stage involving only a proportion of all sellers and buyers.

Source: *Roadmap for the Establishment and Development of the Power Market in Vietnam (see below)* and. *Vietnam BOT Framework, Workshop No.3, Presentation. Slide 13.*

Gas already accounts for about a third of power generation and the power sector consumes 88 percent of Vietnam’s current gas production. With power industry reform, the gas sector cannot do business as usual. Given the important role of gas in power generation, competition among gas suppliers for this market would be highly desirable in the CGM and WCM phases of the competitive power market. Until gas supplier competition is achieved, some features of the gas sector must simulate market outcomes if new gas-fired generation is to be viable in the CGM and WGM.

Policy on Energy Markets in the NSED: A competitive gas market is a stated policy objective of the GoV. One of the purposes of the NSED is “to form and develop a sound competitive energy market” (Heading 2, “Development Objectives”, Item a, “Overall Objectives”), involving “a strong shift in the power and petroleum (includes gas) sectors to the state-controlled competitive energy market mechanism” (Item b) “Specific Objectives”). In terms of organizational solutions, this is to involve a step by step restructuring of the energy industry to form a sound competitive market. Legislative steps are to be taken to achieve the shift to market mechanisms and elimination of monopoly and to “re-structure the energy industry to, step by step, form a sound competitive energy

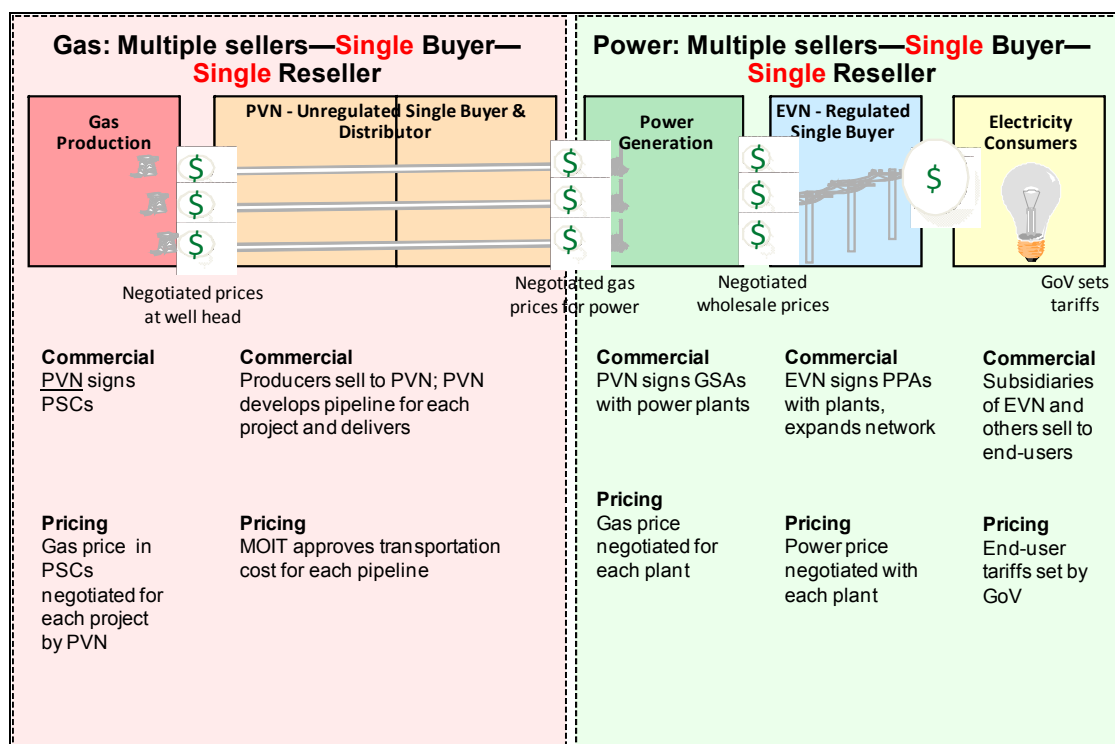
market” (Heading 5, “Solutions”, Item d, “Solutions on organization mechanism”). These objectives and policy intentions clearly reflect that the GoV understands that if markets are allowed to work for energy commodities (coal, oil, LPG, natural gas, power) important efficiencies result and market forces can be relied on to continuously balance supply and demand.

5.2 What a competitive gas market requires

In the context of the creation of a competitive market in Vietnam for the commodity natural gas, the term “market” means a place where natural gas is freely traded and prices established. By this definition, there is currently no functioning market for natural gas in Vietnam. Instead, there are three physically and commercially separate gas-to-power and gas-to-fertilizer projects with a fourth gas-to-power project under negotiation. The gas transacted under these arrangements is not of a common quality standard; in particular the CO₂ content of the gas is quite variable. Until the issue of a standard gas quality is dealt with, which would be at some cost in terms of capital and operating expenditures, Vietnam cannot have a gas commodity market because there is not yet an exchangeable product (“marketable pipeline gas”). Each of the three gas projects currently in operation has its own special features.

Figure 5.1 illustrates the present situation in generic terms with regard to sales by producers to power generators through PVN which is both the commercial intermediary and the supplier of pipeline services.

Figure 5.1. Current situation of Gas ‘Single-Buyer’ Market Design in Vietnam



In the upstream sub-sector, PVN signing PSCs does not in principle represent an obstacle to efficient gas industry planning and development. However, the present design whereby PVN is the monopoly buyer and reseller of any gas prevents necessary competitive market developments. Price negotiation appears to be a major, time-consuming element leading to delays in project development. This adversely impacts the present values of projects, both to the developer and to the state as resource-owner.

In gas transactions, there is a multiple-seller (gas producers)-single buyer (PVN)-single reseller (PVN) format. There are no value-adding intermediaries because of PVN's *de facto* monopoly. PVN also dominates T&D. It is understood the pricing of new transmission pipelines is approved by Ministry at the project development stage (as an aspect of project approval). However, this is not the equivalent of modern regulation of pricing for a natural monopoly pipeline (see Box 1.3).

For gas-fired power generation, the gas supply agreements between PVN and the generators (EVN, PVN Power or private generators) are linked (or “back-to-back”) with the gas purchase agreements with the gas producers. This means that there is little or no “value” added by PVN's activity as intermediary between the gas producer and the power generator as gas consumer. The price of gas for each plant is negotiated between PVN and the plant.

Necessary conditions for a competitive gas market:

- *Competition requires competitors:* there must be gas suppliers (producers and wholesalers) seeking buyers and gas buyers seeking suppliers and these parties must be free to choose each other;
- *The conditions must exist for gas to be physically exchanged* between several suppliers and buyers: this requires a pipeline system into which suppliers place gas which meets predetermined quality standards and from which buyers draw gas
- *The pipeline system must be open to shipments by competing suppliers* on a non-discriminatory basis (in Europe this is called “third party access”), while ensuring a fair, regulated return to pipeline investors on their capital (return on equity) and of their capital (depreciation of investment) and of their prudently-incurred costs (including: labor, maintenance, materials, fuel and taxes). As previously noted, “third party access” does not mean that any party at any time can obtain the right to ship gas on a pipeline system. “Third party access” must be regulated to protect the interests of existing shippers and of the pipeline company.
- *The pricing and sale of the gas commodity should be separated (or “unbundled”) from the provision of gas pipeline services:* this condition flows from the principle of pipeline open access. It could be applied equally to the processing link in the gas chain. In both cases it fosters access to these links in the chain and encourages transparency.

Box 5.2: Why and How to Regulate Gas Markets

Perfect markets are characterized by a large number of buyers and sellers, none of which can affect prices; a homogenous product; adequate information about prices and other market behaviors; and no barriers to entry to the market. Examples: markets for fruit and vegetables in a large city in Vietnam; stock markets in large financial centers. Perfect markets do not require government regulation of prices in order to function properly. Perfect markets may require government monitoring to ensure that dominant positions do not develop and if they develop are not abused.

Imperfect markets are characterized by few buyers or sellers, a heterogeneous product, inadequate information about competitors' prices and significant barriers to entry. Imperfect markets for a strategic commodity such as natural gas require some government regulation to simulate and encourage competition and prevent the abuse of the market's imperfections.

Regulation can simulate competition: for example, the market regulator can require that sellers and buyers use a competitive pricing methodology which simulates behaviors in a perfect market (see section 4 of this Report).

Policymakers and regulators can encourage competition: policymakers can create favorable conditions for new market entrants and ensure that government policies do not present entry barriers. Where there are natural monopolies that provide transmission and distribution services, regulators can ensure that all market participants have non-discriminatory access to these services (see Box 1.3). Both policymakers and regulators can take steps to provide market transparency (for example, pricing information) that assists competitive behaviors.

Regulators monitor market behavior, advise policymakers: where markets have not achieved perfect competition, dominant positions exist and may be abused. Regulators should monitor the behavior of markets, assess the effectiveness of competitive forces and advise policymakers whether government interventions are needed or should be changed.⁴²

Congruent gas and power market designs are important

Vietnam needs to develop a competitive gas market in coordination with its competitive power market. Ideally, this should result in multiple, discretely-owned-and-operated gas generators which have access to multiple, competing sources of gas supply (and vice-versa for gas suppliers with regard to power generators).

Fulfilling these requirements will involve (among other measures):

- Physical connectivity, provided by an integrated onshore gas pipeline network (alluded to in this report as a “trunk pipeline”): significant investment is involved in this undertaking;

⁴² Even in the well-developed Canadian gas market, the national regulator periodically publishes energy and gas market assessments. For example, in 2004 the National Energy Board released a document “Looking Ahead to 2020: Natural Gas Markets in Transition” which was a 27-page paper inviting public discussion of market behaviors. This assessment is available at <http://www.neb-one.gc.ca/clf-nsi/rnrgynfmitn/nrgyrprt/ntrlgs/gslknghd2010gst2004-eng.pdf>

- A quality standard for pipeline gas that will render this commodity physically exchangeable among all users, regardless of the source of gas: significant investment in gas processing may be involved;
- Open-season⁴³ open-access by producers to gas pipeline connections with gas power plants and to low pressure distribution system markets⁴⁴, regardless of the ownership of those pipelines and distribution systems; open seasons are held when investors are considering construction or expansion of facilities and, later, when capacity becomes available as a result of the commitments of existing users expiring or being rejected; and
- (Desirably) Opportunity for individual owners in production sharing contracts (PSCs) to market their gas separately if they wish.

An interim step is needed There is clearly a wide gap between the current situation of the gas sector and the requirements of a competitive gas market. Therefore, a phased approach to market-oriented gas sector development is recommended for Vietnam.

5.3 Recommended evolution to a Wholesale Competitive Gas Market: Preparatory (1), Interim (2), and Final (3) Phases

A three--phase evolution of Vietnam's gas market is recommended, as follows:

- **Phase 1** is the *preparatory phase* in which the Ministry's analytical and operational capabilities are improved, further work is done in areas such the competitive pricing methodology and rate regulation and approvals are obtained from the policymakers.
- **Phase 2** is the *interim phase*: a continuation of the current "single-buyer model" with competitive gas pricing (see section 4 of this Report) and regulation of T&D, followed by
- **Phase 3** which is the *final phase*: a functioning wholesale competitive gas market is established.

Phase 2 is intended as an interim step to a competitive gas market, not an alternative to a competitive gas market. This interim stage can help achieve greater investment in the gas sector as part of a step-by-step transition to a competitive gas market for all participants including PVN.

Phase 3 is the recommended approach for the long term to achieve the desirable "end state" of market design implementation. The WCGM model focuses on achieving a functioning market for the bulk supply of gas to industrial consumers such as power

⁴³ An open season is a period of time during which potential customers of the pipeline or distribution system can bid for its services and during which customers are treated equally regarding priority in the queue for service. Once the open season has closed, the pipeline or distribution company allocates available capacity to the applicants for it according to some predetermined procedure that has been approved by the regulator and published.

⁴⁴ Gas-fired power plants generally require a high pressure supply and normally that would be taken from the high pressure transmission system rather than from the low pressure distribution plant.

generators and fertilizer plants and to distribution companies supplying smaller industrial, commercial and residential consumers and natural gas vehicle (NGV) demand. In this respect it is comparable to the CGM in the power sector. It does not envisage the creation of a retail competitive market (in that respect it differs from policy for the power sector). The WCGM has three essential purposes:

- It will enable complete market opening where all of the links in the gas chain will be open to investment by state-owned or private enterprises, Vietnamese or foreign. PVN will then be one important player among many;
- It will transition gas pricing from a competitive pricing methodology to a situation where pricing and other contractual relationships are decided by negotiations between willing sellers and willing buyers without government involvement; and
- It will allow the GoV to focus on a monitoring role in the gas market with interventions directed only at preventing the abuse of monopoly and the safeguarding of supply security.

Operation of the market in the interim phase: The working of the Phase 2 market design is summarized in Figure 5.2. For new gas developments, gas producers will sign PSCs with the single-buyer (PVN) which embody a “competitive pricing methodology” (see section 4). They will sell to the single-buyer at prices that reflect the competitive gas price in power generation minus transmission and other costs. The single-buyer will provide pipeline transportation services whose prices will be negotiated within a band prescribed by the regulator and designed to recover costs plus a reasonable return. The single-buyer will also provide “value-added” services, such as off-take and supply guarantees and operational services such as load balancing, to both sellers and buyers of gas. The single-buyer will resell the gas to power generators and other large consumers, at competitive prices, recover the costs of transmission, distribution and services and return the balance to the producer-seller.

The single-buyer monopoly should not be an absolute one. If a new gas producer-seller is willing and able to create a bilateral deal with a gas buyer, it should be allowed to do so. Similarly, if a new producer-seller and/or its customer is willing and able to invest in new pipeline capacity to connect the supply to the market, it should not be prevented from doing so.

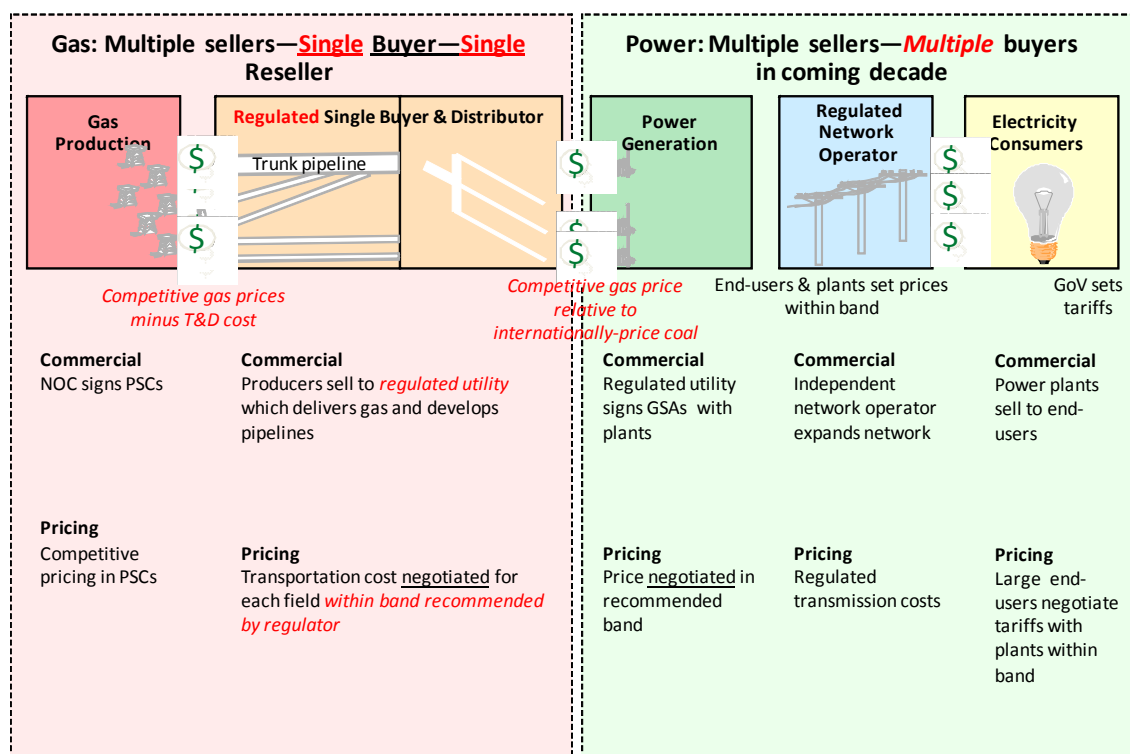
Pre-existing contractual arrangements based on other pricing approaches may be renegotiated by unanimous agreement of all parties to the contracts, to embody the competitive pricing methodology.

The competitive pricing methodology is recommended in order to address the potential abuse of dominant positions in gas sales or purchase in an imperfect market. The “single buyer model” is proposed in the Phase 2 market design for the following reasons:

- It is in keeping with the step-by-step approach to energy market formation that is counseled by the NSED;
- The single buyer can contribute to market development by aggregating gas supplies that individually may be too small to support new pipelines or power projects; and

- The single buyer can have the critical mass needed to provide value-adding intermediary services between producer-sellers and consumer-buyers.

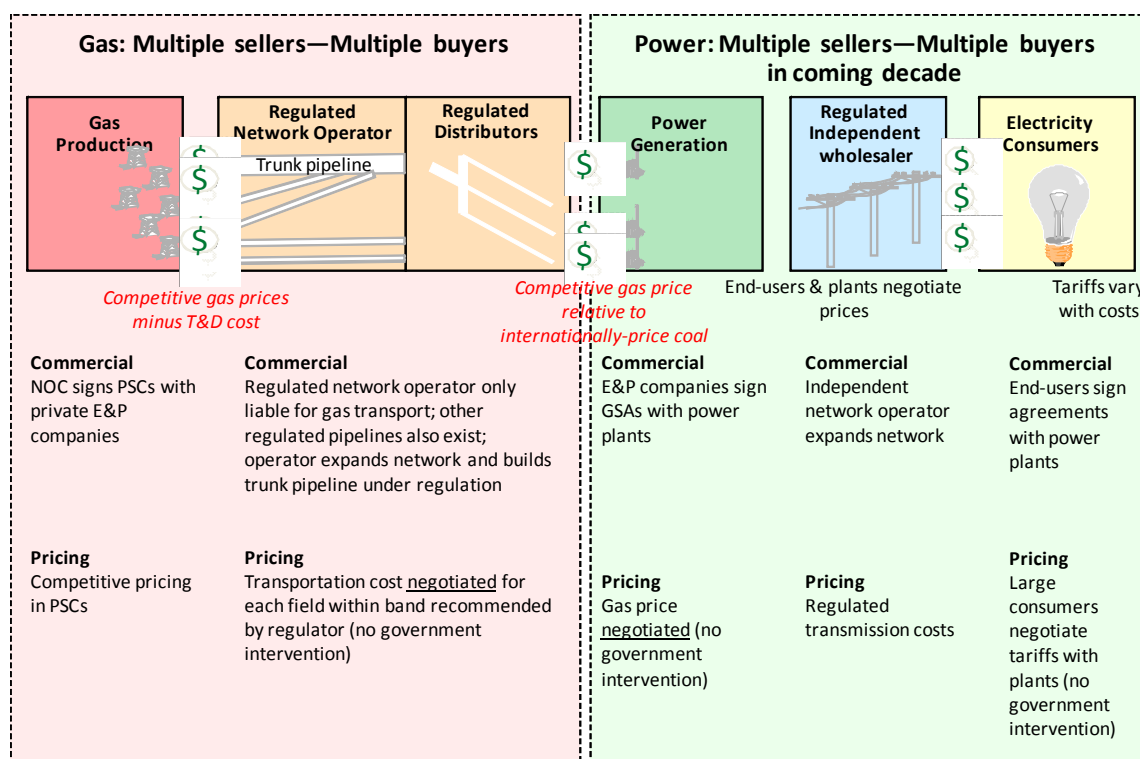
Figure 5.2 Phase 2: ‘Single-buyer’ with competitive pricing & regulated T&D



Because of the role it already plays in Vietnam’s gas business, its experience and financial strength, PVN is the obvious company to fill the single buyer function in Phase 2.

The GoV’s regulatory role in Phase 2 will focus particularly on implementation and monitoring of the competitive pricing methodology as well as on the regulation of rates (prices) and access terms for T&D businesses.

Operation of market under WCGM: As figure 5.3 shows, under the WCGM gas producers will become responsible to sell directly to gas consumers, including distribution companies. Existing sales that have been made by PVN as the single buyer in the interim phase will become the responsibility of gas producers. New sales arrangements will be negotiated directly between producers and consumers. Marketing intermediaries will be allowed to take part in these transactions on a competitive basis. PVN could be one intermediary.

Figure 5.3: Phase 3 – The Wholesale Competitive Gas Market

When that condition comes about, gas sellers (producers and possibly marketers and other intermediaries) will negotiate pricing and other terms of new gas sales with gas buyers (electric generators, other large consumers, gas distributors and possibly marketers). Pre-existing contractual arrangements based on the competitive pricing methodology may be renegotiated by unanimous agreement of all parties to the contracts.

Trunk line transmission services will be provided by a network operator whose pricing and conditions of service will be regulated to control abuse of monopoly power and to prevent discrimination among users of the network.

Where new pipelines are needed to serve particular field developments, transportation prices can be negotiated with third-party owners of such facilities, on a cost-related basis within a band recommended by the regulator. Producers will also be free to invest in their own transmission under the same regulatory conditions.

The values of gas for fiscal and other purposes will be derived essentially from its freely negotiated price in the various markets serviced, with deduction of T&D and other costs incurred between the point of production and those markets. The exception will be where parties to pre-existing contracts decide to retain the competitive pricing methodology.

Regulation under the competitive pricing methodology will be replaced by careful market monitoring. The results of this monitoring will be in the first instance for consideration by policymakers. However, publication of the results can help make gas markets more transparent and consequently more competitive and is therefore recommended.

The importance of the trunk line: Mention has been made several times in this Report of a trunk line, connecting existing and future gas supply and consumption nodes, handling a standard quality of gas, and thereby providing the physical basis for a functioning gas market. This subject has been discussed in earlier reports that have been reviewed and is understood to be actively considered by PVN. The importance of a trunk line (sometimes referred to as a “gas grid”) must be emphasized. It will support market growth, contribute importantly to security of gas supply and a national Vietnam gas market cannot function without it. The trunkline must almost certainly be a state initiative and its rates (prices) and service terms should be subject to independent regulation to ensure cost-related pricing and non-discriminatory open access for all comers.

5.4 Policy alternatives to what is proposed

While an interim market design has been described in this section, there is no obvious policy alternative to a WCGM as the preferred option for the long term. When the conditions for workable competition are present, any solution that stops short of allowing gas sellers and buyers to negotiate their own sales and purchase contracts would impede the healthy development of the gas sector.

Concerning international examples of gas market design alternatives:

- At one end of the range: multiple suppliers (it has not been possible to identify a significant single supplier gas sector); a single buyer; and a government-decreed price (Examples: Bangladesh; Pakistan—there are several distributor-buyers but all are controlled by the same NOC entity). Comment: this is not the “domestic competitive energy market” stressed in the viewpoints and objectives sections of the NSED. It need not be pursued here.
- At the other end of the range: multiple suppliers; intermediaries and consumer-buyers; prices formed by competition of suppliers for buyers and buyers for suppliers, no government activity beyond “monitoring”. Comment: this is a “functioning gas market” at the level of “wholesale competition” and represents an ideal long term goal for Vietnam (Examples: Canada, UK). This is a “domestic competitive energy market” envisaged in the NSED.
- Intermediate cases: some countries have made a unilateral commitment to ultimate achievement of a competitive wholesale market. One example is Turkey whose Natural Gas Market Law of 2001 is intended to transform a monopolistic structure into a competitive one through encouragement of new market entry and investments (Turkey’s gas supply is almost entirely imported). The IEA reported in 2005⁴⁵ that 80% of the market is free to choose supplier competition but it has not yet fully developed because of monopolistic tendencies on the part of the national transmission company. Other countries are required to achieve such market conditions by a supranational authority (for example, the EU member states). The IEA is the best source of historical and ongoing information about these

⁴⁵ IEA: Energy Policies of IEA Countries: Turkey 2005 Review
<http://www.iea.org/Textbase/npsum/Turkey2005SUM.pdf>

developments as far as the fully industrialized countries are concerned.⁴⁶ The Agency also from time to time reports on energy policy developments of non-members such as Indonesia⁴⁷. Comment: examination of the international gas policy, regulatory and market scene shows a broad spectrum of approaches, but with a strong tendency to seek out and apply market solutions to the particular circumstances of individual countries.

5.5 Transitioning from Phase 1, the current state, to Phase 2, the Interim Model

PVN would be the single-buyer: PVN is the obvious organization to become the single-buyer. PVN would be an agent of the GoV for purposes of gas policy implementation, rather than being an independent actor in the gas sector. Accordingly, the GoV would instruct PVN on how to use its powers to achieve the model's predetermined policy objectives through its gas purchase, resale and, if required, T&D investment activities.

Preconditions for transitioning from Phase 1 to Phase 2: Three pre-conditions apply before a transition from the current situation to the single-buyer with competitive pricing and regulated T&D can commence.

- First, the competitive pricing methodology has to be developed, agreed and adopted.
- Second, GoV capacity has to be built for regulation and oversight to ensure appropriate implementation of the competitive pricing methodology, effective regulation of T&D and careful market monitoring.
- Third, new supply has to become available—from any source, either (i) significant quantities from a small number (1 or 2) of new suppliers, or (ii) with significant quantities dispersed among a larger number of new suppliers none of which is capable alone of creating an economically viable gas development anchored by a new gas-fired power plant.

Existing gas-to-power projects should be excluded from the Phase 2 market design: The three existing gas projects should be excluded from this phase and only be later brought into a WCGM on a voluntary basis. The price of gas in individual projects such as Bach Ho, Nam Con Son and PM3 will therefore continue to be different from each other and will almost certainly be different from the prices that result from use of the competitive pricing methodology. This may not be an ideal situation, but the projects are not currently conjoined and the energy system does not seem to be harmed by the subsisting price differences.

Time Period for commencing Phase 2: Since Phase 2 is, in effect, a modification of the status quo, it could be prepared-for promptly by confirmation of PVN's single-buyer status, if that confirmation is needed. It could not of course be implemented until one or more new gas discoveries create the basis for new projects.

⁴⁶ For a full listing of IEA member country energy policy reviews see http://www.iea.org/Textbase/publications/free_new_result.asp?title=energy+policies

⁴⁷ The IEA in-depth review of Indonesian energy policy is available at <http://www.iea.org/textbase/npsum/indonesia2008SUM.pdf>

The Phase 2 model would meet the following policy and market needs:

- Implement competitive pricing of natural gas, thereby meeting a policy objective, encouraging additional gas supply while at the same time providing gas energy to the market at a competitive price,
- Address concerns about potential abuse of dominant market positions that would arise if the new gas supply were concentrated in one or two hands,
- Provide a necessary value-adding aggregator function if, on the contrary, the new gas supply was dispersed among several producers, no one of which could provide sufficient gas to meet an anchor customer's needs,
- Extend value-adding guarantees in the event that parties on either side of a potential gas transaction were not considered sufficiently credit-worthy for the transaction to be completed,

The single buyer could also provide processing, T&D services in the event that there is insufficient capital or interest to support construction by others of the required infrastructure facilities.

5.6 Transition from Phase 2, the Interim Model to Phase 3, the WCGM

In the design of the interim model, provision would have to be made for contracts between gas producers and the single buyer and between gas consumers and the single seller to be modified according to a predetermined formula when the single-buyer single-seller functioning disappears upon initiation of the WCGM. In most cases, it would be left to the producer-sellers to fulfill the commitments made by the single-buyer single-seller for the balance of the contract terms. Special arrangements, possibly involving continuance of the NOC's intermediary role, might have to be made where the NOC has been performing a *de facto* aggregator function. Provision would also have to be made for pricing in contracts entered into in Phase 2 and embodying competitive market pricing to be modified by unanimous agreement of the parties, to incorporate freely-negotiated pricing in the final stages of the WCGM.

The challenges in eventually creating a WCGM must not be underestimated: Challenges arise mainly because of such factors as: uncertainties about the amount and nature of new gas supply; the number of competing new suppliers (producers, marketers and, in some scenarios, providers of imported gas); the very high concentration of demand in power generation; the “lumpy” nature of supply and demand increments; the unusual geography of the country, including the location of known gas resources; and, related to that, the absence of a trunk pipeline system. Realistically, it may take 10 years before the main elements of a WCGM are present and 15 before government can defer from interventions and leave the operation of the gas sector essentially to the forces of competition in regard to the supply and price of the commodity and to the regulator in regard to natural monopoly elements and monitoring of market functioning. Notwithstanding these challenges, a start must be made in gas market design. That will provide invaluable guidance, presently lacking, to state and private companies as to the environment for project development.

Planning for the WCGM must be on a prospective basis: The conditions must be spelled out as soon as reasonably possible under which future increments to supply and demand will “interact”. This will provide valuable information to current and potential gas sector investors as to the GoV’s policy decisions and implementation intentions. If policy announcements about the interim model and the eventual WCGM are coupled with indications of a movement to competitive market pricing for natural gas, the effect on investors’ intentions and later on activity in the sector should be positive.

Gas and power market reforms need to be coordinated: The eventual existence of a WCGM for natural gas is an important counterpart for the creation of a CGM and, later, a WCM in the power sector. Effective competition in the market for gas and other fuels in power generation and other industrial uses cannot exist without a WCGM. Further, if an industrial energy user has from 2016 the benefit of a WCM for power as well as competitive markets for coal, LPG and oil fuels, it is reasonable to try and provide that user with a WCGM for the other “network energy”, namely natural gas. There is no reason to take gas market design for Vietnam to the ultimate stage of retail competition: the transaction costs of retail competition are unlikely to be justified by the probably-small per customer gas consumption in a country like Vietnam that requires very little space heating load.

Preconditions for a WCGM: There are four specific pre-conditions. In addition, there needs to have been successful implementation of the interim phase, together with reform of sector structure in terms of both institutions and components of the gas chain (the following needs to be read in conjunction with the comments under heading 5.2 regarding “requirements for a competitive gas market”):

- First, multiple sources of new supply must become available with no element of supplier monopoly (example: volumes dispersed among three or more suppliers) and with volumes sufficient for suppliers individually or cooperatively to support projects sufficiently large to be successfully anchored in the power market. There should be consensus that sufficient new suppliers and buyers exist to eventually make workable competition possible. It is not essential that workable competition arise straight away. There could be a lengthy period during which several suppliers and buyers interact directly but where prices are still formed by application of the competitive pricing methodology. The important point is that policymakers, acting on the basis of expert advice, decide that there is a reasonable possibility that workable competition is possible in the long run.
- Second, competitive market pricing should be ready to be replaced by negotiated prices. Prices would then be set by negotiation (since competitive pricing would be present initially in the WCGM, it will always be a back-up pricing methodology). Prices of T&D services will be determined according to methodologies approved by the GoV and implemented by Ministry or an agency of Ministry. T&D providers will be regulated because they are natural monopolies (the same approach is being developed in the power sector: regulated transmission charges methodologies, regulated retail tariffs and distribution network tariffs methodologies). Box 5.3 summarizes the relevant features of economic regulation.

- Third, there would need to be physical connectivity, involving an integrated onshore gas pipeline network—a place where sellers and buyers can “meet”. Associated with this would be standard technical specifications for pipeline gas that will render the gas physically exchangeable among all users. This would also require the institutional and legal infrastructure for permitting open-access by producers to gas pipeline connections with gas power plants and to low pressure distribution system markets, regardless of the ownership of those pipelines. This would allow individual interest-owners in PSCs the opportunity to market their gas separately if they wish (this is desirable but not essential). This would require that PVN’s monopoly of gas purchase and sale is also adjusted. PVN would no longer be the “single buyer”. The single-buyer contracts would revert from PVN to the respective “sellers” in those contracts who would continue to fulfill them the same way PVN does. Already during Phase 2, other investors with adequate financial backing and who were otherwise qualified to enter the T&D would not be prevented from doing so.
- Finally, GoV capacity would have been developed to execute modern regulation of pipeline and distribution system natural monopolies and to carry out effective market monitoring to be able to advise policymakers as to whether the market is functioning to protect consumers’ interests.

Origin of gas supply for a WCGM: The origin of the gas supply is not a precondition for a WCGM. In particular, the sourcing of some gas from imports whether pipeline or LNG would not compromise the WCGM as envisaged in this report. Indeed such a development, by increasing the number of supply sources, would foster the conditions for achieving a WCGM, always provided the imported gas reached its markets through the envisaged trunk pipeline system from which it could be accessed by multiple buyers.

Time-horizon for a WCGM: WCGM may not happen by 2025 but it is possible if large supply additions actually take place as forecasted.

Failure to move to a WCGM

- Potential gas developers would confront a situation where the GoV’s policy objectives for energy market competition set out in the NSED and the GMPs are clear, but they are not expressed in a plan to create a competitive market;
- Gas developers would be discouraged at the prospect of continued, protracted, case-by-case government-directed project negotiation with uncertain outcomes, instead of being allowed to make their own deals with gas buyers;
- Gas developers’ planning would be hampered by continued lack of transparency in the gas chain and uncertainty about the GoV’s intentions in regard to ownership and regulation of the chain, despite NSED’s stated intentions to diversity investment and ownership and to eliminate monopoly; and
- The planned development of the power market would be hampered because there would be less inter-fuel competition in supplying the generation market and specifically the development of competitive gas generation would be impeded.

Box 5.3: Economic Regulation to Address Monopoly and Provide Transparency

NSED: “Eliminate monopoly and monopoly enterprise”

NSED: “Strongly shift to state controlled competitive market mechanism”

Economic Regulation

- Regulation means “government control and direction of those business activities that are not adequately disciplined by competitive forces”
- The purpose is by regulation to model the action of competition in all sectors like gas transmission and distribution (T&D) which are characterized by monopoly and possible abuse of dominant positions
- The scope of regulation relates to approval of: investments; prices charged; terms of access for third parties; quality of service; the conditions under which owners of T&D may engage in gas sales

Features of Regulatory Transparency:

- All laws, regulations, guidelines and codes of practice are public
- All regulatory proceedings—applications, approvals, complaints are made public
- All parties to those proceedings are fairly treated and heard
- Regulatory decisions are based on facts interpreted in the light of laws and regulations
- The regulator periodically reports to government and the public on its activities
- The prices of T&D services and the service terms are made public
- In addition, natural gas businesses are subject to technical regulation dealing with such matters as health, safety and environmental protection

*The term “Regulation” is qualified in this context as “Economic Regulation” to distinguish it from “Technical Regulation” which deals with the protection of health, safety and the environment].

Source: World Bank/China Institute for Economic System and Management. “China: Economic Regulation of Long Distance Gas Transmission and Urban Gas Distribution” Beijing and Washington DC, 2002.

5.7 Implementing the gas market design

Step 1: Map the gas chain functions and indicate how they will be governed (an element of Phase 1 of the overall evolution, namely the Preparatory Period)

Timing: Next 12 months

- Production and Processing: the exit of the processing plant completes the production function and is identified as the transaction point for marketable gas of a predefined quality;
- T&D are identified as natural monopoly functions subject to regulation of rates (prices) and service offerings, including terms of non-discriminatory access for all users;
- T&D unit costs could readily be modeled by the Ministry’s Petroleum Management and Regulation Unit using semi-public knowledge about the costs of pipeline and distribution infrastructure recently built in Vietnam and applying a simple

accounting model (depreciation + debt costs + return on equity + operations and maintenance (O&M) + taxes=total cost of service divided by annual throughputs). This is sometimes referred-to as a “cost of service” or “cost plus” methodology;

- The point of transfer from the T&D function to the final consumer is identified as the point at which the price of the commodity is defined according to principles set out in section 4 of this Report;
- The price at the exit of the processing plant is the commodity price minus the regulated costs of T&D; and
- Legal provisions respecting gas purchase and sale are carefully identified and findings made as to whether and how they would have to be changed eventually to enable gas producers to sell directly to gas buyers and how long it would take to make those changes.

Result: this step would present government, investors and other market players with a clear picture of a transparent gas chain reflecting cost conditions already experienced in Vietnam.

Step 2: Establish a Framework for Gas Commodity Price Negotiations and Settlement (another element of Phase 1 of the overall sector market evolution)

Timing: next 12 months and probably continuing through 2010/2011

- This is the competitive gas pricing methodology recommended in section 4.

Result: The methodology for establishing competitive market prices of natural gas to the final consumers (power plants, large-volume industrial buyers or distribution system operators) is predetermined, exemplified and made public.

By deduction of T&D regulated costs from that value range, there is agreement on the value of gas at the point at which pipeline quality gas enters the system. These values provide benchmarks for later negotiations between sellers and buyers.

Depending to some extent on the price relationships that eventuate (domestic gas pricing compared to international LNG pricing), conditions will be more favorable than today for the eventual introduction of LNG or pipeline gas imports to Vietnamese regional markets.

Step 3: Implement the interim model (Phase 2 of the evolution)

Timing: This cannot be predetermined. It depends on incremental supplies becoming available in sufficient volumes to support at least one new project, almost certainly to be anchored by a power generation project. However, the preparatory steps must be undertaken because of the positive signal that it will give to investors in supply and markets for gas.

Preparatory steps: There do not appear to be any necessary legal steps to implement the interim model. It is presumed that the GoV is in a position to instruct PVN to use the competitive gas pricing methodology in gas supply projects that follow Chevron’s B&52-O Mon project. It is similarly assumed that the GoV may request PVN to act as an

intermediary and provide, for an appropriate fee, “value-added” services for new gas sellers and buyers.

Step 4: Implement the WCGM with competitive pricing but, when market conditions allow, shift to freely negotiated prices⁴⁸ (Phase 3 of the evolution)

Timing: This cannot be predetermined. It depends on incremental supplies becoming available, the amount of those new supplies, their ownership, type (onshore, offshore, imports by pipeline or LNG) and the geographical location in Vietnam at which they become available to the market. However, the preparatory steps must be undertaken in anticipation of new supply because they provide the legal and institutional framework in which that new supply will be accommodated. Investors, public and private, Vietnamese and foreign, will be helpfully informed by having advance notice of what that framework comprises.

Measure to be taken in support of the WCGM:

1. A “Gas Law” is enacted that brings T&D under modern regulation in regard to pricing and service offerings and a downstream gas regulator is created to carry out the economic regulation of natural monopolies in the gas chain (refer to Box 1.3)
2. The Gas Law is used by the regulator to establish open access to new T&D businesses so that the “rules of the game” will be clear, even in advance of new T&D facilities being constructed.
3. The Gas Law provides for the licensing of market participants for purposes of selling and buying gas. Large consumers and local distribution companies are licensed to purchase gas directly from producers⁴⁹.
4. More suppliers are encouraged to become active in the market, for example by allowing foreign partners in PSCs to sell their gas directly to large consumers, to distribution companies and to aggregators, marketers and traders. Legislation may be needed to remove PVN’s monopoly of gas purchase and sale and this could take some time.
5. Provision is made for the licensing, as approved gas sellers and buyers, of “intermediaries” such as demand aggregators, marketers and traders

⁴⁸ This description of the introduction of the WCGM may seem short and simplistic. That is because the principles that are proposed are few and simple. In this connection, note that the process to creating the world’s first fully-functioning gas market (Canada) was started in October 1985 by the a press release from the Federal Government and three provincial governments stating that, after a transition year, gas suppliers would be allowed to find buyers and gas buyers would be enabled to find suppliers. The rest of the process, which took several years to complete (see Annex 5), was left to regulators and to the gas industry itself.

⁴⁹ This “licensing approach” to modern gas regulation was pioneered in the UK and has been widely adopted elsewhere. It was recommended for China in the Joint Report of the World Bank and the Institute of Economic System and Management of the National Development and Reform Commission, *China: Regulatory Framework for Long Distance Gas Transmission and Urban Gas Distribution*, Beijing and Washington, 2003. Annex 1 of that Report presents *Model Legislation Regarding Long-Distance Transmission and Urban Gas Distribution Based on International Experience*.

Step 5: As significant new supply becomes available (completes Phase 3 of the overall evolution)

1. New producer-sellers contract directly, or through marketing intermediaries, with new consumer-buyers. Prices are still determined by the competitive pricing methodology. Contractual arrangements created in the Phase 2 single buyer model devolve from the single buyer-seller to the respective producer-sellers and consumer-buyers.
2. The downstream regulator monitors and reports on the development of the market with a view to identifying whether a condition of workable competition exists in which, even though there is a rather small number of sellers and buyers, market power is not being exerted.
3. If workable competition is developing, regulatory oversight of commodity price negotiations is relaxed and the market increasingly functions by itself. The regulator monitors for market abuses. Government control has now largely given way to regulatory oversight to check that competitive forces continue to work freely (Box 5.4 provides a definition of workable competition and some comments on measuring it).

Result: The market matures as more competitors enter the gas commodity business. Open access to T&D enables sales to be made by producers directly to large consumers served off the transmission system. In a growing proportion of the market, gas commodity prices are formed by negotiation. Regulatory oversight concentrates on monitoring rather than on control of prices. But the regulator intervenes if dominant positions are abused.

Box 5.4: Defining and Measuring “Workable Competition”

- “Workable competition” is defined as a market situation characterized by a bilateral oligopoly (small number of sellers and buyers) but where there is sufficient competition to protect participants from significant abuse of market power
- The Herfindahl-Hirschman Index (HHI) is the most widely used measurement of concentration in an industry. Briefly, the index is the sum of the squares of the percentage market shares of industry participants. A number below 1000 indicates an unconcentrated condition; 100-1800 moderate concentration; >1800 indicates high concentration. The index is widely used by American regulators including the Federal Energy Regulatory Commission.
- The HHI has been criticized for its rigidity: empirical studies show that a high degree of competition can exist concurrently with a high degree of concentration in industries such as passenger airlines and road transportation.
- For purposes of signaling that conditions exist to move from the interim model to the WCGM, the regulatory authority will have to apply its own pragmatic judgments to existing factual situations.

5.8 Regulatory methodologies for the coordinated development and operation of the gas and power markets in Vietnam

Principles: It is important that Vietnam should have a competitive gas market in order that gas should take its expected place as a competitor in the market for fuels for thermal generation. The CGM and, later, the WCM could of course be achieved without additional gas supply because electricity generation can be seen as a “manufacturing process” and its energy needs can be met from several sources other than natural gas. However, from the perspectives of national policies for energy and power, there is a desire and an expectation that gas should maintain a significant share of the power generation market. To do so effectively in the new era of competitive power generation and electricity resale, the design of the gas market should be similar to that of the power market with multiple gas suppliers competing for business over open-access transmission systems. This will require, among other things, appropriate gas regulatory institutions and methodologies.

Upstream: There is no need for a fundamental change in the regulatory methodology (the PSC, with PVN as the governmental counterparty to the contractor) or fiscal system, always assuming that the present design continues to be internationally competitive. It is also assumed that the fiscal system can be adapted to deal with unusual cost conditions. However, consistent with the NSED and with modern international practice, PVN’s regulatory functions in regard to the upstream should be transferred to a Petroleum Directorate in Phase 3 of market development. .

Gas processing: This link in the chain should be subject to modern international practice. Essentially this involves the parties which own the raw gas (in the present case, the parties to the PSC) negotiating privately with the party supplying the gas processing service (which may be PVN). The objective is to arrive at agreements on matters of prices and services. However, gas processing has natural monopoly elements and there may need to be provision for recourse by users of processing services who consider that this monopoly is being abused. This recourse might involve regulatory intervention by the Petroleum Directorate. Alternatively, the industry may have developed and obtained regulatory approval for a template that predefines how these matters should be settled. For example, the current negotiation template in use in Alberta, Canada where there are hundreds of processing plants, provides for the recovery by the plant owner in user charges of: operating costs and local taxes; 20% per annum of the capital investment before income taxes; the capital investment allowed is in the range of original cost to replacement cost; there is no allowance for depreciation.⁵⁰ There are also provisions for non-discriminatory access to processing services.

Transmission & Distribution: These links in the gas chain should be subject to modern international practice, which is consistent with the requirements of the NSED in regard to dealing with monopoly and creating competitive markets. Such treatments would also be

⁵⁰ Gas processing fee practices in Alberta, culminating in the currently-used JP-04 methodology are explained in a PowerPoint presentation found at <http://www.esc.ab.ca/pdfandpp/EconomicsSocieJP-04Rev1.ppt>

congruent with what is proposed for the power sector. The key elements of international practice that apply in this case are as follows:

- T&D pipelines, treatment and storage systems would be subject to a full regulatory regime.
- The regulatory regime should include regulatory accounting separation, technical regulation, dispute resolution processes, and standard license conditions.
- The license conditions will require pipeline suppliers to offer third parties access to their pipelines and systems on a fair and equal basis and to negotiate transportation tariffs subject to prescribed principles.
- Gas supply would be subject to regulatory arrangements to protect the interests of consumers, particularly consumers who may not be able to choose their gas supplier.⁵¹
- A regulatory authority be established for the downstream gas sector.⁵²

5.9 Recommendations and Anticipated Benefits

Summary of market design recommendations: the current absence of a market design is a serious handicap to gas sector development. It discourages ongoing investment and if it continues will retard future project implementation.

This deficiency can be remedied:

- First, by decisions on, the announcement of and the introduction of an interim **solution. This comprises the existing single-buyer model with the introduction of competitive gas pricing for new projects, the provision of value-adding services by the single buyer and the regulation of T&D.**
- **Second, as additional new** supplies become available from whatever sources, by the phased introduction of the WCGM, initially using market value pricing in multiple seller-buyer transactions and then, as and when a condition of workable competition develops, freely negotiated pricing.

Existing gas-to-power and gas-to-fertilizer projects are left to run the term of their contracts, unless all parties to those arrangements agree otherwise. Planning for the WCGM is, therefore, on a prospective basis which allows ample time to develop the practical application of the concept.

In the preparatory period (Phase 1), the gas chain functions and how they will be discharged in the interim model and in the WCGM are mapped out. This will give all

⁵¹ This monitoring and protecting role in respect of customers who cannot choose their suppliers would be exercised by the recommended downstream regulatory authority. Virtually all customers in this classification would be served by gas distribution businesses, such as PVGas City (industrial and commercial) or PV Gas Distribution (retail) and the practical responsibility for this protection lies with these distributors who would be participants in the wholesale gas purchase market.

⁵² As discussed elsewhere, this regulator could be the ERAV with an additional mandate (recommended), or a specialized Gas Regulatory Authority of Vietnam or the Petroleum Directorate (not recommended).

parties a clear picture of a transparent gas chain and, in order of magnitude terms, of the costs likely to be incurred along the chain at the mid- and down-stream levels. A framework is established for gas commodity pricing in relation to competitive requirements in the principal market served by gas—power generation.

The status quo is modified in the interim model (Phase 2). New supply is available but workable competition has not yet developed. PVN continues to play a central intermediary role between suppliers and buyers. It is pre-committed to competitive pricing and to providing value-added services, as required. PVN would also be the provider of processing, T&D services, under modern regulation, unless alternative investment sources are forthcoming.

In Phase 3, the WCGM is implemented, initially with competitive gas pricing by multiple sellers and buyers. Subsequently, when a determination is made that a market condition of workable competition exists, all contractual conditions are freely negotiated. Government then assumes a market monitoring mode and the PVN becomes one of several competitors in the provision of wholesaling and other services to the sector.

A changed role for Policymakers: This does not mean that policymakers “abandon” the gas sector. It means that instead of managing prices and deciding on individual projects, policymakers are focused on the critically-important “big picture”. This includes: long-term gas and energy supply-security; management of domestic resources, ensuring the competitiveness of fiscal regimes; seeing to it that all energy markets are operating satisfactorily; creating a favorable climate for Vietnamese and foreign investment; dealing with international energy relations; and addressing energy sector employment and social issues.

Anticipated benefits of the proposed evolution of market design

From a policy standpoint, the gas market design proposed in this section will fill a critical gap in gas sector planning with an approach that is entirely consistent with the policy requirements of the National Strategy. The objective of the power sector reforms cannot be fully achieved without a competitive multi-seller gas market which is the final result proposed here. The WCGM design has been successfully implemented or is in progress in other industrial countries.

From the point of view of economic efficiency, the recommended market design should lead to superior results in terms of the efficient utilization of resources—human, financial and natural—compared to the current single-buyer sector structure.

From the standpoint of industry development, the investment requirements of an expanding gas industry are publicly acknowledged to be huge. The proposed design will encourage new private sector investment, including foreign direct investment, while still affording wide scope for investment by existing players including PVN.

In conclusion, the recommended evolution of gas market design with the ultimate goal of a WCGM is a vitally important policy step in achieving Vietnam’s ambitious goal of a gas sector some three times as large as the present one and making a dynamic contribution to the nation’s economic development with particular regard to the electricity industry.

6. The Implementation Road Map for the Gas Sector

This Report envisages the evolution of Vietnam's gas industry from a state-led sector (with strong GoV discretion in decisions on the role of corporations, on pricing and on regulation) to one characterized by broad participation by Vietnamese and foreign investors, state and private, across the gas value chain. Progressive market opening would be encouraged by modern regulation and regulatory institutions and by generic competitive pricing criteria giving way eventually to prices freely negotiated between sellers and buyers. This Report's policy recommendations regarding institutional changes, pricing methodology, and market design, mean that a multi-faceted transformation needs to be managed. To guide this transformation, this main section outlines an interleaved road map for implementing a phased transition to a market-oriented gas sector. After presenting the road map in broad outline, the section provides detailed implementation steps and as well as explores possible implementation risks.

Arrangement of Material

Section 6 starts by setting out the key conclusions as to what can be achieved by an improved gas sector development framework for Vietnam discussed under **heading 6.1**. There follows in **6.2** a brief recapitulative description of the condition of the gas sector today and in the interim and final phases of sector restructuring. Detailed implementation steps are set out under **6.3**, and priorities—immediate, near-term and long-term—identified in **6.4**, **6.5** and **6.6** respectively and the implementations risks are dealt with in **6.7** as an exercise in potential problem analysis.

6.1 Key conclusions about what can be achieved

The GoV is justified in placing a high policy priority on gas sector development. The reasons for this include:

- The prospect of increased GoV revenues from accelerated upstream gas development;
- The contribution gas can make as a fuel for power generation to sustain Vietnam's economic growth needs for an adequate and reliable power supply;
- Gas as a more environmentally benign resource than other fossil fuels; and
- Optimum utilization of domestic gas resources to diversify the nation's energy balance and help address GoV's energy security concerns.

For these benefits to be captured in a foreseeable future and in an economically efficient manner, Vietnam has to develop its gas resources rapidly and on a large scale, particularly to serve major power generation complexes.

But large-scale development means large investment requirements. And these requirements necessitate greater private sector involvement across the gas value chain, together with the technology and entrepreneurship that can bring. This need is one of the major drivers of change in the gas sector's framework.

To attract and facilitate greater public and private sector investment requires a market-oriented sector framework that involves strengthened GoV institutions for policy-making, sector oversight and regulation, a pricing methodology that is appropriate for Vietnam's energy sector and a market design that is aligned with the market-oriented reform taking place in Vietnam's main gas consuming sector: power generation. This Report makes specific recommendations on each of these three elements of a gas sector framework—an institutional structure, a pricing methodology and a market design.

The key conclusion of this Report is that it is within Vietnam's reach to capture the many benefits of gas development if the right decisions are taken at the appropriate time. An implementation road map is needed to guide this complex policy undertaking. This section presents the outline of a recommended road map for implementing the inter-leaving initiatives on each of the elements of a gas sector framework.

6.2 Vietnam's gas sector in each phase of the road map

The road map focuses on the three central, closely-related elements of a gas sector framework:

1. The gas sector in country energy planning, in which *institutional* considerations and their application to *policy analysis and implementation* are central (Phase 1);
2. The implementation of a *competitive pricing methodology* for gas in the *interim single-buyer model* (Phase 2); and
3. The inception of a gas *market design* in which the for a time the competitive pricing methodology is retained for a time but where the long-term goal is market-determined, freely-negotiated prices in a *wholesale competitive gas market* (Phase 3).

In Phase 3, *sector* structure issues such as *regulation* of natural monopolies and the future *role of PVN* which are first addressed in Phase 2 would have their final resolution.

The tabular representation in figure 6.1 presents a breakdown of the overall road map arranged in relation to components of the gas sector structure (development; pricing; commercial relationships; management; and infrastructure) and showing how changes are to occur as the recommended transition takes place from the current situation, the preliminary Phase 1, through the interim (Phase 2) to the WCGM (Phase 3). The three main elements of the road map are:

Vietnam's gas sector today which is the background to Phase 2, the preliminary phase: The current state of gas sector development is that four gas fields are in production for power (mainly) and fertilizer—all off-shore Southern Vietnam: Bach Ho started production in 1995, Nam Con Son in 2002, Block 11-2 in 2006, and PM3 in 2007. PVN is the GoV equity holder in the Production Sharing Contracts (PSCs) for these fields. PVN also signs all Gas Supply Agreements (GSAs) with consumers. As the

single-buyer and single-reseller of gas, PVN signs back-to-back gas purchase and sale agreements for each of these fields and these contracts serve as the commercial link between the producer-suppliers and the end-users.

Pricing involves significant GoV discretion (exercised through the PVN Group) across the gas value chain. In the upstream sector, producers' prices are negotiated on a project-by-project basis by PVN, generally using a cost-plus approach. T&D are approved by GoV at the project stage. And end-user gas prices are negotiated between PVN and each consumer.

Sector management on a day-to-day level is conducted by PVN, *de facto*, on behalf of the GoV. PVN also invests in pipelines, negotiates all PSCs with E&P companies, manages and monitors these contracts. The system of pipelines is not currently inter-connected and gas quality varies from one pipeline to the next.

Adjustments to the institutional framework preparatory to undertaking the changes to pricing and the creation of a market design are identified in the following as part of this Phase 1.

Vietnam's gas sector in Phase 2, the interim phase (Single Buyer, Competitive Pricing): The main changes from the current situation to the proposed interim phase are the introduction to the current single-buyer model of the competitive pricing methodology and the regulation of T&D. PVN would continue to play the role of the single-buyer and would still sign all GSAs with consumers, but its activity as an intermediary would include the provision of value-adding services for gas sellers and buyers. PVN would also continue as the GoV equity holder in PSCs and would sign PSCs on GoV's behalf.

With the introduction of competitive pricing for new projects, the opening up of investment possibilities in T&D and the prospect of the eventual creation of a WCGM, the exploration of Vietnam's gas basins should be strongly encouraged. For planning purposes, the expectation is that one commercially viable gas supply project would come on stream every couple of years with some 6 to 8 new projects by 2025.

Sector management would progressively move to the Ministry as it builds capacity for monitoring and regulation. Concurrently, PVN shifts from its sector management responsibilities to a greater focus on its business opportunities, including the creation of additional gas transport infrastructure, particularly the needed onshore trunk gas pipeline.

With regulation of T&D, new public and private investors would also enter the gas transport businesses where much new capital would be needed to satisfy the sector's growth.

Vietnam's gas sector in Phase 3, the final phase (WCGM): With multiple sources of gas supply emerging, successive waves of gas exploration would continue as Vietnam's gas sector prepares to launch the WCGM. It is possible that these multiple sources include imports in the form of LNG and by pipeline.

Under a WCGM, sales and purchase contracts for gas of a standard quality would be signed directly between gas suppliers and multiple market participants. PVN would

remain the GoV's counterparty in PSCs but the Ministry's capabilities would have matured to the point where it would negotiate and sign PSCs on the GoV's behalf. Upstream, contracts between parties would be freely negotiated based on GoV policy guidelines, without direct government intervention in negotiations.

Initially under the WCGM, competitive pricing would continue to apply in sales and purchase arrangements. Ultimately, as an environment of workable competition is found to exist, sellers and buyers of gas would be allowed to freely negotiate prices. T&D tariffs would continue to be regulated.

As the Ministry takes over its role of monitoring and regulation, PVN is expected to emerge as a major player among many in each link of the gas chain. With a stable, market-oriented sector structure, GoV interventions in sector decision-taking would become rare. Instead the GoV's focus would address the "big picture" issues of resource development, supply security, international gas relations and sector social and employment issues.

The trunk pipeline would need to be available as a backbone for the WCGM with producers and gas importers feeding gas into the pipeline and consumers withdrawing gas of a uniform, standardized gas quality from it.

The fundamental changes in Vietnam's gas sector framework that are proposed are summarized in the following chart. The five headings represent one way of "classifying" the gas sector framework. The texts under each heading reflect how the activities under each would change as the successive phases (Phase 1, Phase 2, Phase 3) of recommended policy implementation occur.

Figure 6.1. Recommended Roadmap for Implementation over 10-15 Years

	Sector Development	Pricing
<u>TODAY</u> Current Vietnam Gas Sector	<i>Supply:</i> Four gas fields in production—Bach Ho in 1995, Nam Con Son in 2002, Block 11-2 in 2006, PM3 in 2007—for power (mainly) and fertilizer; <i>Demand:</i> PVN signs back to back gas purchase and sale agreements	<i>Upstream:</i> wellhead prices are negotiated on a project-by-project basis by PVN using cost-plus <i>T&D:</i> tariffs approved by GoV at project stage <i>End-users:</i> gas sales prices are negotiated between PVN and each consumer
<u>INTERIM PHASE:</u> Single-Buyer with competitive pricing	<i>Supply:</i> successive waves of exploration in Vietnam gas basins; one commercially viable gas supply project every 2 years; 6-8 new projects by 2020 <i>Demand:</i> PVN in value-adding role, e.g. guarantees gas purchase	<i>Upstream:</i> competitive pricing established in <i>T&D:</i> tariffs approved by regulator <i>End-users:</i> gas sales prices are negotiated between PVN and each consumer
<u>PROPOSED LONG TERM FRAMEWORK:</u> Wholesale Competitive Gas Market	<i>Supply:</i> Multiple sources; successive waves of exploration in Vietnam gas basins; possible pipeline gas and LNG imports <i>Demand:</i> Gas suppliers sign contracts with multiple market participants	<i>Upstream:</i> Initially, competitive pricing applies; ultimately, prices are freely negotiated in environment of workable competition <i>T&D:</i> tariffs are regulated by downstream regulator <i>End-users:</i> Suppliers negotiate prices with buyers

	Contractual Relationships	Sector management	Infrastructure
<u>TODAY</u> Current Vietnam Gas Sector	<i>Upstream:</i> PVN is GoV equity holder in PSCs <i>Downstream:</i> PVN signs all GSAs with consumers	PVN conducts day-to-day gas sector management on behalf of GoV, invests in gas pipelines, negotiates all PSCs with E&P companies, monitors contracts	Whole system not inter-connected; no uniform gas quality
<u>INTERIM PHASE:</u> Single-Buyer with competitive pricing	<i>Upstream:</i> PVN is GoV equity holder in PSCs <i>Downstream:</i> PVN signs all GSAs with consumers	MOIT develops sector management capacity; MOIT develops monitoring and regulatory capacity; PVN signs PSCs	Additional gas transport infrastructure created by PVN + new public & private investors Gradual standardization of gas quality
<u>PROPOSED LONG TERM FRAMEWORK:</u> Wholesale Competitive Gas Market	PVN is GoV equity holder in PSCs <i>Upstream:</i> freely negotiated contracts between parties based on GoV policy guidelines (i.e. without direct government intervention in negotiations)	MOIT signs PSCs; PVN is a major player among many; MOIT monitors & regulates; sector structure is stable; GoV interventions are rare	Trunk pipeline available as backbone with producers & importers feeding into it, consumers drawing from it; uniform gas quality

Note to Figure 6.1: transition to the Interim Phase is dependent on the development of significant new gas supply volumes. Transition to the Long Term Framework requires the development of further volumes and diversification of suppliers. These factors are to some extent outside the control of the GoV.

6.3 Detailed implementation phasing

A road map as a plan implies a time-scale and one is provided where possible. But because the growth of the gas sector is largely dependent on the rate at which incremental domestic supplies are found, developed and produced, a time-scale is not always possible. But even where no time-scale can be given, the proposed sequencing of activities is provided. Where they exist, preconditions are identified for each component of the road map. If these preconditions are not met, then the particular step forward cannot be taken.

Table 6.1 summarizes the road map with the timeline of tasks to be accomplished for institutional development, pricing, market design as well as broad sector development. The time lines are ordered according to the expected sequencing of the various elements.

The first set of tasks relates to and is part of the preliminary phase (1):

- The first order of business is to get the Prime Minister's approval for the planned changes in the gas sector with the associated issuance of relevant decisions;
- As the relevant decisions are gradually issued, the institutional house has to be put in order with particular regard to the organizations that deal with gas in Ministry and then those organizations are put to work on the issues. Simultaneously, it would be critical to reach policy agreement on the recommended design of the gas market and on the competitive pricing methodology,
- As to timing, this work could largely be completed over the next 12 months
- These preliminaries are followed by two sub-phases which should occur in parallel: determining the long-term sector role of PVN, and creating the institutions for sound sector management, both of which may require legal changes. The establishment of the Ministry's Gas Policy and Advisory Unit and the petroleum management and regulatory entity would be key elements in this process. Given that legislation may be involved, the lead time is considerable but the work should be completed by the end of 2011 at the latest. This would complete the preparatory phase, designated Phase 1.
- These institutional would culminate in the introduction of the regulation of T&D which is a necessary preparatory step to the proper implementation of Phase 1.0;

Next comes the work of the interim phase (2):

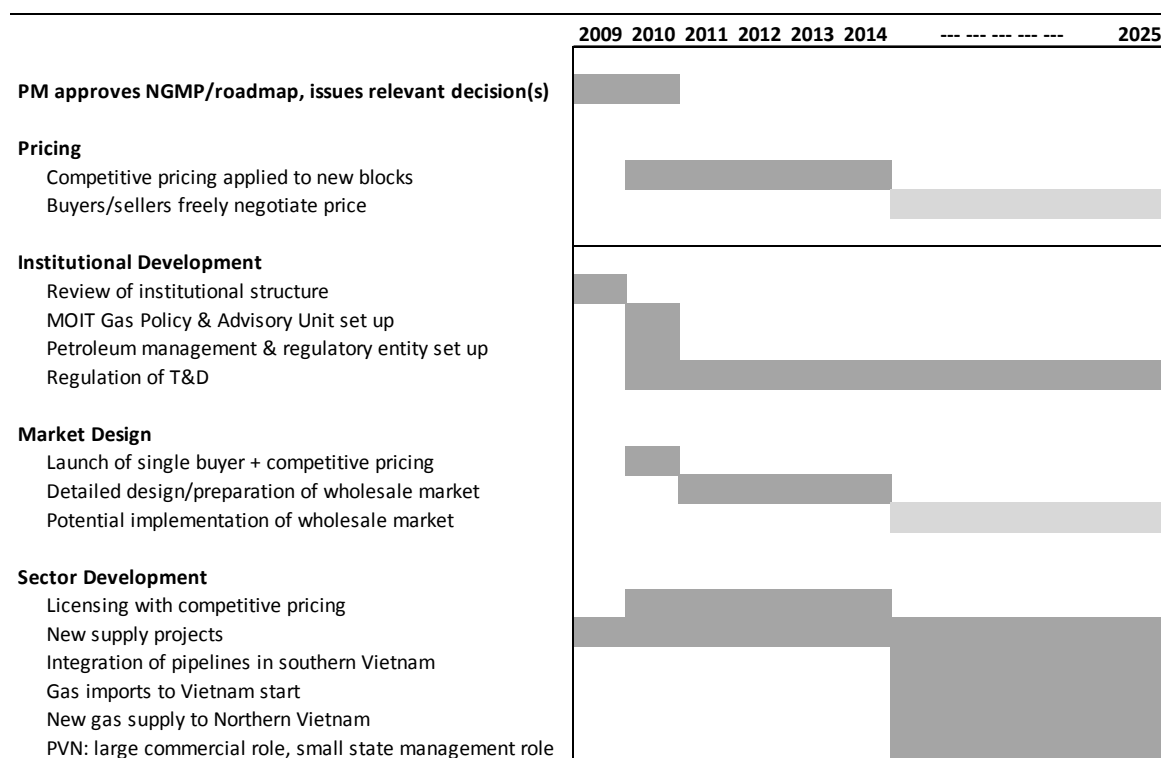
- The implementation of competitive pricing of gas would occur as soon as that methodology has been agreed and put into the PSCs and new commercial projects come forward. This intention should be announced during 2010 and implementation actions taken.

Then the final phase (3), the WCGM:

- When the gas consuming nodes, at least in southern Vietnam have been connected by a trunk pipeline receiving and delivering gas of a standard quality, additional volumes are available and suppliers are diversified and the conditions

of market competition permit, the WCGM can be brought into being as the end-state. The timing of Phase 3 depends largely on gas supply and demand trends and competitive activity in Vietnam's energy economy and cannot be predicted at this stage.

Table 6.1. Potential Timing of the Recommended Implementation Roadmap for Vietnam's Gas Sector



Legend: Dark gray bars used for tasks which depend on decisions of GoV; light gray bars used for tasks that have preconditions which are not solely under GoV control

Detailed implementation phases are presented below based on immediate, medium-term and long-term priorities:

6.4 Immediate priorities (through the next 12 months)

A. The institutions for sound sector planning are reviewed, revised and put to work

By law, Ministry has the central responsibility for state management of the petroleum sector. It is essential that it be fully equipped to discharge this role in respect of the gas sector if there is to be appropriate follow-up to gas master plans and if the recommendations of this Report are to be properly implemented. This therefore becomes the first action priority.

The main objectives are to identify and fill any “gaps” in the current approach to sector planning and increase capability in policymaking, analysis and operations. There are no preconditions. The key tasks are:

- Correctly identify the main activities required for effective gas sector planning;
- Create a Gas Policy Development and Advisory Unit within the Energy Department;
- Establish a Petroleum Management and Regulatory Unit;
- See to it that gas planning is appropriately staffed in terms of numbers, salaries sufficient to attract and retain good people, and training;
- Use the revamped institution to address specific issues (competitive pricing methodology; refinement of market design recommendations; LNG imports; gas supply to Northern Vietnam, etc.) and to achieve a structured approach to sector decision-taking, partly on the basis of a system of “indicative planning”.

It is important to bear in mind here that one lesson from the international experience in implementing such institutional change in the gas sector is that it can be accomplished and effective policymaking and implementation can be implemented even where there has been no previous experience of a market-oriented gas sector (example: Argentina in the 1990s⁵³).

Milestone: The natural gas function in the Energy Department is appropriately organized, staffed and resourced to address ongoing issues including those stemming from this Report.

Results: The assessments recommended will be carried out, issues raised by this and other reports will be addressed and, more generally, a robust basis will be created for sector planning with improved policy implementation and project decision-taking.

Priorities in the near-, medium- and long-term

6.5 Near-term priorities (through 2010/2011)

Gas sector policy planning, like investment in gas projects, is a long term business. The following activities (B1 and B2) are therefore important even though it may be several years before the conditions exist to transition from the interim phase, Phase 2, to a functioning WCGM, Phase 3. A sound pricing methodology is needed for both the interim phase and for the first part of Phase 3.

B1. A coherent approach is taken to Gas Pricing Principles: a pricing methodology is agreed and published

The pricing methodology recommended in this report is “competitive pricing of gas in relation to internationally-priced coal in the power generation market”. The objective is to agree upon and publish a pricing methodology based on coherent principles, which properly value gas in a market context. Again, the pre-conditions are increased Ministry policymaking and analytical capability.

⁵³ See Law, P.L. and Svensson, B.R. *Gas Sector Restructuring and Privatization: Lessons from Argentina etc.* in Natural Gas: Private Sector Participation and Market Development. World Bank, Washington DC, 1999, pages 21-24.

The key tasks are:

- Refine the pricing methodology recommended in this Report, relating it appropriately to other policies such as upstream fiscal and environmental policies, and publish the result;
- Take appropriate steps to express that methodology as GoV policy;
- Embodying that choice administratively by including it in PSCs.

Milestones: (1) Senior policymakers take and publish decisions on pricing principles. (2) Officials then develop, propose and policymakers accept and publish an implementation program. (3) Officials present and periodically update information on the levels of gas prices that would result from the application of these principles.

Results: Policymakers, officials and investors will have a predefined gas pricing methodology, hitherto absent, for upstream investment evaluation, energy and power sector planning. This will have a positive long-term effect on sector investment. Additional capital sources, with associated entrepreneurship and technology will be attracted to the sector. Policymakers will be continuously aware of the probable resulting gas price levels which will inform such areas as fiscal planning, economic and energy policy.

B2. Gas Market Design Options are identified, choices made, the basics of the design agreed and published

The objective here is to carefully design structures that will move the sector step-by-step towards competition and appropriate interaction with a competitive power generation market. And the pre-conditions are increased Ministry policymaking and analytical capability.

The key task is for the WCGM to be finally established when a condition of workable competition exists. As an interim, the single-buyer model with competitive pricing and regulated T&D are to continue.

The relevant lessons of international experience are from Canada. In the period 1975-85 this country used competitive pricing to ensure the retention and expansion of gas markets against competition from fuel oils. Since 1986, it has successfully followed a gas market design based on open and competitive markets for the commodity and modern regulation of the networks by which it is transported and distributed.⁵⁴

Milestones: (1) Senior policymakers take and publish decisions on market design options. (2) Officials then develop, propose and policymakers accept and publish a program for implementation of those decisions.

⁵⁴ See Annex 4 and refer to the summary of energy and gas policy found at: <http://www.nrcan.gc.ca/eneene/polpol/owevue-eng.php> and factual information about the gas industry at: <http://www.nrcan.gc.ca/eneene/sources/natnat/index-eng.php>

Results: Policymakers, officials and investors will have a clear line of sight (which is presently lacking) to the long-term sector structure. There will be long-term positive effects on sector investment.

C1. The long-term gas sector role of PetroVietnam is determined and any related legal changes identified and put in hand so that when the time comes future sector restructuring is not delayed by legal constraints (end of 2010/11)

PVN is a dominant player in the sector from PSC counterparty to electric generator, with elements of unregulated monopoly in T&D that appear to be inconsistent with the NSED. There are also concerns about the operational implications of PVN's cross-ownership of gas transmission and gas generation.

The objective here is to create the conditions for PVN's strengths ultimately to be deployed at management's discretion in a competitive environment in all links of the gas chain and, meanwhile, to apply those PVN strengths in the interim phase (2). The preconditions are increased Ministry policymaking and analytical capability, and possible technical assistance.

The key tasks are:

- Bring greater transparency to PVN's current activities;
- Clarify if any activities are to be retained solely for PVN (otherwise eliminate PVN's monopoly functions);
- Bring new investments in facilities having natural monopoly characteristics under modern regulation (existing T&D facilities would be brought under this regulation only by unanimous agreement of their owners and users);
- Prepare to remove any existing regulatory responsibilities from PVN;
- Achieve agreement on PVN's role in the interim phase (2).

International experience says that the relinquishment of sector-management responsibilities can have an invigorating effect on state-owned energy enterprises (example: China National Petroleum Corporation [CNPC, PetroChina]).

Milestones: (1) Senior policymakers take and publish decisions on the long-term gas sector role of PetroVietnam. (2) These decisions are acknowledged by PetroVietnam's management. (3) Action is taken to secure any required legal changes.

Results: (1) PVN is primed to be the principal instrument which successfully implements the interim phase. (2). PVN progressively withdraws from any regulatory functions and, if it possesses any "rights" to monopolize certain activities, loses those rights. Ultimately PVN has the discretion to be a major investor and competitor across a restructured gas sector

C2. The institutions for sound sector regulatory management are created (end of 2011)

The present situation is that there is no modern, independent regulation of those links in the gas chain links which need it, namely exploration, development, processing, T&D

The objectives, as per NSED guidance, are that state management functions over the petroleum sector be concentrated in one agency, monopolies are to be addressed and a legal basis established for, particularly, economic and technical management of the mid- and down-stream. The preconditions are increased Ministry capability in the area of regulatory design, possibly involving training abroad and technical assistance from outside the GoV.

Internationally, regulation is recognized as an essential function in a modern petroleum economy and governments dedicate substantial resources to it.⁵⁵ Progress with the introduction of competitive gas markets has been associated with the presence of strong, transparent, independent regulation.

The key tasks are:

- Design, legislate, resource and put into effect a Petroleum Directorate (PD);
- On the assumption that the PD is to regulate only the exploration, development and processing links in the gas chain, do the same in respect of a regulatory authority for T&D.

Milestones: (1) Senior policymakers take and publish decisions on the institutional framework for sector regulation. (2) Action is taken to secure any required changes to existing legislation and to create new legislation as necessary. (3) The new institutions are created, staffed, resourced and start their duties.

Results: Vietnam will be equipped with an institutional structure that reflects international best practices and can be promptly put to work.

6.6 Long-term priorities (dependent on development of incremental gas supply which may include LNG and pipeline imports)

D. The interim Phase 2 is put in place, including the use of competitive pricing (should be done in advance of significant new supply becoming available)

The objective is to create some of the conditions for prompt and favorable decision-taking by gas developer(s). If new supply eventuates, establish a more efficient market than presently. The precondition is the competitive pricing methodology has been elaborated and agreed between Ministry (with Prime Minister's approval where needed) and PetroVietnam and other potentially affected parties such as power sector

⁵⁵ The source of this statement, and a relevant reference is the report *Modernizing China's Oil and Gas Sector: Structure Reform and Regulation*, Chapter 3, Regulatory Reform: Promoting Transparency, Investment and Competition. The World Bank. Washington DC, 2001.

investors as part of the activity in B1 and B2 above. A commercially significant new gas discovery awaits development.

Vietnam will accord in this respect with international best practices which are to predefine the broad policy conditions for project development rather than, as currently, to have them negotiated on a case-by-case basis.

The key tasks are: Take practical steps to put in place the interim phase (2) comprising principally: the continued PVN monopoly of gas purchase and sale; the use of the competitive pricing methodology; the offer of value-adding intermediary services by PVN to gas sellers and buyers; and PVN investment in new T&D businesses, subject to regulation.

Milestone: There is an announcement by the Minister of Industry and Trade that provides comprehensive guidance to all private sector players as to initiation and implementation of the interim phase.

Results: The gas developer(s) have a clear understanding of the market-structure and pricing environment for their project(s). The interim phase (2) contracts embody legal provisions that will enable them to mutate into the WCGM multi-seller multi-buyer model when the time comes.

E. The WCGM is put in place, initially with competitive pricing, eventually with prices freely negotiated (the latter when a condition of workable competition is identified)

The objective is to further improve the conditions for prompt and favorable decision-taking by gas developer(s) and for a more efficient market than is achieved during the interim phase (2)

The preconditions are that the WCGM model has been elaborated and agreed between Ministry (with Prime Minister's approval where needed) and other interested parties such as gas and power sector investors, gas distributors and large consumers. There are a number of significant additional gas discoveries which, if developed, would eventually create a condition of workable competition. Vietnam will accord in this respect with international best practices.

The key tasks are:

- Take practical steps to put in place the WCGM;
- Phase out the PVN monopoly of gas purchase and sale;
- Allow gas producers to contract and sell directly to large consumers and distributors;
- Permit intermediaries to enter the market;
- Adjust and, when workable competition exists, eliminate the use of the competitive pricing methodology in favor of free negotiations between buyers and sellers;
- Open new T&D businesses to any investor public or private, subject to regulation.

Milestones: There is an announcement by the Minister of Industry and Trade that provides comprehensive guidance to all private sector players as to initiation and implementation of the WCGM.

Results: Gas developers have a clear understanding of the market-structure and pricing environment for their project(s).

6.7 Implementation risks for improved gas sector management and planning

The actions proposed above are consistent with the NSED, but it is reasonable to expect that policymakers will look for some “risk analysis” as they consider the alternatives proposed. This section discusses the risks which could be faced in the implementation of the proposed road map.

(a) Institutional change relating to the gas sector in national energy planning

Risk: The existing, probably seriously under-resourced institutional structure has trouble in adapting and makes some mistakes. Modern regulation of gas natural monopolies is a new field of activity for the GoV and there as well, mistakes will be made.

Response: There is some lead-time available before major policy changes need to be finalized. This time must be used to properly resource this activity, to train staff (sometimes abroad) and to exercise them in their new roles. The cost of properly resourcing this activity is small in relation to the efficiencies and other macro benefits that gas sector reform can yield. Nevertheless, policy and operational mistakes may occur. Timely mid-course corrections can be made if the Ministry’s policy unit’s monitoring is effective and its subsequent advice is properly directed. As to regulation of natural monopolies in the gas sector, there is much international experience to draw on and if ERAV is expanded and mandated, that aspect of gas regulation will be in good hands given the experience which, by then, ERAV will have accumulated in dealing with electric power natural monopolies.

International example: In the early 1990’s, with World Bank encouragement, Argentina largely privatized and liberalized its electricity and gas sectors. In regard to gas, the state monopoly T&D company was split up and privatized, modern regulation of network natural monopolies was introduced, producer-seller competition was facilitated and a functioning wholesale gas market was successfully created.

These changes were accomplished in a country with a very long history of state intervention in the energy sector (the state oil monopoly YPF was created before the First World War), by a bureaucracy that had no previous experience in creating the conditions in which market behaviors could initiate and flourish and with a governmental and legal tradition that previously had no place for the modern concept of transparent regulation of natural monopolies.

The gas regulator *Ente Nacional Regulador de Gas* (National Gas Regulatory Body) has a strong international reputation for competence and transparency. The website is in Spanish: <http://www.enargas.gov.ar/>

(b) Gas Market Design

Risk: As a result of consolidations (producers selling assets to each other) or of the unexpected concentration of new supply in a few hands there is a weakening in seller competition and doubts arise as to whether there is still a condition of workable competition. Critics will then argue that this eliminates a basic underpinning of the WCGM.

Response: (1) It is generally accepted that even “weak competition” yields better resource allocation results than “good regulation” as it might be practiced by an NOC or by the new Regulator; (2) Replacing weak competition by reverting to the interim NOC-led framework will do nothing to increase competition; (3) The bulk of the gas is going to be sold into power generation for the foreseeable future and in that use there will always be competing fuel sources, which will strongly constrain any market power of the gas sellers in relation to new generating capacity.

International example: The European Union (EU) has been seeking since 1998 to establish competitive gas markets in its jurisdiction (excluding the United Kingdom where a strongly competitive, liquid market already existed). With the cooperation of the EU, the IEA has just published a major study *Development of Competitive Gas Trading in Continental Europe—How to achieve workable competition in European gas markets?* (http://www.iea.org/textbase/papers/2008/gas_trading.pdf)

From this report two things are clear. First, that even after 10 years’ effort, in many parts of the EU, workable competition has not been established. Second, that despite disappointments the goal is still being pursued because of the overall interest in increasing economic efficiency and ultimately lowering costs to final consumers. Two factors which have made the achievement of workable competition more difficult have been the tendency to consolidation among European utilities and the dominance in some parts of the EU of single supply sources such as Russia. Despite the great differences compared to Vietnam in the history, size and supply-sourcing of the EU gas market, there are lessons here: sometimes, industry reacts to liberalization in ways that reduce competition (by consolidation); that the creation of workable competition is not easy; but that the rewards are considered to be so important that the goal is still worth pursuing. It is in this context that the EU is now proposing further measures to encourage competition.

One finding of the report relevant for Vietnam is that “...real reform progress has been observed in markets with strong and independent regulatory authority.” (IEA report, page 7) One objective is stated as follows: “In the present market context, significant shortfalls in investment throughout the value chain of the industry can be observed globally. The regulatory framework implemented in the European gas markets should be designed as “investment friendly”, to allow costly and long term investments needed by the markets to be realized.” (IEA report, page 89)

(c) Pricing Principles for Gas

Risk: The application of value pricing results in gas supply contracts with new generators containing prices which are much above the prices in the existing contracts (in the range

of \$2.1-3.22/MMBTU) and instead of escalating at a predetermined rate of below inflation (e.g. 2% for Nam Con Son) they will escalate with the price of competing fuels.

Response: It is not knowable what might eventuate from value pricing. The analysis is a complex one. Besides, there is the possibility, alluded to in the Report, of putting floors and ceilings on the fuel value prices. But fundamentally, competitive market pricing is what the NSED calls for and this is what value pricing will produce. Note that the rest of the economy—the very important oil fuels component for example—is fully related to international prices and price escalation. Prices of imported coal and imported LNG will also be at international levels and fluctuate with them. There is no good reason to insulate the gas-using consumer from these tendencies, on the contrary that would be harmful to sound inter-fuel competition.

International example: The under-pricing of gas is a major policy issue in a developing Asian country where gas is a critically important energy source and there are major supply uncertainties. An international consultant has recently addressed the problem in the following terms:

“In other words – current gas prices in --- are well below the opportunity cost of gas. In strict economic terms, gas should be priced relative to its opportunity cost – clearly this is not the case in --- as yet. Gas price relative to opportunity cost will enhance the upstream activities.”

“Pricing of gas is a sensitive issue in all developing countries across the world.... The government may take a view that subsidized gas and energy prices play an important role in contributing to strategic sectors.... While these views are valid considering the socio-economic impact that gas plays in the economy, prices that do not reflect costs result in a financially non-viable gas value chain in --- and artificially inflated gas demand.”

“The need for domestic price reform is urgent given our long term analysis of the --- demand and supply scenario. Our analysis shows that --- faces a significant shortfall in gas supply in meeting the needs of its domestic market under all three cases of demand. Existing 2P gas reserves are only sufficient for the next seven years.”

It is not suggested that the situation in Vietnam is as dire as the one being addressed in this consultant's report. However, the consultant's analysis is fundamentally applicable also for Vietnam: gas pricing is a sensitive issue, but opportunity cost pricing is necessary in order to enhance supply.

(d) Changed roles for the NOC (PVN) in the Gas Sector

Risk: The valuable role that the NOC has played in securing the Vietnamese public interest in the petroleum sector will be lost and the country will suffer.

Response: the NOC will continue as a very large enterprise active in many fields at home and abroad. Experience shows that where an NOC has had a monopoly position which is subsequently removed, competition results in more efficient operations. The NOC has built up huge experience and should be able to thrive in a competitive market. Not having to perform public interest related functions will free up the management to concentrate more fully on profitable functions to the benefit of its shareholder, the government and people of Vietnam. .

International example: The outstanding examples of NOCs that have been completely relieved of their sector-management, regulatory and social responsibilities and obligations and have become world-class energy businesses are of course the three Chinese NOCs—Sinopec, China National Offshore Oil Company and, the leader of the group, CNPC. The transformation that CNPC and its peers have achieved is remarkable and has projected it into the top tier of the international companies, in fact CNPC is reported in August 2009 to be the world’s largest company in terms of stock market valuation⁵⁶. A glance through the 2007 Annual Report confirms this: <http://www.cnpc.com.cn/Resource/eng/img/07AnnualReport/2007PDF.pdf>

The Chinese examples should create even greater confidence in the future of PetroVietnam. There is no reason at all that PetroVietnam should not be able to follow the same course of transformation, although necessarily on a different scale.

(e) Failure to Implement the Road Map

Risk: The most important elements of the road map are its recommendations for market design and for value pricing. But they did not originate with this Report and they are not unique to it. Thus: they are inherent in the NSED, they are highly relevant to the ongoing work on power market reform and they will no doubt be addressed in the NGMP. The present Report simply works out and applies key elements of the NSED to gas market design and pricing. Given that the absence of these elements is recognized as a serious “gap” in policy, given also the statements about competitive energy markets and energy price determination in the NSED, gas sector stakeholders of all kinds await implementation actions that should flow from the NSED. They likely expect actions of a type that are already under way in the power sector. Failure to now move on the road map would retard the development of the gas sector and of a competitive power market, discourage investments in the links of the gas chain and consequently have negative consequences for achievement of GoV policies such as modernization, industrialization, increased FDI and energy security.

Response: This potential problem is real and needs to be recognized and acted upon especially in the present times of global recession. The global energy industry may now be capital-limited rather than opportunity-limited. Investors will be seeking business environments where the “rules of the game” are clear and where pricing and fiscal regimes are internationally competitive. The road map, if acted upon, would help to create that kind of an environment for natural gas development in Vietnam.

International examples: A good example of the positive effects of laying down sound policies in advance is the way in which the USA announced its policies for LNG imports in anticipation of the new wave of applications for LNG import terminals and then left policy implementation entirely to the regulator. This case has already been cited under heading 6.2 D on page 94. In regard to international competitiveness, Southeast Asian neighbors such as Malaysia and Thailand appear to offer predetermined policy conditions

⁵⁶ The Economist, August 1, 2009, page 82. Top companies by market capitalization. CNPC (PetroChina) with a value approaching \$400 billion ranks ahead of Exxon-Mobil.

that include attractive pricing for new gas development. They appear to be well positioned to meet their growing gas requirements, in the case of Thailand by including imports in the supply mix. Timely policy action is particularly important in regard to gas supply: if R/P ratios decline to the point where supply is jeopardized, it is difficult to find policy measures that can quickly reverse the situation.

Annex 1

Energy Security for Vietnam

Established policy: The National Strategy of Energy Development (NSED) directs that national energy development should be harmonized with the establishment of national energy security (heading 1. “Development Viewpoints”). The first of the NSED’s overall objectives is to ensure the national energy security (heading 2. “Development Objectives”). National energy security policy is therefore the first item under heading 4. “Implementation Solutions”, with seven priorities listed: (1) development of all energy sources; (2) energy savings; (3) reduced dependence on oil products imports; (4) short-term reduction in coal exports; (5) joining in regional security systems; (6) increasing petroleum storage⁵⁷; and (7) combining energy security with national defence and security.

International standards: The oldest and best known international statement of energy security is the IEA “Shared Goals” which were adopted in 1993 and provide the groundwork for IEA’s broad approach to security.⁵⁸

It should be noted that the “Shared Goals” document relates to energy security in a very broad sense. The IEA has since 1974 maintained a comprehensive allocation scheme for oil only, for use in the event of a major global disruption. This is the Emergency Oil Sharing Scheme (EOSS) which is part of the Agreement on an International Energy Program, the founding document for the IEA. The emergency sharing scheme has in practice been found to lack flexibility and another approach is therefore available in the form of Coordinated Emergency Response Measures (CERM).⁵⁹

Vietnam’s established energy policies are consistent with the IEA’s Shared Goals on a number of points such as: the importance of competitive energy markets; the diversification of energy supplies; the encouragement of environmentally acceptable resources including renewables and nuclear; the improvement of energy efficiency; and energy prices determined by market mechanisms. The IEA, like Vietnam, considers strategic oil storage and international cooperation to be other important contributors to national energy security.

Lessons from International Experience of Insecurity of Energy Supply

For the past half century, the energy security concerns of the industrialized countries who are members of the IEA have tended to focus first on oil imports (the EOSS). Vietnam has not experienced physical disruption of oil supplies. She is acting, by building a refining industry, to reduce what may be an overdependence on oil products imports.

⁵⁷ There is a specific objective of ensuring the national petroleum strategic reserve equals 45 days of average consumption in 2010, 60 days in 2020 and 90 days in 2025.

⁵⁸ See IEA Shared Goals at <http://www.iea.org/about/sharedgoals.htm>

⁵⁹ A comprehensive summary of the IEA’s emergency response systems is available at <http://www.iea.org/about/ome.htm>

Oil supply security has for a long time been an issue of great importance in the Association of South East Asian Nations (ASEAN). The organization has carried out studies on the vulnerability of its members, discussed strategic oil storage, demand restraint and “surge production” as methods of addressing supply security and worked with the IEA on emergency measures.

There has been, second, a concern about security of imported gas supplies, particularly to Western Europe from Russia. That concern has been heightened by the events of January 2009 relating to Russian gas transiting Ukraine.

Vietnam is not currently contemplating pipeline gas imports. But an unpublished study has stated that “...the West-East inter-connection pipeline has the role of import gas from other countries in ASEAN area through the Trans-ASEAN Gas Pipeline (TAGP).” However, it should be pointed out that a position at the end of a supplying pipeline is not the most advantageous from a supply security standpoint. The market at the end of the line will tend to be the most vulnerable to supply disruptions, however they may be caused. It is understood that, alternative to the ASEAN pipeline, consideration is being given to the possibility of a pipeline from the Natuna field offshore Sabah (Malaysia), in which case Vietnam would be the first delivery point on the pipeline.

The security of LNG imports has not been a significant concern worldwide, but if Vietnam were to implement an LNG import project anchored by a power market, consideration might be given to the technical feasibility and commercial implications of backing up the commercial stock held in the LNG tanks by additional underground storage in an aquifer or depleted gas field.

By contrast with oil and gas, coal imports have not attracted attention from a supply security standpoint, especially where supplies have been protected by long term contractual arrangements. Nevertheless, if Vietnam were to become dependent on coal imports for a portion of her electric power requirements this issue would require policy attention which might include a requirement to hold more than normal commercial stocks of imported coal.

Another concern relates to the importance of electricity security because there have been cases in recent years of social and economic disruption caused by power supply failures in Canada, France, Italy and the USA.

This is an aspect of the realization that domestic energy sources may not provide truly secure supplies. The worst peacetime disruption of UK energy supplies was caused by a year-long coal miners’ strike some 25 years ago. In the state of Victoria, Australia, the failure of a gas processing plant in 1998 caused an almost total disruption of gas supplies and cost gas users some \$US1 billion.

In this connection two observations are made:

First, the *gas processing plants* that treat raw gas destined for major power plants (Phu My and Ca Mau) are clearly of vital importance for domestic electricity supply. The identification, protection and, where possible, reinforcement of this kind of “critical infrastructure” is an important activity in the industrialized

countries today.⁶⁰ Consideration of security of gas supply for Vietnam could well start by examination of the protection of critical infrastructure and consideration of the creation of resilient networks, which is the next point.

Second, the presence of *“networks” makes gas and electricity supply more secure* but the Vietnam gas sector does not yet have any network connections. An unpublished study repeatedly draws attention to the mooted West-East inter-connection pipeline because of its “important role in gas supply security and energy security in the Southern area.”

Oil and Gas Import Prices

The very high prices of oil and, to a lesser extent of LNG, experienced through mid-2008 raised concerns about the “price security” imports.

Small countries acting alone are not in a position to influence the price of imported energy. They are therefore “price takers”, that is they have to accept the going market price, rather than “price makers”. Particularly in an emergency situation where supplies from a particular large exporter may have been affected by war, civil unrest or disruption of trade routes, oil and gas, like other commodities, will flow to countries that are able to pay the going market price for it.

Only countries that can exert significant influence over export or import volumes can try to act as “price makers”. Therefore the Organization of Petroleum Exporting Countries (OPEC) at present (second quarter of 2009) seem to be talking about curtailing supply in order to influence prices upwards. The IEA countries probably have the capacity, by curtailing demand and releasing strategic stocks, to moderate the price effects of a supply disruption. Of course, any successful IEA measures would benefit all importing countries, not just those that are involved in the IEA.

How an Industrial Country Addresses Energy Security: the case of Canada

Canada’s energy policy is based on a strong market orientation and where state interventions are necessary they are carefully targeted. Much importance is given in a federal state to relations with the ten provinces which own the energy resources within their borders and to international relations, particularly in the context of the North American Free Trade Agreement.⁶¹

Canada has been affected by international electric power supply failures in 1965 and 2004. In 1973-74 she was impacted by the selective boycott of destinations by some Arab oil exporting countries. Canada was a founding member of the Agreement on an International Energy Program that created the IEA. The country clearly therefore attaches

⁶⁰ The Public Safety function in the Government of Canada devotes research and works with the private sector to protect national critical infrastructure. Refer to <http://www.publicsafety.gc.ca/prg/em/cip-eng.aspx>.

⁶¹ A brief summary of Canada’s energy policy can be found at: <http://www.nrcan.gc.ca/eneene/polpol/owevue-eng.php>

importance to the working of the IEA Emergency Oil Sharing Scheme and subscribes to the IEA's statement of shared goals.

The official Canadian position on energy security is as follows:

“Canada is an energy producer richly endowed with coal, oil, oil-sands, natural gas, uranium, hydro, tidal and geothermal energy sources. Further, research and development into advanced energy technologies such as fuel cells, nuclear power and bio-fuels, coupled with advances in conservation and efficiency technologies such as energy efficient appliances and hybrid vehicles, means that Canada is virtually energy secure. Growing demand for energy will continue to enhance our economic prosperity; Canadian oil sands are assuming a higher international profile and will become an increasingly important source of oil production and export, particularly to the US.

Canada is a net energy exporter, with 99% of our energy exports going to the United States. We are also a trade-dependent economy strongly supportive of open, transparent and rules-based international markets. This holds particularly true for the international energy market, and could be described as the antithesis of “petro-diplomacy”. Its approach to global energy security has been to promote a balance between the effective and respective roles of the state and private sector on energy: the appropriate role for governments, whether of a developed or developing country, is primarily to establish an enabling business environment through open, transparent and predictable regulatory, judicial and taxation regimes, while it is generally industry's job to look after the mechanics and operations of the sector along the energy supply chain within the context of this enabling environment. Thus together governments and industry do their part, based on their respective areas of expertise, to contribute to global energy security in the most efficient and cost-effective manner. The fact that the provinces own the energy resources in Canada has complicated our domestic energy picture somewhat but does not detract from its overall international approach.

Despite its market-focus, Canada has a vested interest in technically informed, balanced and inclusive (of all energy sources, producers and consumers) international discussions on energy security. Through such discussions it resists efforts to label one form of energy as “appropriate”, such as renewables, and others as “inappropriate”, such as hydrocarbons and nuclear; each country has the right to choose the energy mix most appropriate to its circumstances. Continued international efforts are also needed to support markets and their enabling mechanisms, while being mindful of the special challenges this presents for the environment and developing countries.”⁶²

A possible approach to further work by the Ministry on security of gas supply

If it is decided to provide a specific focus for gas supply security, the following steps are recommended.

⁶² Source: Canadian Statement on Energy Security by the Department of Foreign Affairs and International Trade. http://www.international.gc.ca/enviro/energy-energie/overview-appercu.aspx?menu_id=20&menu=R

Objective: The main objective is to identify current areas of gas supply vulnerability. The preconditions are increased Ministry technical capability, close cooperation of gas and power operators, and attention to international best practices. Consultant advice might be needed. Vietnam will be acting according to international best practices based in part on the experience of gas and electrical interruptions in the fully industrialized countries.

The key tasks are: Given that gas supply is currently from sources entirely within Vietnam's borders, vulnerabilities are probably for the most part technical and relate to physical facilities. Address these vulnerabilities on the basis of expert advice by operating personnel.

Milestones: Specifics of this activity are not put in the public domain. "Milestones" therefore do not involve public announcements. (1) Policymakers are comprehensively informed about potential gas security issues. (2) Infrastructure operators and security services are aware of vulnerability assessments and take action to address these issues.

Results: Critical infrastructure is identified and steps taken to minimize the related security risks. For the longer term the security value of creating networks is highlighted.

Annex 2

A “Petroleum Directorate” for Vietnam?

The NSED policy position is as follows: “State management functions over the petroleum sector should be concentrated in one agency.” “Appropriate and effective exploitation and use of domestic natural resources”. In the following text, the expression “Petroleum Directorate” or “Directorate” is used to mean the “one agency” referred to in the NSED.

The assumptions are made that the Petroleum Directorate is for the upstream only, that is to the point at which oil and gas of commercial quality has been produced and can enter the respective markets.

The alternative assumption: The GoV decides to “bundle” upstream regulation with regulation of natural monopoly elements of the mid- and down-stream. NSED: “Establish a legal basis for activities in the petroleum sector, pay special attention to the mid- and down-stream activities, of which there are important tasks of economic and technical management such as licensing T&D, approving gas price, price of gas T&D, technical specifications etc.”

1. International Examples

Sample of practices in jurisdictions that appear to have international best practices of petroleum administration:

Three of these agencies have an “independent” character, but report through a minister or ministers of the government of which they are part:

The Canada-Newfoundland Offshore Petroleum Board (CNLOPB)-- an independent regulatory agency concerned mainly with oil development off Canada’s east coast.

The Canada-Nova Scotia Offshore Petroleum Board (CNSOPB)—an independent regulatory agency concerned mainly with gas development off Canada’s east coast.

The Norwegian Petroleum Directorate (NPD)—an independent state administration authority, reporting to the Ministry of Petroleum and Energy

Two of these agencies are part of much larger government departments:

UK: Oil and Gas Group (O&GG) which is part of the Energy Group of the Department of Energy and Climate Change—responsible for UK onshore and offshore oil and gas and reporting to the Secretary (=Minister) of Energy and Climate Change

USA: Minerals Management Service (MMS)—part of the Department of the Interior—responsible for the USA outer continental shelf (OCS) in Alaska, the Atlantic, the Gulf of Mexico and the Pacific and reporting to the Secretary (=Minister) of the Interior.

Conclusion as to “responsibilities”: a review of international best practices leads to the conclusion that the responsibilities assigned to petroleum directorates are essentially the same. They are: basically:

- The provision of access to the resource by granting leases, entering into PSCs or granting other permissions by which parties are allowed to exploit minerals owned by the state;
- The management of those leases, PSCs etc. to ensure that their terms are properly respected and to regulate them at all stages from inception to decommissioning, from standpoints of health, safety and the protection of the environment; and
- The provision of support services—information technology (IT), human resources etc--to these two operational functions of the directorate.

In light of this finding, it is not proposed to provide options for the responsibilities of the petroleum directorate, other than the option of “bundling” the upstream with the mid- and down-stream regulatory functions.

2. Typical Responsibilities and Operations of a Petroleum Directorate

1. **Evaluating the resource**---establishing the likelihood, amount and quality of petroleum discoveries in the landmass of the jurisdiction in question. The purpose, according to the NSED, is to “Enhance the preciseness in the evaluation of the reserves of the primary energy resources”. In terms of government organization, this need not be an “exclusive responsibility”: it could equally be one that is shared with other government agencies such as the geological survey and the NOC.
2. **Pre-clearing for access to the resource**—dealing with international boundary issues; environmental pre-clearance for commercial access; dealing with any social issues (fisheries). The purpose is that access can be provided to those parts of the resource that have been pre-cleared so that exploration can take place, leading to development and production of petroleum, without any obstacles later arising in regard to these matters (boundaries, environment, social issues).
3. **Dealing with applications for access to the resource**—the provision, by Production Sharing Contracts/Agreements, of access to the resource—NSED: “Set up a clear and effective organization system to supervise contracts and contract selecting and award for oil and gas exploration”. The purpose is to allow investors, domestic and foreign, private and state, to access the potential petroleum resource to develop it in the national interest.
4. **Supervising PSCs:**
 - a. **Dealing with applications** from holders of PSC for:
 1. **Exploration**
 2. **Development**
 3. **Production**
 4. **Decommissioning**

...in all cases, taking account of: environmental protection; worker and public health and safety; and reservoir management to secure the maximum safe recovery of petroleum from the resource.

b. **Administering PSCs and all applications granted pursuant to PSCs**

In this case, seeing to it that conditions imposed on the successful applicant in the PSC are properly observed.

5. **Metering, accounting and revenue collection** in order to accurately measure and account for all production operations and ensure the correct flow of revenues to each of the parties having a right to a share in those revenues.
6. **Service functions** for the operational components of the directorate:
 - a. **Systems, IT, data collection, storage, retrieval, manipulation)**
 - b. **Legal and**
 - c. **Human resources.**

3. **Principal Structures of the International Examples of Petroleum Agencies**

All of the “typical functions” outlined under heading #2 above probably find a place in each of the selected organizations. The only exception is that the responsibility for safety matters which the NPD held until 2004 is now vested in a different body (see footnote 2 below).

Three of these organizations have a function which is not listed under heading #2, namely policy or strategy, meaning principally policy or strategy in regard to how to manage the petroleum resource. These three organizations are: the CNSOPB, the NPD and the O&GG of the UK. One presumes that the policies and strategies that the agencies are responsible for are communicated through the reporting relationship with the responsible Minister for approval, rather than being implemented directly by the particular petroleum directorate.

Policy-making: Policy is the domain of the minister(s). Regulators do not have an energy- or gas- policy-making function. The only legitimate policy function for a regulator is policy in regard to the way it applies its own statute (law) and regulations.

The senior management structure of the different directorates is as follows:

CNLOPB: Chairman; 6 Board Members (plus 61 Staff; budget about \$US8 million)

CNSOPB: Chairman, 6 Board Members (plus about 50 staff; budget about \$US5.5 million)

NPD: Director General and 6 Board Members

O&GG: Director, Deputy Director

MMS: Director, Associate Director, Deputy Associate Director (plus about 1650 employees; 2009 requested budget about \$307 million⁶³)

CNLOPB (Canada)	CNSOPB (Canada)	NPD (Norway)	O&GG (UK)	MMS (USA)
• Resource management • Legal & land • Exploration • Operations & safety • Environment • Support	• Policy & legal • Resources & rights⁶⁴ • Health, safety & environment • Administration	• Strategy • Exploration • Development (and decommissioning) • Production & metering⁶⁵ • Forecasting, analysis & data • Work processes & internal development	• Policy • Promotion, knowledge & exploration • Maximizing recovery • Environmental engineering • Licensing: - Rounds - Admin • Infrastructure⁶⁶ • Development & production • Consents⁶⁷ • Metering	• Resource evaluation • Environment • Leasing⁶⁸ • Production & development

4. Organizational options for a Petroleum Directorate:

Features common to all three organizational options:

- There is a *chief executive officer* responsible to the Minister for the work and the staff of the Directorate.
- There is a *designated interface* with all of the publics that the Directorate deals with—the petroleum industry, the general public and other agencies of

⁶³ This is a gross number representing the total expected cost of operating the MMS in Fiscal Year 2009. The net cost to the USA federal government is about \$160 million after netting out some \$147 million in cost recoveries and income from rentals).

⁶⁴ “Rights” means the vehicle—a permit, licence or order—that gives a person or company the right to explore the petroleum resource.

⁶⁵ Since 2004, the Petroleum Safety Authority Norway has been a separate organization.

⁶⁶ This means pipeline infrastructure and liaison with neighbouring countries such as Norway and The Netherlands which share North Sea oil and gas infrastructure with the UK.

⁶⁷ “Consents” means “approvals” for such matters as field development, commissioning, production, flaring, pipelines and decommissioning.

⁶⁸ “Leasing” is another term for permitting persons or companies to explore for and develop the petroleum resource, in this case by the grant of a “lease” by the USA government.

government. That interface functions as a “portal” to receive applications, information, requests for information etc. and to respond with approvals or denials of applications and the provision of information.

- There is an organizational unit that provides *coordination* among the different operational functions. The size and importance of this coordination unit will vary with the overall approach to organization that is adopted. It will probably be most important in the case of Option A below.
- There is an organizational unit that deals with *all aspects of accounting related to petroleum production* operations, in terms of volumes and money, and includes metering
- If the government wishes to use the Directorate as a source of policy advice or if government wishes the Directorate itself to develop and apply policy (for example, in both cases, as to the rate at which the petroleum resource is offered to industry for exploration and development), then a *policy or strategy function* is present in the Directorate’s organization.
- There are one or more organizational units which staff *support for the operational functions* of the Directorate, dealing with such matters as data storage, manipulation and retrieval; IT and communications systems; office accommodation; business travel; employee relations including salaries; publications and annual reports; and public relations, etc.

A. Organize by Professional Responsibilities (no current example)

This is an admittedly now “old fashioned” approach, that worked well for several decades in the case of Canada’s two premier energy regulatory organizations, the National Energy Board and the Alberta Energy Resources Conservation Board.

The concept is that requests, applications and the like enter the Directorate through the public interface portal and are then taken in hand by the coordination unit. That unit then seeks information, analysis and judgments exercised by professional groups having specialized knowledge relevant to the case in hand. These groups, not all of which would be consulted in all cases are, in alphabetical order, as follows:

- Accounting (oil and gas accounting, both in terms of volumes and money)
- Earth sciences (geology, geophysics)
- Economics (especially quantitative economic analysis)
- Engineering (especially petroleum, but including environmental)
- Environment (especially the life sciences)
- Legal (with special regard to conformity with the law, regulations, guidelines and other instruments that fall in the jurisdiction of the Directorate)

Each of the groups that are consulted will provide the coordination unit with written advice on the matter at hand. All the streams of advice are then taken into account by the coordination unit which takes a recommended position to the Chief Executive Officer (CEO) for decision. The decision required of the CEO might, for example, be

to clear a certain area of the country's offshore for bidding; to allow a PSC holder to drill a certain well or series of wells; to approve the design and construction of a gas processing plant; to penalize a PSC holder for an environmental infraction etc.

This staff organization does not function only in a reactive way, which is by responding to requests by the petroleum industry. It is also proactive as a result of the different groups receiving and reviewing information provided mainly by PSC holders. If this information flow indicated a deficiency on the part of the PSC holder, then one or more of the staff groups would approach the coordination unit with a view to initiating a process to correct that deficiency. The coordination unit would initiate the process by seeking advice from all of the concerned staff units.

Result: This professions-based organization presents a flat structure with a broad span of control but that potential disadvantage is largely mitigated from the CEO's standpoint by the presence of the coordination unit between the CEO and the small number of layers in the staff support organization. The number of layers would presumably mainly reflect seniority. This organizational structure is presented in Attachment 1.

B. Organize by Regulatory Function with a Narrow Span of Control and a Layered" Organization (CNSOPB)

The concept is that there are only two "pillars" in the operational organization reporting to the CEO which correspond with the broadest regulatory functions of the Directorate. They are the granting of rights (PSCs) and the administration of those rights. In addition there are the staff functions referred to earlier. There would be no need for a coordination function in this organizational model:

- The *management of the resources and of the rights* granted to exploit those resources. Within this structure are:
 - Geoscience and the understanding of the resource;
 - Rights issuance and administration;
 - Reservoir engineering; and
 - Data management
- The *management of operations carried out by the holders of those rights*, in terms of health, safety and environmental protection. Within this structure are:
 - Safety and
 - Environmental monitoring and enforcement
 - Production engineering
 - Data management (clearly, the data management function in each pillar could be combined into one)
- (a staff function) Legal matters, secretary, regulations and policies on regulations

Result: This is a "traditional" hierarchical organization that presents a narrow span of control for the CEO, contains a necessarily pyramidal structure in each of the two main pillars, which would therefore have a degree of management and staff layering. The organization chart of the CNSOPB is Attachment 2.

C. Organize by Links in the Chain of Activities in Petroleum Resource Management (Oil and Gas in the UK DECC, NPD Norway)

The concept here is to create an organizational unit corresponding to each of the links in the chain, some of which have an entrepreneurial character (promotion of the resource to new entrants to the region) or a pro-active role (liaison with neighboring countries regarding infrastructure) while others are typically regulatory (dealing with approvals for field development, well drilling, flaring, decommissioning).

This type of organization cannot be represented on a traditional chart. In the case of the NPD it is characterized as “flat and based on flexible, multidisciplinary and collaborating teams organized around priority products.”

The operational functions, corresponding to the chain of activities, are as follows:

- Understanding, planning and promoting the development of the resource
- Dealing with PSCs to access the resource:
 - Offering PSCs publicly
 - Administering PSCs that have been entered into
- Developing and producing discovered reserves
- Maximizing the recovery of petroleum from those reserves
- Safeguarding the environment
- Providing/denying approvals for activities by PSC holders from initial exploration through to decommissioning
- Coordinating the development of optimal infrastructure

(The above is based on the UK model. The Norwegian model is somewhat different. The “core” activities are the succession from exploration to development to production and there are other activities such as environmental regulation, strategy, forecasting and analysis that are carried on in parallel with the “flow” of these three core activities.)

Result: This design is for a flat organizational structure with probably relatively few layers and presents the CEO with a wide span of control. It tends to reflect a modern, “bottom up” approach suitable for knowledge workers who look for more individual responsibility and authority. To be effective, it requires good communications among the half dozen or more organizational units.

The organization chart of the NPD is attachment 3.

The NPD is situated within the organization of government in regard to petroleum matters according to attachment 4.

Alternative assumption: The GoV decides to “bundle” upstream regulation with regulation of natural monopoly elements of the mid- and down-stream

1. International Examples:

Alberta, Canada: For more than 15 years, through 2007, the functions of the former Energy Resources Conservation Board--ERCB (dealing with the upstream) and of the Public Utilities Board (dealing with the downstream) were combined in the Energy and Utilities Board--EUB. These functions were separated again in 2007 into two organizations, the ERCB and the Alberta Utilities Commission.

Federal, Canada: The National Energy Board (NEB) is responsible for regulation of all aspects of interprovincial and international pipelines, oil and gas imports and exports and is in addition the regulator of oil and gas operations in the Canadian North.

Note that the functions of the ERCB and of the former EUB and of the NEB do not include the provision of access to the petroleum resource: the “leasing” of access to government-owned resources has in both cases always been a responsibility of the Department of Energy of Alberta and of the Department of Indian and Northern Affairs of Canada. In this respect they are both fundamentally different from, for example, the USA Minerals Management Service (MMS) described above.

2. Advantages/disadvantages of `bundling` mid- and down-stream regulation into the Petroleum Directorate

Advantages:

- The support staff of the Directorate, dealing with such matters as data storage, manipulation and retrieval; IT and communications systems; office accommodation; business travel; human resources; publications and annual reports; and public relations etc could equally well serve the mid- and down-stream regulatory functions, resulting in some economies.
- There are some commonalities as between up- mid- and downstream regulation, particularly in regard to technical matters of structures, pipelines, compressors, pumps storage tanks, communications systems, safety and environmental engineering issues. “Bundling” would enable staff to share and gain experience and result in some efficiencies. Additionally, technical regulators can learn from each other in regard to developing and applying effective regulatory processes, even when the regulatory processes relate to different fields (example: onshore pipeline engineering and offshore structures).

Disadvantages

- There are broad areas of regulation where there are no commonalities and no possibilities for cross-fertilization. They include petroleum engineering

in the upstream and economic regulation in the mid- and downstream. The staff involved in each of these areas would be working in completely separate “silos”.

- The upstream regulator would have to do with oil, natural gas and gas liquids. The mid- and downstream regulatory responsibilities have mainly to do with natural gas
- Requests for decisions and direction flowing up to the decision-taking level (the Board or the Director-General) would tend to be of two fundamentally different types, having to do with petroleum resources and engineering in the upstream and with economic regulation of natural monopolies in the mid- and downstream. The likelihood is that the decision-taking level could not deal equally well with both requirements. This could result either in poor decision-taking in one field or the other or in the need to divide the decision-taking responsibilities between two groups or two persons. This would suggest that two separate organizations may be the better

Assessment

- A combined up- mid- and downstream petroleum regulator is not recommended because the efficiencies that might result are modest compared with the probable decision-taking inefficiencies.

The Relationship of a Petroleum Directorate to the Ministry

If a Petroleum Directorate were created in the GoV, regardless of the scope of its functions (upstream only or a combined up- mid- and down-stream regulator), it should be situated organizationally as part of the Ministry. That is, it should have the same relationship as the ERAV does to the Ministry today and as does the NPD to the Norwegian Ministry of Petroleum and Energy that is illustrated in Attachment 4 to this Annex.

In regard to working relationships, the PD staff would maintain a close liaison with the staff of the proposed Ministry’s Petroleum Management and Regulation Unit, keeping it informed of developments, operations and expectations in the upstream that are relevant to monitoring of the petroleum sector. Whether or not the PD were to have a policy advisory function, the PD would liaise with the proposed Ministry’s policy unit and in particular would provide regularly updated assessments of the effectiveness, relative to GoV objectives, of the regime that it is implementing. If the PD were to have a policy function, that function would have to be subordinated to that of the policy unit.

The governance principle at work here is that primacy in policy advice and in analysis must be retained by the ministry of government, in this case the Ministry that has the overall responsibility for energy, petroleum and natural gas matters. In a properly ordered governance model, neither the regulator nor the NOC can have an advisory

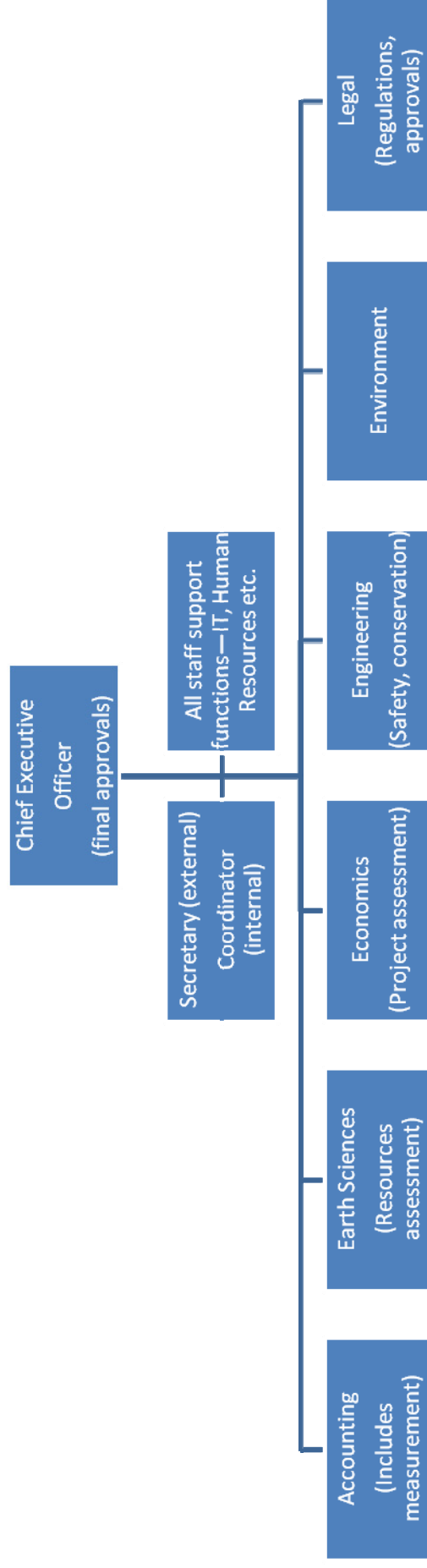
function, even in areas of their special expertise that is superior to that of the authorized ministry. This is called the principle of subordination.

The principle just enunciated also applies to what has been called the “competing streams of advice” model. Experience shows that it is ultimately not helpful for competing advice on the same subject to flow to the ministerial or prime ministerial level. This is what might happen if the principle of subordination is not upheld. If the regulator or the NOC have different views than those that are held in relevant parts of the authorized ministry, then either the disparate views must be reconciled at the staff level or they may go forward but only with an accompanying perspective or critique provided by the ministry. The principle of subordination is important to be upheld because it is unfair for competing and conflicting advice to reach the non-expert policymaking level in an unsorted form.

Attachment 1 to Annex 2

Option 1: Organization by Professional Activity (no current example)

This is a workable, but possibly “old fashioned” approach that was successfully used for many decades by leading Canadian regulatory institutions. The “secretary” functions both as the “portal” to the organization and as the coordinator of staff advice from the professional levels to the CEO. The secretary seeks and coordinates the professionals’ views in dealing with both applications for access to petroleum resources and the regulation of operations by parties which have been granted such access.



Attachment 2 to Annex 2

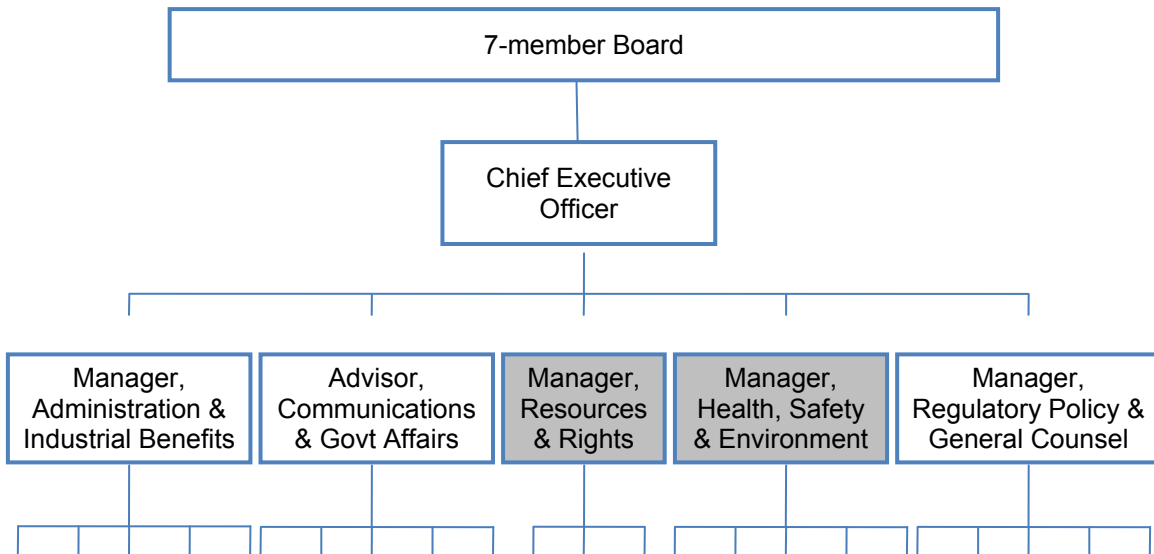
Option 2: Organization by Regulatory Function: the Canada-Nova Scotia Offshore Petroleum Board (CNSOPB)

The CNSOPB organization has two functional columns and a narrow span of control for the Chief Executive Officer who reports to the seven-member Board of Directors, which is the supervisory level.

The first column from the left is essentially a service organization for the rest of the staff. The second column is an external relations group. The central column deals with the issuance of rights to the resource. The fourth column is concerned with the subsequent management of those rights (both are shaded). The right hand column is in effect another service function rather than an operational one.

Option 2: Organize by Regulatory Function

Example: Canada-Nova Scotia Offshore Petroleum Board(CNSOPB)

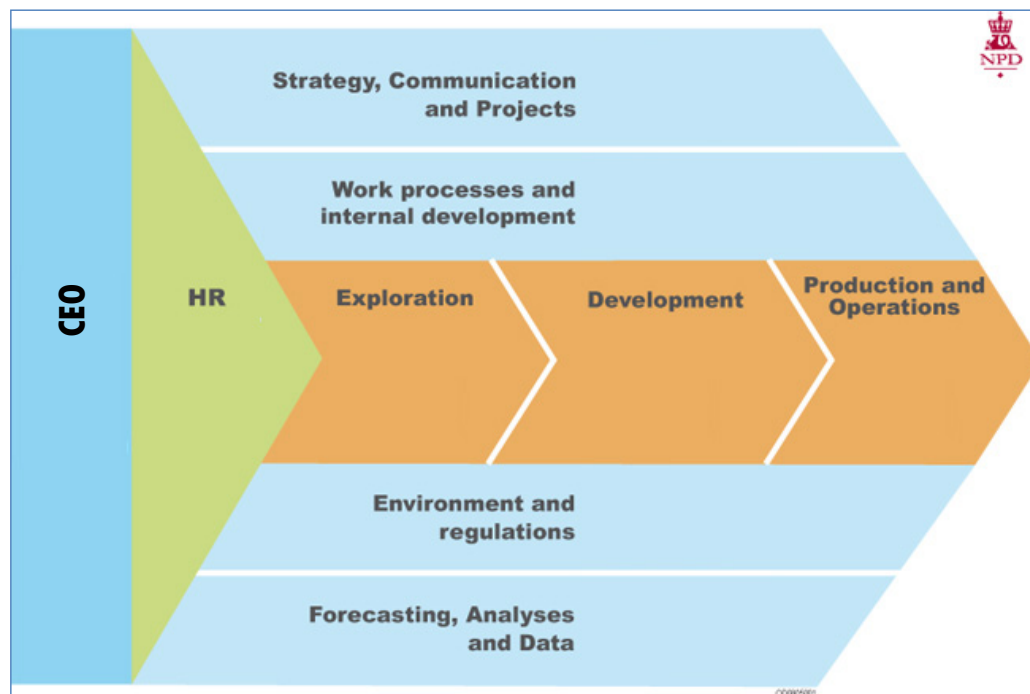


Attachment 3 to Annex 2

Option 3: Organization by Links in the Chain of Upstream Activity: the Norwegian Petroleum Directorate (NPD)

The NPD is organized around the three “products” of exploration, development and production and operations, each of which issues (or denies) and then manages relevant approvals. There are four units which service the four operational functions—human resources; strategy, communications and projects; work processes; environment and regulations; and forecasting, analyses and data.

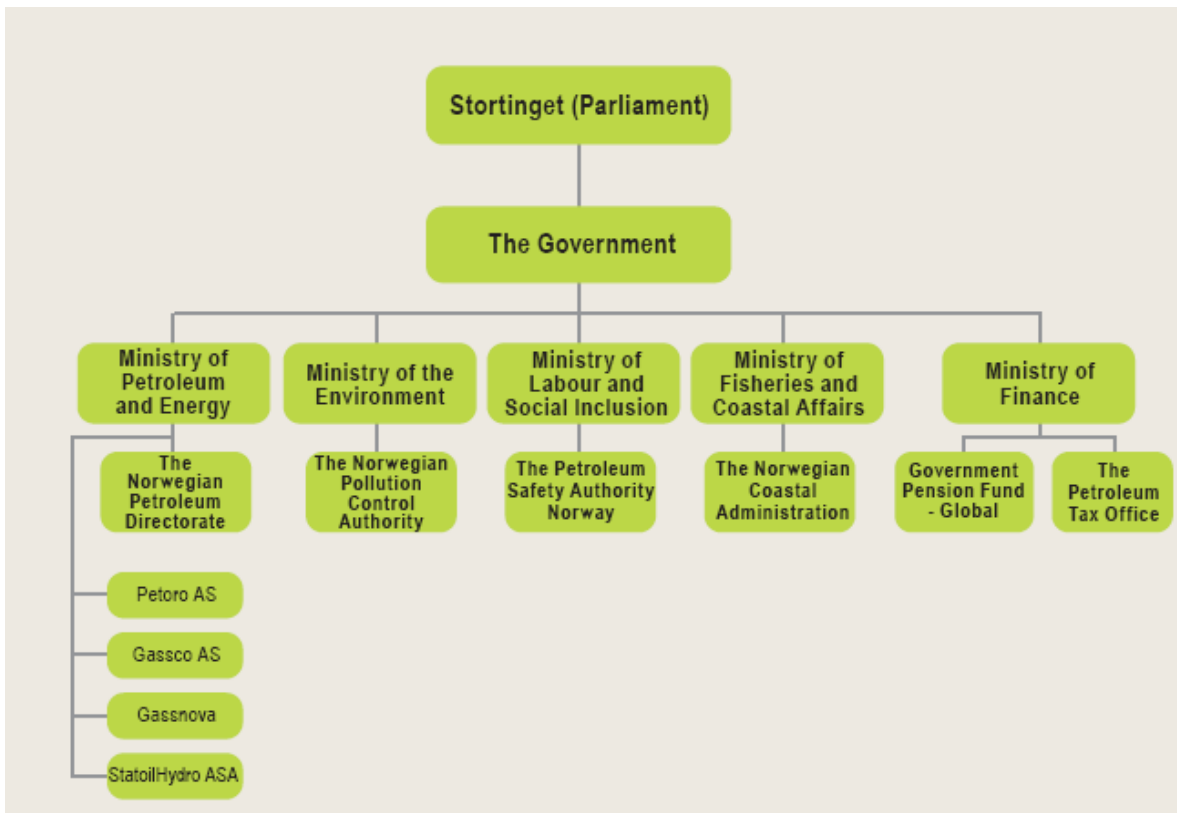
Petroleum Directorate Option 3: Organize by Links in the Chain Example: Norwegian Petroleum Directorate



Attachment 4 to Annex 2

Reporting relationship of the Norwegian Petroleum Directorate

The Directorate reports to the Ministry of Petroleum and Energy, which is the government department responsible for resource management and for the petroleum sector as a whole. It is therefore comparable to the Energy Department of the Ministry of Industry and Trade of Vietnam. Note that four state companies also report through this Ministry. Note too that at least one of these companies, Statoil-Hydro is a “joint stock company” in the Vietnamese sense of that expression. The Ministry of the Environment is responsible for the external environment, the Ministry of Labour for health, the work environment and safety, the Ministry of Finance deals with state revenues and the Ministry of Fisheries is in charge of oil spill contingency measures.



Is there a role for the National Oil Company (NOC) in the Gas Sector in the Context of sound National Energy Planning?

PetroVietnam (PVN) presently plays a central role in the gas sector. Thus, it is a party to all PSCs; it has invested heavily in gas pipelines; it is the single buyer for resale of all gas in current arrangements; it is a major investor in gas-fired power generation; it is in a sense the GoV's "window on the industry"; and it contributes advice to the GoV on gas policy matters, supplementing that provided by the Ministry. PVN has exploration activities in more than a dozen foreign countries, but it is not engaged as an operator in primary oil and gas exploration in Vietnam. Given PVN's dominance of the gas sector from production to final use of the commodity and given the potential for conflicts of interest which this dominance contains, it is entirely reasonable to raise the question posed in this heading.

There is nothing exceptional about PVN's domestic activities. NOCs play a prominent role in many oil and gas producing developing countries. As with any oil company, NOCs may be vertically integrated—encompassing the entire supply chain from exploration and production in the upstream to refining, storage, distribution and retail, pipelines and power production in the downstream—or confined to primarily upstream or downstream operations. Most NOCs in hydrocarbon-producing countries are vertically integrated, but some, such as India's Oil and Natural Gas Corporation, operate primarily in the upstream. Among the national oil companies in the East Asia and the Pacific region are Petroliam Nasional Berhad (Petronas) in Malaysia; China National Offshore Oil Corporation (CNOOC), China National Petroleum Corporation (PetroChina), and China Petroleum and Chemical Corporation (Sinopec) in China; Pertamina in Indonesia; and Vietnam Oil and Gas Group (PetroVietnam) in Vietnam. The Chinese entities have been corporatized and, while the state retains a controlling interest, a substantial minority interest in each is held by private shareholders.

However ownership is not a critical consideration, what is important for sound national energy planning and a healthy gas sector with private as well as public participation is that the NOC's role should be clear, its activities transparent and if those activities have natural monopoly characteristics, they should be regulated in exactly the same way as those of private sector or foreign public sector investors in Vietnam. Essentially, the long-term objective should be to create a "level playing field" for all investors—PVN, other NOCs and IOCs—in all the links of Vietnam's gas chain. Failure to create these conditions will in the long term discourage investors who consider that they are discriminated against or otherwise disadvantaged relative to the national company. The following are steps towards the creation of desirable conditions for participation and competition in the sector:

First, the GoV should clarify whether there are any links in the gas chain that are to be reserved for PVN apart from its role as the partner in all PSCs. It does not appear from the NSED that there are such links. This therefore calls into question PVN's

Vietnam Gas Sector Development Framework – The World Bank and the Ministry of Industry and Trade

current role as the single buyer and re-seller of all gas. Whether or not the GoV has determined that this should be a monopoly conferred on PetroVietnam, the question needs to be asked and answered whether this role “adds value” in the gas chain.

Second, in regard to its role as PSA partner, there should be a public accounting of the flows of revenues from the upstream oil and gas production activities. This is an important aspect of transparency.

Third, PVN should not exercise any technical or economic regulatory role in the energy business. Instead, as the NSED prescribes (heading 3. “Development strategy”, sub-heading c) “Petroleum Sector” at page 4), “...the functions of state management...over the petroleum sector should be concentrated in one agency.” This is understood to mean a Petroleum Directorate and not PVN which is not mentioned in the NSED.

Fourth, where PVN invests in gas (and power) sector businesses and where these businesses have natural monopoly characteristics (example: gas T&D), then PVN’s operating affiliates in these businesses should be subject to the same regulation of prices and service terms as any other company’s. In particular, it is most important to ensure that PVN is not by these investments benefiting disproportionately from upstream rents or discriminating in favor of its own products on what should be “open access” energy networks. Today’s practical situation is that PVN’s transmission pipeline tariffs are approved by the GoV at the project stage, but the basis for this approval does not appear to be made explicit. There does not appear to be any similar regulation of PVN’s pipeline service terms or of PVN’s role as a gas processor. In the power sector, there is the risk of discrimination by PVN in favor of its own generation operations. This could arise, as already noted, if gas supply is constrained and as well PVN may be tempted to give its own plants more favorable gas prices than it provides to third parties. Means would have to be found to address both these contingencies.

Fifth, PVN as a result of its “window on the industry” role can be a source of policy advice to the GoV on energy and gas matters, but that advice must be subordinated to the GoV’s principal source of policy advice and implementation which, as provided in the NSED, is the Ministry. Perhaps the most useful advice that PVN can provide is insight into Vietnam’s gas potential and the attractiveness or otherwise of its fiscal and pricing regimes, based on PVN’s technical expertise and its national and international experience,

If these conditions are met, PVN should continue to play a major role in the energy and gas sectors, in a thoroughly transparent and non-discriminatory manner, to the full extent that its financial and technical capabilities allow. This will call for robust management by its shareholder, the GoV, and by the appointed regulator(s) of the sector. This is recognized as no easy task. Failure to act in this manner would weaken the confidence of private investors, Vietnamese and foreign, and harm the virtuous circle of gas exploration, development, production and power generation that has been successfully started.

Does PVN have a “right” to a particular place in Vietnam’s gas sector in the long term because it is the National Oil Company? Note that the roles envisaged here for PVN do not arise because it is an NOC. In the absence of GoV direction that certain gas sector roles should be reserved for PVN, it is not possible to build a policy case for PVN to occupy any particular role in the gas chain simply by virtue of the fact that it is a state-owned enterprise. PVN’s claim to continue as a major player must rest solely on its managerial, financial and technical capabilities to make a major contribution in the various links of the gas chain in open competition with other players, Vietnamese and foreign, public and private. Where, in this Report, a privileged role is recommended for PVN in the MSBM, that role will hopefully be only a transitional one on the way to the WCGM and it is recommended to be occupied by PVN because of its established and experienced position as an intermediary between gas producers and downstream markets.

A word of caution may be appropriate as to the extent of the contribution that can be expected from PVN in relation to the gas sector. On the one hand, the company is the largest business enterprise in Vietnam and commands very significant financial and technical resources. On the other hand, it is not yet a financial giant on the scale of Petronas in neighboring Malaysia and it is already heavily committed to a wide range of activities nationally and internationally. While, as noted, the company should continue to play a major role in the gas sector, Vietnam will also have to look, perhaps increasingly, to private and foreign capital, not excluding foreign NOCs, to contribute to the necessary growth of its gas industry.

Given appropriate conditions, such as predetermined market design and pricing principles, an “open door” to investment from all sources and internationally competitive fiscal regimes, there are good reasons to expect that the very large capital requirements needed to achieve a gas market of 24-25 BCM annually by 2025 could be met without the need for special funding by the GoV.

PVN has the resources to be a major player although it cannot itself bear the full burden. Other Vietnamese sources of capital and entrepreneurship can surely be found from the ranks of public and private enterprises. FDI should be available, again from public and private sources, particularly from other countries of East Asia such as China, Japan, Korea and possibly Singapore.

Liquefied Natural Gas (LNG) Issues

The Ministry has requested some information and comments about the potential role of LNG in Vietnam's gas sector.

Previous references: LNG is mentioned in the April 2008 Outline for the NGMP reflecting a strong desire to introduce new forms of gas into the market. An earlier unpublished study contained the statement that “Viet Nam could consider the case of import LNG and then gasify it to supply to the gas consumers. However, this case should be studied in more detail because the LNG price on the world market is much higher than the domestic gas price excluding the investment cost and transportation fee” and concluded that “LNG import is a potential case that would be considered in the future if Viet Nam has a requirement for importing gas.” The study in question examined the export potential of neighboring Southeast Asian countries, based on year 2000 data. The study suggested that the export potential of Brunei, Indonesia and Malaysia might peak at about 9.5 Billion cubic feet per day (Bcf/d) in 2005 and decline to about 7 Bcf/d in 2010 and remain at about 6.2 Bcf/d in the 2015-2020 timeframe.

Supply of LNG: If the data presented in the earlier study are correct and the potential for exports of LNG from the sources most proximate to Vietnam is likely to decline, this does not mean that Southeast Asian LNG is likely to be severely constrained going forward. Global LNG supply is dynamic and new sources are coming on-stream that are economically tributary to the East and Southeast Asian markets. For example, the Sakhalin Project (Russia), which characterizes itself as “the new energy source for Asia-Pacific”, announced first gas in January 2009. Qatargas, drawing from one of the world's largest natural gas fields, is currently exporting 10 million tons of LNG annually and reports that exports will increase to 42 million tons in 2020. For perspective, Vietnam's current annual gas consumption of about 8 BCM is equivalent to 6 million tons of LNG. Conclusion: it is reasonable for Vietnam's energy planners to assume that LNG would be available from world markets to meet the country's import needs, which are probably modest in relation to those of the “LNG giants” of east Asia, namely Japan, Korea and Taiwan.

Acquisition of LNG: We are not qualified to respond in this area. We note however that Singapore decided to use an aggregator to obtain initial LNG supplies and to aggregate demand for gas in Singapore. Their request for proposals seems to have attracted a lot of worldwide interest and it would seem that a subsidiary of British Gas (BG) was eventually selected. It would obviously be important to find an aggregator who is both experienced in the Asian LNG business but at the same time not conflicted by having other interests in the export or import of that commodity.

Demand: The world LNG trade is very concentrated: the “LNG giants” in 2007 imported about 135 million tons of LNG which is 60% of the global total of 226 million tons. The next three largest importers—Spain, the USA and France, in that order, accounted for 25% of the total world trade. The remaining 15% represented imports by eleven other countries, including China (about 4 million tons, but growing). There are expectations of

a large increase in LNG imports by the USA where many new import projects are either seeking regulatory approval or being developed with a view to getting approvals. New LNG terminals have also been built to serve another very liquid gas market, namely the United Kingdom (UK). The developing dynamic of the global LNG trade seems to be that the USA and Northwest Europe are becoming the marginal destinations while Asian markets represent the base load demand on the global LNG supply system. Marginal surpluses of LNG tend to find a ready market in the USA and the UK and when those markets experience marginal shortfalls they are compensated in part by bidding for LNG imports. Note that LNG import volumes are concentrated in countries that have no significant domestic gas supplies (example: Japan, Korea, Taiwan) or whose domestic supplies have been comprehensively developed and fall short of national requirements (example: the USA).

Conclusion: If Vietnam were to enter the world LNG trade, say in five years' time, the modest scale of her imports would not have any significant global impact in terms of LNG supply or price.

Price: There is no global gas price. Instead, there are four major regional gas markets: The USA, the UK, the European Union (excluding the UK) and northeast Asia (essentially Japan and Korea). Only the behavior of the northeast Asia market is at this stage of fundamental importance to a country like Vietnam contemplating LNG imports. In this market, sellers and buyers have traditionally relied on long-term contracts negotiated years ago. Under these contracts, the buyer has traditionally taken the volume risk through "take or pay" clauses and the seller has accepted the price risk through price escalation clauses. The early negotiations between sellers and buyers, with little government interference, established important pricing precedents. When the first contracts were negotiated with Japanese buyers some 40 years ago, the Japanese electric power industry was heavily dependent on fuel oil. Early pricing clauses tied the LNG escalation to crude oil prices as expressed by the "Japanese Customs Clearing Price" or the "Japan Crude oil Cocktail" (JCC). This precedent was adopted by Korea and Taiwan and by some Chinese contracts. There have been modifications over the years, but the precedent remains for northeast Asia and has been hard to break. However, the oil price shocks of recent years have resulted in some modifications to protect the consumer on the upside of price swings and the seller on the downside. But the fundamental relationship to the prices of competing oil fuels remains. This means that the potential exists for very high LNG prices when oil and other energy prices are "spiking" as they did in mid-2008. For example, some cargoes reached the Korean market at that time at a c.i.f. price in the range \$US700-800/tonne which is \$14.4-16.4/MMBTU.⁶⁹

⁶⁹ Two relatively recent developments call for comment. First, global LNG supply and demand appears to have gone from a tight balance as recently as mid-2008 to a situation of apparent supply surplus in the first half of 2009. For the moment at least, prices in the East Asia market appear to be following long term contractual terms and marginal surpluses of LNG appear to be disposed off in North American and European markets at prices required to ensure competitiveness with pipeline gas in those markets. Second, there are indications that some traditional East Asia LNG importers are dissatisfied with the linkage of LNG to oil prices in the long term, because fuel oils are no longer the dominant alternative energy source in major markets such as electricity generation. Instead the future direction is likely to be towards nuclear, renewables and clean coal. The present pricing system is described as 'irrational' by the authors of a recent paper (Miyamoto A and

Conclusion: Vietnam is unlikely to be able to purchase LNG on terms fundamentally different from the “LNG giants”. For reasons of security of supply, she would surely want to purchase on the basis of long term contracts with suppliers and for shipping capacity. The prices in those long term contracts would almost certainly be related to international oil prices and not to any measurement of Vietnamese domestic energy prices, whether coal, oil or gas. If Vietnam became a significant LNG importer under those conditions, there would be a tendency for suppliers of domestic-origin natural gas to seek price-parity with LNG as the marginal source of gas supply to the Vietnamese economy. If there were to be large-scale imports of LNG and if LNG prices were to be closely related to international oil prices, then this could result in a step-change upwards in the general price level for natural gas in Vietnam.

Market: It is reasonably presumed that any future LNG imports would have to be “anchored” by the power generation market, even though provision could and should be made for some sales to industrial and commercial users, with the possibility of the gas being delivered to them by pipeline or in the form of CNG. It is also reasonable to assume that there may be a policy preference for imports at least initially to be for northern Vietnam markets which presently lack any pipeline gas supply.⁷⁰

Conclusion: The power generation market would have to accommodate what would likely be fairly high-priced energy imported, stored and gasified in expensive, new, un-depreciated facilities. There may be a mostly intangible “benefit” associated with the import, namely experience in the construction and operation of LNG facilities, but LNG import, storage and re-gasification plant is not “high technology” and does not afford interesting employment benefits.⁷¹

Regulation of LNG: The LNG import price would be determined by contract and could not be regulated by the GoV (although it might be appropriate for the GoV to “approve” the price that resulted from commercial negotiations in order for the project to proceed). The LNG import, storage and re-gasification facilities should probably be subject only to

Ishiguro C, *A New Paradigm for Natural Gas Pricing in Asia: A Perspective on Market Value*. Oxford Institute for Energy Studies (UK), NG28, February 2009).

⁷⁰ It was stated at the April 9, 2009 Hanoi Workshop that there is a need for supplemental gas supplies to feed distribution markets in the Ho Chi Minh City area and that this supply can only come from LNG. It was not explained why this gas could not be made available from the B&52 development.

⁷¹ The major components of an LNG import project are a pier where LNG carriers would dock; pipework to move the LNG to the insulated storage tanks; a simple heat exchange system to gasify the LNG using either heat from burning a small amount of gas or seawater; and a compressor to compress the gas into the pipeline which transports the it to market. Clearly, these are very simple activities. There is no refining or processing: the product at all stages of the operation is methane. In many respects this is similar to a large LPG import, storage, bottling and distribution operation which you already have in Vietnam. The technology is long-established and has been operated safely for more than 40 years. Regarding employment, a three-tank LNG import project with a 1 Bcf/d send-out capacity is nearing completion in Canada (Repsol-Irving Canaport LNG). The construction workforce was about 250 people working a 12-hour shift. The operating workforce is expected to be 16-20 people per shift.

regulation for health, safety and environmental considerations if, as is likely, they are to have only one user. If it later developed that other users wished to access the LNG import facilities, because they have natural monopoly characteristics, there would be a case to regulate access and prices. That regulation would have to ensure that the interests of the project developers were not harmed. The T&D facilities downstream of the re-gasification plant should be regulated in the same way as facilities handling domestic gas.

An international example of an LNG to Power Project: The first IPP in the world to integrate an LNG import project with an electric generating station was EcoElectrica of Puerto Rico which came on-stream in the year 2000.

The Puerto Rico Electric Power Authority (PREPA), a 60-year old state monopoly, was directed in 1993 by the Government of Puerto Rico to attempt to diversify its energy sources away from fuel oil. After examining project alternatives, PREPA selected a gas-fueled combined cycle gas turbine and cogeneration plant (EcoElectrica) and a coal plant and these have now both been constructed with the result that coal now accounts for 14% of generation, gas for 13% and fuel oil for most of the rest.

EcoElectrica's 540MW plant is owned by Gas Natural (Spain), International Power (UK) and Mitsui (Japan) and was largely financed by an international banking consortium. It is fed by re-gasified LNG imported to and stored in a single 160,000 m³ tank which provides a 40-day supply of LNG imported under long term contract from Trinidad.

EcoElectrica states that the cost structure of the two private IPPs in Puerto Rico is determined by energy and capacity payments. The energy payment is based on the cost of the fuel, variable operation and management costs and efficiency. The capacity payment pays primarily for the investment and fixed costs of operations and maintenance.

Based on this analysis, EcoEléctrica's total energy costs are stated to be among the lowest in Puerto Rico. The cost of natural gas is higher than coal, lower than fuel oil #2 and comparable to fuel oil #6. Yet, the operation and management costs of EcoEléctrica are the lowest in the energy market in Puerto Rico and its thermal efficiency is the highest. These factors allow EcoEléctrica to offer the second lowest cost (to coal) within the energy market in Puerto Rico in addition to offering significant environmental benefits.

Conclusion: There are probably no insurmountable technical or commercial obstacles preventing the establishment of a similar LNG import activity in Vietnam, anchored by a new electric generating plant. However, its generating costs might be higher than those of plants using domestic coal, domestic natural gas or imported coal

Security of supply considerations: The security of imported LNG supply has been generally good. When interruptions to specific LNG flows have occurred (Algeria [Arzew plant failure], Indonesia [civil disturbances in Sumatra] and Qatar [technical failure]) the industry has generally speaking been able to find and deliver alternative supplies to long-term contracted customers. Security of imported LNG supply can be enhanced by “backing up” the storage available in the import terminal by storing additional gas in geological formations such as aquifers or depleted gas fields. There are of course costs associated with such non-commercial storage.

Policy framework: Policymakers will want to consider whether it is appropriate to plan to import LNG in the 2015-2020 timeframe, when Vietnam’s own natural gas resources are not yet adequately explored and understood. They will weigh the supply “certainties” associated with LNG imports against the “uncertainties” as to the quantity, quality and timing of new domestic supplies tributary to the Northern Vietnam energy market.

Decision-takers will require careful cost/benefit analysis relating to the use of LNG versus alternate fuels, domestic and imported. In those comparisons, account should be taken of benefits in terms for example of government revenues and employment that are associated with the use of domestic resources. If for supply-security reasons it is decided that additional LNG storage would be required above the commercial minimums, then discussion is needed as to how the associated costs should be borne—by the economy at large, by all gas or electricity consumers or by consumers of imported LNG.

It will be important to carefully review the gas-pricing implications of LNG imports, both in relation to a possible LNG-gas-to-power project in isolation and in relation to pricing policy for domestic gas. In the latter context, LNG imports to most countries which also have domestic gas-producing industries (USA, UK) only take place when domestic gas prices are at levels that support the costs of importing, storing and gasifying the LNG. There is no discrimination in the matter of price between the imported and domestic source: this of course is the essence of a functioning market.

In that connection, it is worth noting that four LNG import terminals were built in the USA in the period 1971-80 in the expectation that shortfalls in domestic supply and cutbacks in Canadian exports to the USA would drive imports of LNG. However, deregulation of the gas industry in the 1980’s fostered domestic supply and tended to drive gas prices in North America well below those on the international LNG market. Accordingly two of the terminals were shut down and two of them experienced very low utilization rates: in other words the investments made in the 1970’s were largely “stranded” as a result of changed market circumstances. It was only after two decades that rising North American gas prices and the availability of LNG from new plants in Trinidad, proximate to North American markets, revived commercial interest in LNG imports. The mothballed terminals were re-opened and a fifth terminal came on stream in 2005. Two more have been commissioned since then for a total of seven active terminals (excluding EcoElectrica in Puerto Rico). There has been a rush to obtain regulatory approval for additional LNG import facilities. There are currently about 12 new sites being applied for to the regulatory authorities and about seven more potential sites are under development in the USA together with three in Canada and two in Mexico for a grand total of 24 focused on the USA gas market. It remains to be seen how the market will reward these actual and potential investments: gas prices in North America are currently far below those of LNG for sale to European and East Asian markets. It is conceivable that, once again, the North American LNG import industry will go through a period of excess importing capacity and very low utilization rates for some terminals.

There may be value in predetermining the policy and regulatory conditions under which LNG may be imported to Vietnam. This could be a useful guide for potential investors,

whether they are NOCs or IOCs. The FERC in the USA provided such guidance in its LNG import policy announced in 2002.⁷²

To Summarize: The Pros and Cons of LNG Imports at this stage of Vietnam's Gas Development

Pro:

- Assured supply: LNG imports are available and would provide a “certain” supply of gas at a time when there is “uncertainty” as to the increments of gas available from domestic sources;
- Geographical: LNG imports provide a gas to northern Vietnam which is presently without a large-volume gas supply and where domestic supply prospects are particularly “uncertain”;
- Synergies: Conceivably some synergies might be found with Vietnam's oil refining and petrochemical ambitions, for example if a source could be found of liquids-rich gas to be imported to an existing or future refinery and petrochemical site⁷³;
- Technology and employment: LNG imports would give Vietnam experience of a technology which is presently unknown to its petroleum and engineering community;
- Greenhouse Gas Emissions (GHG): If GHGs are a factor in future electric generating fuel choices, then it should be noted that a recent study, in a USA setting, finds that the life-cycle GHG emissions of LNG-supplied CCGT power generation is not much more than half of the GHG emissions of the most efficient coal plants using an advanced ultra supercritical steam cycle.⁷⁴

Con:

- Timing: It is questionable whether it is sound policy to introduce foreign LNG at a time when Vietnam's own gas resources are not well understood in terms of their extent, quality and cost;

⁷² The FERC's LNG policy is summarized in and can be followed from links in the following website:
<http://www.ferc.gov/industries/lng/indus-act/policy.asp>

⁷³ The approach of importing liquids-rich LNG, recovering the LPGs and using them as petrochemical feedstock is an unusual one. There does not seem to be such a project in operation. However, Keltic LNG in Guysborough, Nova Scotia, Canada has proposed this approach. Keltic is associated with the Maple group of companies. A Government of Canada summary of the project can be found at <http://www.nrcan.gc.ca/eneene/sources/natnat/goldboro-eng.php>

⁷⁴ Source: Life Cycle Assessment of GHGs Emissions for LNG and Coal-Fired Generation Scenarios: Assumptions and Results. Pace (Consultants). Prepared for the Center for Liquefied Natural Gas. Washington D.C. February 2009

- **Cost and Price Effects:** The cost of re-gasified LNG might be appreciably higher than the price of natural gas from domestic sources valued in relation to competitive fuel prices in the power generation market. It might be difficult to find a market in power generation to “anchor” an LNG project and if such an anchor were found, that would present a target price for domestic natural gas developers, potentially raising all Vietnamese gas prices to LNG import parity;
- **Comparative fiscal and economic impacts:** In the absence of significant Vietnamese investment in the overseas production, liquefaction and shipment of LNG, the price of LNG imports would be essentially a 100% foreign exchange cost and no fiscal benefits would be created for the GoV. By contrast, where domestic gas resources can be developed, the foreign exchange component of the price would be probably quite small, significant domestic economic multiplier effects would be created and the GoV would receive the benefits of the upstream fiscal regime applicable to gas production;
- **Technology and Employment:** While the experience might be marginally useful, LNG importing, storage and re-gasification is not a sophisticated technology and does not create a lot of employment;
- **Supply Security:** While the worldwide experience of LNG imports from a security of supply standpoint has generally been satisfactory, the presence of such imports would tend to add another security of supply concern to those already relating to crude oil, oil products and possibly coal;
- **Pipeline Imports:** The economics of pipeline imports should be evaluated and that possibility perhaps discarded before Vietnam opts for LNG imports. That suggestion is made recognizing the pipeline imports raise their own issues of costs, prices, location and security.

A possible approach to further work by the Ministry on LNG imports

The policy, commercial and technical aspects of possible LNG imports could certainly be explored.

Objective: one desirable objective from the Ministry’s standpoint should be to identify and publicize the policy and regulatory conditions for private and/or public sector investments in an LNG import project(s). The preconditions are increased Ministry policymaking and analytical capability with possible consultant assistance.

Approach: if this objective is pursued, the Ministry should mobilize available expertise, including that of PetroVietnam in a task force setting. This would result in a set of recommendations to the policy level.

International practice: international experience points towards the issuance of an LNG policy by GoV. In the early part of this decade, the USA recognized that there was much industry interest in building new LNG terminals. Therefore in 2002, the relevant

regulatory body, the Federal Energy Regulatory Commission (FERC), researched and published its LNG policy.⁷⁵ This has provided the basis for many projects which have now either been approved, and in some cases have already been built, or are in the FERC's regulatory process. Conditions in Vietnam may be completely different than in the USA, but there is the same value to predetermining the policy and regulatory framework for LNG.

Milestones: (1) Policymakers decide on and announce a comprehensive framework for future LNG imports. (2) Regulators are authorized to deal with applications for such imports and for the facilities to receive them and relevant information is published (3) At the same time, fiscal and other encouragements are given to maintain a high level of domestic gas exploration and development.

Results: Clear policy and regulatory guidance is available to potential investors in the LNG import business, whether PVN, other NOCs, Vietnam private capital or IOCs or some combination and to GoV officials dealing with gas issues and regulation.

⁷⁵ The FERC's policy on LNG imports is available at <http://www.ferc.gov/industries/lng/industry-act/policy.asp>

International Experience of Gas Sector Development

The following tables summarize studies of the gas sectors in Bangladesh, Canada, Malaysia, Pakistan and Thailand. Vietnam is unique and none of these examples provide a comprehensive model for Vietnam. However there are lessons to be learned from each of them, in terms of what has worked well and what has turned out badly, what can be achieved and how long it may take to achieve it. Readers will draw their own conclusions as to what is of most importance for Vietnam. However, some examples of relevant experience arranged by topic are presented in the following notes:

Institutional framework

- Substantial gas sector development can be achieved with a government directorate managing and regulating the upstream (federal and provincial energy departments in Canada, federal Directorate General Petroleum Concessions in Pakistan) with well-regulated and financially robust monopolies in T&D;
- It is not unusual for the NOC to be a gas developer, transporter and distributor and at the same time the principal upstream regulator (Petronas in Malaysia, PTT in Thailand), but change towards separate, financially robust entities in each link of the gas chain is recognized as essential (Petrobangla in Bangladesh);
- An independent regulator takes time to get accepted and established (OGRA in Pakistan, BEREC in Bangladesh) and it may be politically difficult (Thailand) but the separation of policymaking from regulation can be effectively achieved (Canada);
- The existence of dominant NOCs in all phases of the business does not prevent the implementation of modern regulation up- and down-stream (Pakistan).

Market design

- The modified single buyer model has been used effectively for gas sector development with different institutions playing the role of the single buyer in different countries: the transmission subsidiary (Petronas Gas) of the NOC (Petronas Group) in Malaysia, two integrated state-owned T&D utilities (SSGCL and SNGPL) in Pakistan, the transmission subsidiary (Gas Transmission Company Limited) of the NOC (Petrobangla) in Bangladesh, the integrated NOC (PTT) in Thailand;
- Creditworthy buyers (e.g. gas distribution companies and other gas end-users in Canada; SSGCL and SNGPL in Pakistan) are an essential link in the commercial gas chain: if they are not available, development cannot take place (Bangladesh).

Sector development

- Large distribution networks can be created in countries with small heating loads, but it takes a long time to do this (Bangladesh and Pakistan);
- A network serving residential, commercial and industrial buyers can be created in an equatorial climate (Peninsula Malaysia—1500 km of distribution lines and about 3 BCM of gas sales in 2008);
- A distribution business can be financed and operated on the basis of local, foreign and NOC capital (Gas Malaysia: local private investors 55%; Japanese gas company 25%; NOC 20%); T&D expansions can also be financed with locally-raised debt capital (Pakistan);
- Cash injections as well as financial discipline can be introduced to T&D businesses through stock exchanges listings (Petronas Gas in Malaysia; SSGCL and SNGPL in Pakistan);
- It takes a long time and much capital to create a national gas transmission network, but it can be done (Peninsular Malaysia and Pakistan >25 years);
- Experience gained over several decades of both “managed markets” with government-set prices and of “free markets” where prices are set by competitive forces have demonstrated the efficiency and public acceptability of market solutions (Canada).

Pricing experienced by gas producers

- Shifting from ‘cost-plus’ or negotiated gas pricing to generic gas pricing linked to international fuel prices (thus allowing upstream developers to gauge risk using the own projections about international fuel prices) can help increase upstream investment to meet gas demand (Pakistan and Bangladesh in the 1990s; Canada after 1986);
- If upstream producers are financially crippled by low prices, exploration and long-term supply will suffer (Bangladesh). It is better for upstream rents to be harvested by gas resource owners (governments) and gas resource developers (IOCs, NOCs) which means no subsidies in downstream pricing (Canada). Passing upstream rents down the gas chain to end-consumers through subsidized pricing of downstream services (T&D) starves the service providers of investment funds needed to maintain and expand networks (Bangladesh);
- A ‘gas pool price’ can create mixed incentives for E&P companies. In Bangladesh, mixing of internationally-priced ‘IOC gas’ and significantly
- subsidized ‘NOC gas’ has meant that NOCs have not had sufficient funds to make the E&P investments Bangladesh needs;
- Long-term upstream gas contracts with fixed prices can lead to insufficient development of upstream gas resources contributing to gas shortages (Canada up to 1975);

- Separate generic pricing schedules for separate basins can be used to incentivize upstream investment in less prospective basins (Zones I, II, and III based on prospectivity in Pakistan).

Share of gas in the energy economy

- Given favorable conditions (large resources, active exploration, lengthy period of development, heavy investment in T&D) a strikingly large proportion of national energy needs can be met by natural gas (Bangladesh 80%, Pakistan 50%, Malaysia 44%). National energy security is improved by such heavy reliance on domestic gas in the cases cited. Where a proportion of the gas is imported by pipeline or LNG, security is still improved by the resulting diversification of supply.

Demand management issues

- From time to time, governments have attempted to discourage certain gas uses (particularly, electricity generation in the Canada (by persuasion) and in the USA (by law—the Fuel Use Act). The objective was to conserve limited gas supplies for what were seen as socially more valuable uses such as residential heating and cooking. In retrospect, such interventions are seen as having been mistaken and counter-productive.

Project approvals

- The Vietnam practice of requiring project approvals from a senior level and without any apparent predetermined guidelines for such approvals appears to be exceptional. The general case seems to be that projects which have received regulatory approval and which the investor is prepared to support then proceed without requiring separate sanction from the senior policy level.

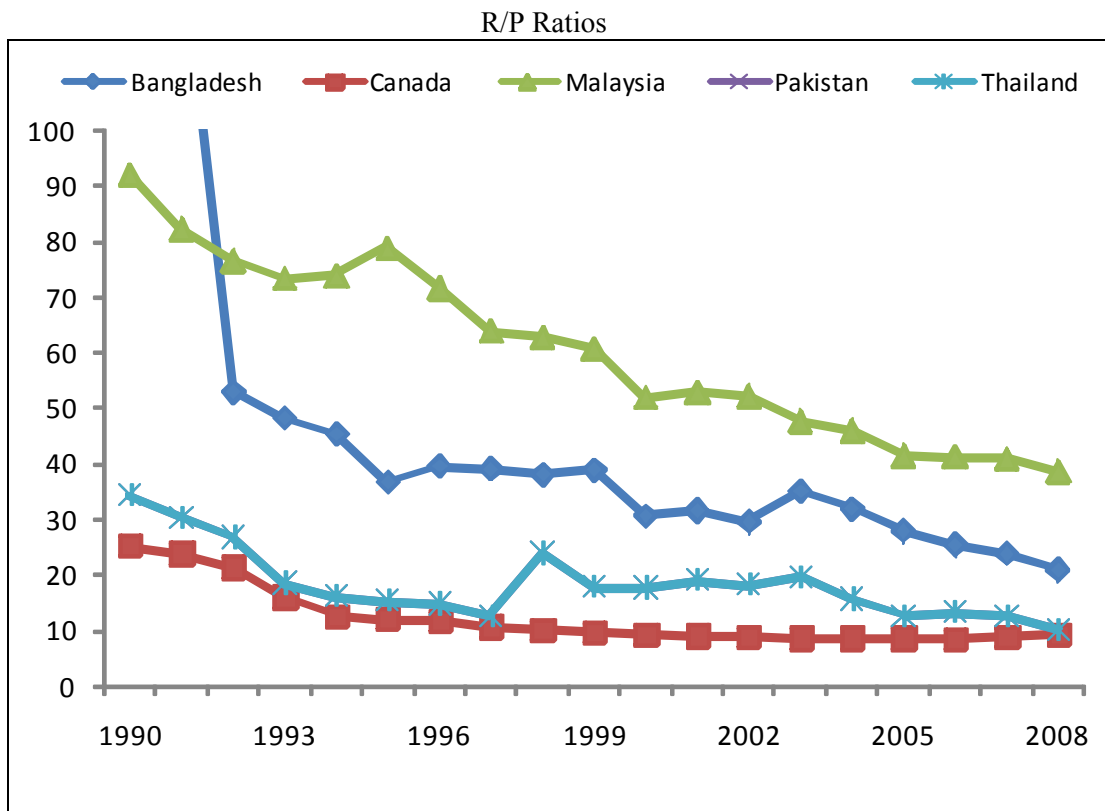
Management of Gas Reserves

- As a country's gas producing sector matures, the ratio of reserves to production (the R/P ratio) generally falls, sometimes to as low as 7 or 8. As a generalization, a fall in the R/P ratio reflects two possible conditions. One of them is desirable from a policy standpoint. The other is not:
 - The undesirable condition is where the economic and policy environment is unfavorable for gas development. As a result, industry exploration and development activity is stagnant or declining. Established reserves are drawn down rapidly to meet domestic market needs and all this is reflected in a falling R/P ratio. This was the condition in Canada in the late 1970s and early 1980s.
 - The desirable condition for a falling R/P ratio is where, as a result of a favorable overall gas business environment, the industry is healthy and is actively and fully developing the domestic resource. Because it is expensive to hold proven reserves over and above the level needed to maintain any given volume of supply, the reserves "inventory" is reduced, which is an

economically efficient course of action. This has been the condition in Canada and the USA since the late 1980s.

- The R/P experience of the five countries reviewed in this Annex is summarized in Figure A5.1 below. Canada has remarkably been able to maintain a very high level of gas production for many years on the basis of a remarkably low R/P ratio, thanks to an aggressive domestic industry. Thailand's gas industry appears to work the domestic resource vigorously while supplementing domestic supplies with imports. Malaysia's R/P ratio has been declining but is still at a rather high level, possibly because her resources are large in relation to domestic needs, possibly because of a commitment to keep a large reserve against her considerable long term LNG export commitments.

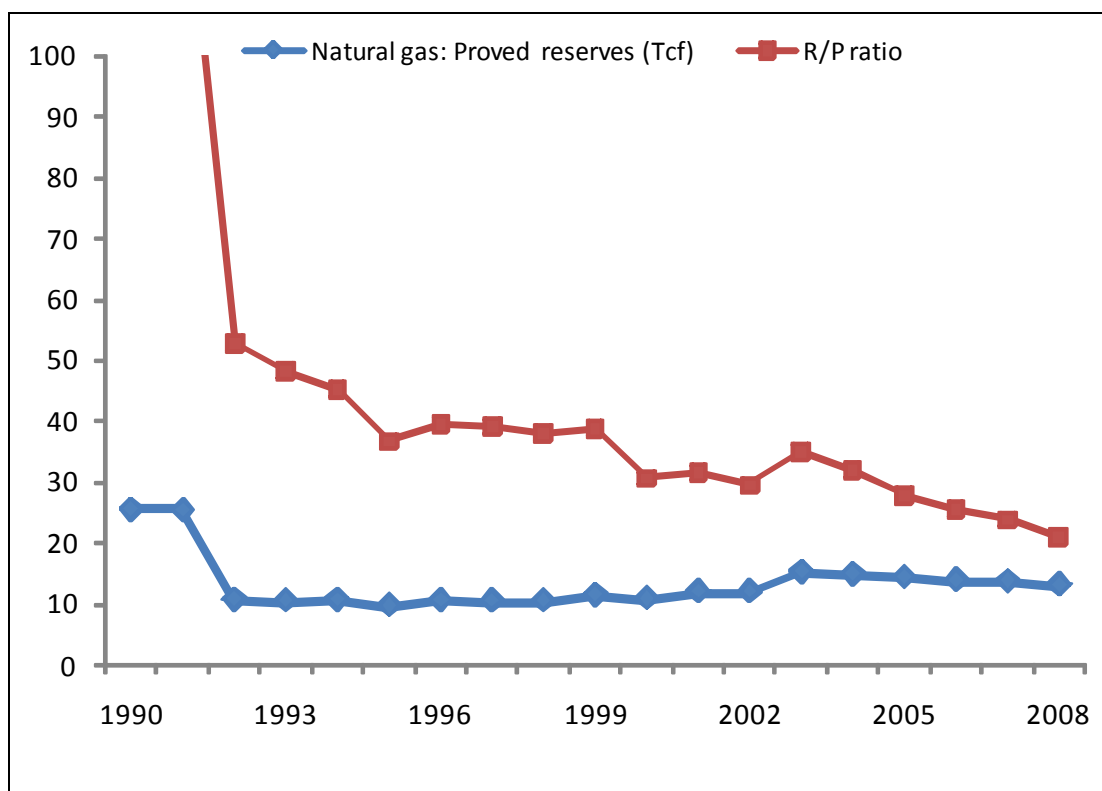
Figure A5.1. How countries have managed reserves & production



(Source: BP Statistical Review of World Energy 2009, World Bank staff calculations).

BANGLADESH - EXPERIENCE IN DEVELOPING THE GAS SECTOR

Figure A5.2 Bangladesh: Reserves and R/P Ratio



(Source: BP Statistical Review of World Energy 2009, World Bank staff calculations)

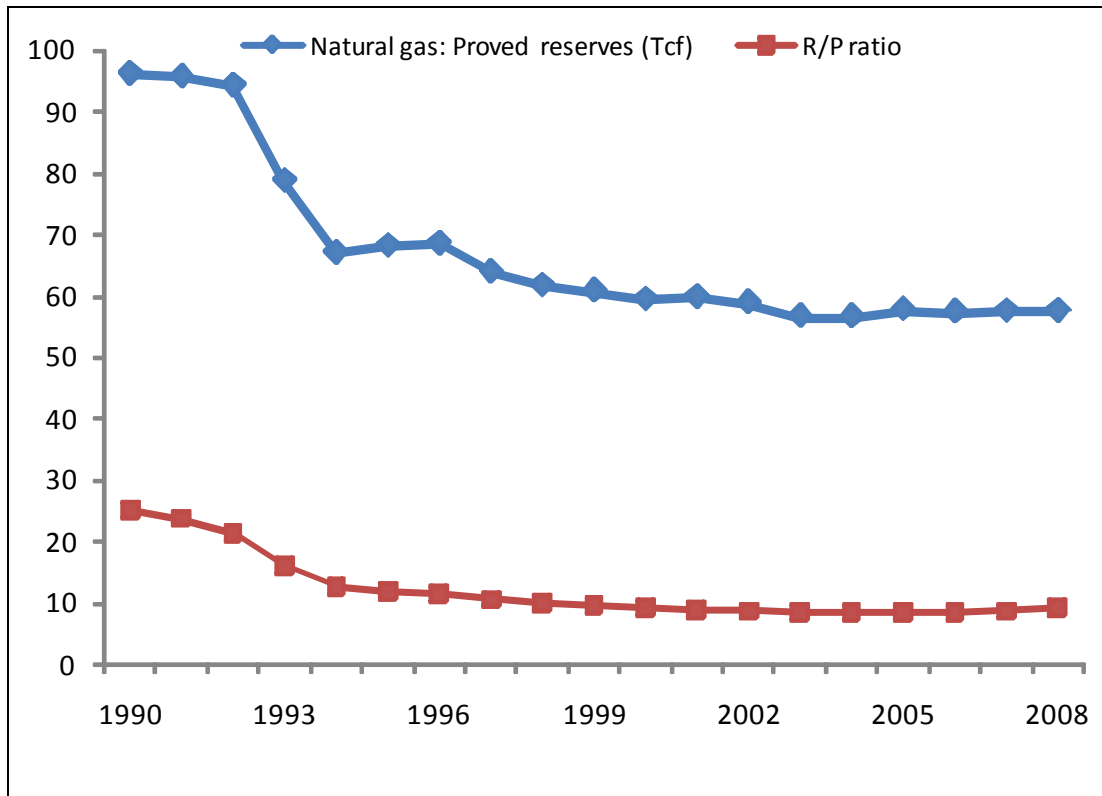
	1997	2008
Supply/Demand balance	Raw gas production 280 Bcf No exports or imports	Raw gas production 562 Bcf Gas sales 535 Bcf No exports or imports
Recoverable reserves (est.)	10.5 Tcf (BP Review of World Gas)	13.1 Tcf (BP Statistical Review of World Energy 2009)
Proportion of gas in primary energy	Approximately the same as 2007	About 80%
Distribution of Demand	Approximately same as in 2007: the market is growing, but the distribution by end-use is not changing much	Power: 54% Industry: 16% Fertilizers: 13% Domestic: 12% CNG: 4% Commercial: 1%

BANGLADESH	
Infrastructure	The Bangladesh Oil, Gas and Minerals Corporation or Petrobangla and subsidiaries own all the T&D and CNG businesses. The indications are that Petrobangla's operations are starved of investment funds needed to properly maintain and expand the networks, because of gas pricing policies.
Market structure	Upstream: Petrobangla in 2007 accounted for 52% of production and IOCs, the most important of which is Chevron, were responsible for 48%, a proportion that has been growing. The IOCs are technically allowed to sell their gas competitively, but there are probably not enough credit-worthy large gas consumers for this to happen. Therefore the <i>de facto</i> market structure is the "modified single buyer" model, the buyer being Petrobangla. This situation has existed for the past 30+ years. Downstream: Petrobangla has an effective monopoly.
Institutional Structure and Sector Management	The Ministry of Energy and Mineral Resources has overall government responsibility for energy and gas sector policy. Within the Ministry is the Energy and Mineral Resources division and its technical support is provided by the Hydrocarbon Unit. In the upstream, the IOCs operate by virtue of their PSCs with Petrobangla which is both the other contracting party and the supervising and monitoring agency responsible to ensure that work obligations and expenditure commitments are met. There is no independent agency to perform these tasks: Petrobangla is in effect the upstream regulator. However, in discussion of institutional reform, the idea of an upstream licensing authority (a "Petroleum Directorate") has been promoted. In the downstream, the Bangladesh Energy Regulatory Commission (BERC) has been operating since April 2004 with the role of a downstream regulator. The Commission's objectives are to: create an atmosphere conducive to private investment; to ensure transparency in management, operation and tariff determination; to protect consumer interests; and to promote the creation of a competitive market. The Commission is now moving step by step to deal with all energy forms.
Pricing experience	In 2006 gas prices to consumers averaged a very low \$1.4/MMBTU. The range of prices was from \$1.0 for fertilizer manufacture to \$3.6/MMBTU for commercial users. Producer gas prices for the NOCs were extremely low—at about 7% of HSFO. Producer gas prices for IOCs under PSCs were linked to international HFO prices but with a floor and a ceiling. In 2006, the cap was effectively equivalent to fuel oil at \$23-26/bbl. All IOC gas is purchased by Petrobangla and blended with the very low purchase price of gas from the NOC producers to yield the range of consumer gas prices mentioned above. Independent analysis concludes that NOC producers are financially crippled by the very low prices received and unable to undertake the exploration efforts commensurate with Bangladesh's need for additional gas supplies. Analysis concludes that, because of the ceilings, the prices received by the IOCs are unattractive at high international oil prices (\$60 and more per barrel). The fiscal regime is seen as internationally competitive.

BANGLADESH	
Rent distribution	Rent distribution pursuant to PSCs in the upstream as between the IOCs and Petrobangla is seen as fair. The NOC however is effectively denied upstream rents, which are instead conferred on gas consumers, particularly fertilizer manufacturers and power generators, through extremely low gas selling prices. Thus, in 2006, gas was discounted relative to liquid fuels by 430% in fertilizers, 382% in power and 1,664% in CNG (compared to the retail price of gasoline).
Role of NOCs	The gas sector is dominated by Petrobangla and its wholly-owned subsidiaries in exploration, production, T&D.
Assessment	The gas sector plays a critical role in Bangladesh's energy economy and has been expanding rapidly in the past decade. On the supply side, the contribution of IOCs has been growing to become nearly half of the production volume. This may reflect in part that the IOCs receive better, fuel-value prices for their output than does the NOC which appears to be starved of capital at all stages of the gas business. It is difficult to see how continued production growth can be achieved and infrastructure maintained and expanded without a fundamental change in pricing, at least for the NOC.

CANADA - EXPERIENCE IN DEVELOPING THE GAS SECTOR

Figure A5.3 Canada: Reserves and R/P Ratio



(Source: BP Statistical Review of World Energy 2009, World Bank staff calculations).

	1997	2008
Supply/Demand balance	Production 170 BCM minus Exports 82 = Domestic supply 88	Production 209 BCM minus Exports 110 = Domestic supply 99
Recoverable reserves (est.)	1809 BCM	1639 BCM ⁷⁶
Proportion of gas in primary energy	32%	32%

⁷⁶ Proven gas reserves have been declining as the producing industry has increasingly tried to minimize its “inventory costs” and produce increasing gas volumes from a smaller proven reserves base.

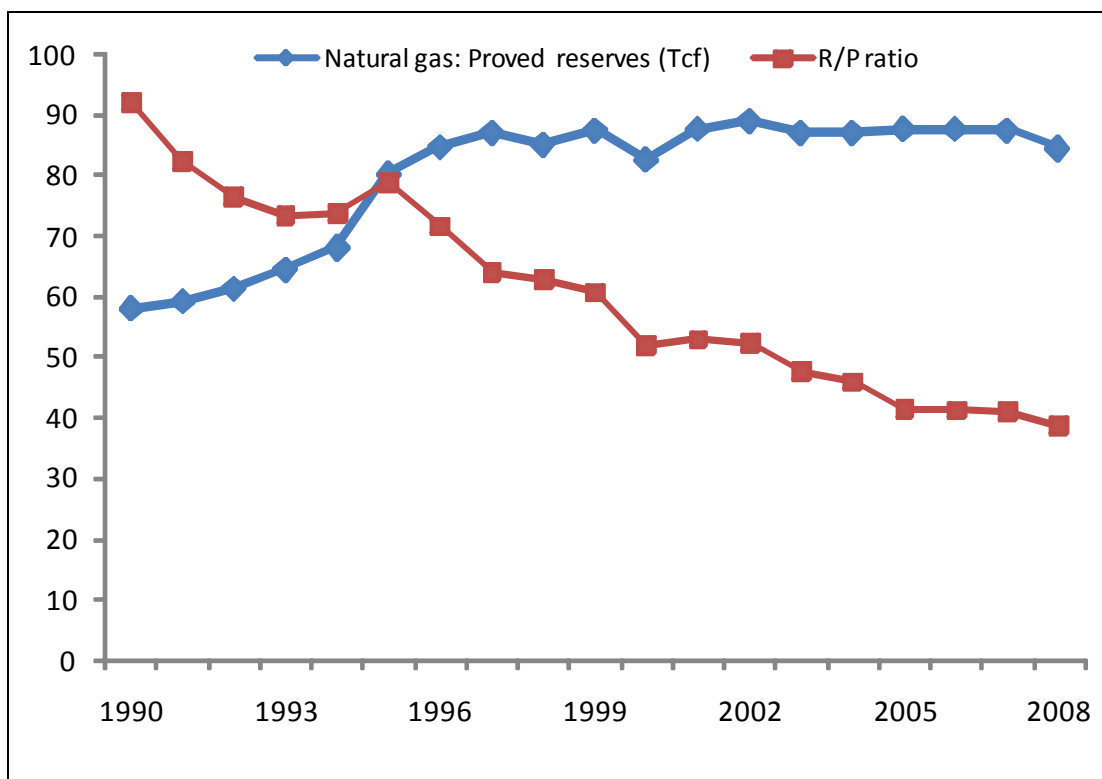
CANADA									
Distribution of Demand⁷⁷	The Canadian gas market is growing slowly and the structure of demand changes very little <table> <tr> <td>Households</td><td>30%</td></tr> <tr> <td>Commercial</td><td>14%</td></tr> <tr> <td>Industrial & power</td><td>52%</td></tr> <tr> <td>Other</td><td>4%</td></tr> </table>	Households	30%	Commercial	14%	Industrial & power	52%	Other	4%
Households	30%								
Commercial	14%								
Industrial & power	52%								
Other	4%								
Infrastructure	The gas transmission sector is dominated by two companies—TransCanada PipeLines (Canadian) and Spectra (American) and there are a dozen significant regional gas distribution utilities. There is a high degree of transparency in areas such as production, consumption, exports, imports, pipeline flows, pipeline rates, market prices at the major “hubs” and consumer prices.								
Market structure	Market structure has been substantially unchanged for the past decade. Wholesale competition exists in most Canadian gas markets and retail competition in some. There are large numbers of producers and sellers of gas and thousands of buyers who are able to make their own purchase arrangements. As a result, gas prices are determined by the competitive forces of the North American gas market, the world’s largest.								
Institutional Structure and Sector management	Canada is a federal state. There are 10 provinces and 3 territories. The provinces own the gas resources within their borders. The federal government owns the gas resources offshore and in northern areas. The federal government and most provinces have either energy departments or natural resources departments with an energy sector, in all cases headed by a responsible minister. These departments tend to play only a monitoring role: governments adjust fiscal terms from time to time but do not interfere in the operations of the gas market. The federal government and most provinces have independent regulatory boards which manage gas resources and regulate gas infrastructure. These boards are responsible for almost all the government gas decision-taking that goes on.								

⁷⁷ Deregulation of the gas commodity market since 1986 has resulted in the growth of direct sales to consumers of all kinds (residential, commercial, industrial and power generation) by “agents, brokers and marketers (ABMs)”. These direct sales are transported and distributed by the gas transmission and distribution utilities on behalf of the ABMs. Direct sales have been a growing proportion of total sales. The gas utilities record and report the classes of consumer to which they sell gas. However, the ABMs do not do so, partly because they do not necessarily know who the ultimate buyers of their gas are. This commercial development has resulted in a significant “gap” in terms of data about the end use of natural gas.

CANADA		
Pricing experience	Pre-1975: the gas transmission companies were the purchasers of gas from producers and sellers of gas to the monopoly distributors. Gas prices were fixed by long term contract at low levels with small annual escalation. As a result, by 1975 the industry was not developing sufficient productive capacity to meet gas demand. Potential gas supply shortages led governments to discourage gas use in power generation. 1975-1985: gas prices in domestic and export markets were set by governments as a ratio to crude oil prices: 100% of crude oil for exports and 60-75% of crude oil in domestic markets. 1986-onwards: gas commodity markets are deregulated and gas prices are determined by competition between large numbers of sellers and buyers of gas, with government monitoring of the results but without government interference in pricing. There is no restriction on gas use or exports.	Prices are driven by competitive conditions in the North American market. They fluctuate widely—in the past year at the Henry Hub in the Texas producing area, they have been as low as \$4.50/MMBTU and as high as \$12. 00. Because prices are free to move, they always equilibrate demand and supply—there are never any shortages or surpluses in the market. Consumers’ gas needs are always met at market prices. The associated price fluctuations have never presented a <u>serious</u> political problem for governments. Canadian governments have for more than 20 years resisted any temptation to start to interfere again in gas pricing.
Rent distribution	Prior to gas market deregulation in 1986, some share of the available rent was from time to time conferred on consumers in the form of below-market prices. Since 1986, rents attributable to resource pricing have arisen only in the upstream and been harvested by resource owners (governments) and gas producers.	
Role of NOCs	A national oil company, Petro-Canada, was created in 1976 and privatized to the extent of 80% in 1991 and 100% in 2004. In 1981-85 it enjoyed a privileged position in regards to ownership of oil and gas in the areas of federal jurisdiction. Since 1992, its shares have been listed on the stock exchanges, it has no privileges and it competes on an even footing with other companies in all its business areas. It is active in Canada and overseas. In April 2009 the managements of Petro-Canada and Suncor, another large integrated Canadian energy company, announced a merger. Suncor shareholders would own 60% and Petro-Canada shareholders 40% of the merged company which would retain the Petro-Canada name only for retail purposes.	
Assessment	After experimenting with a variety of approaches to market structure and gas pricing, Canada has for more than 20 years allowed and encouraged market forces to shape the sector. The result has been the development of a major gas industry on a resource base which is large and varied but which tends to have low well productivities. Exports have contributed greatly to the industry’s growth, but the curve has now flattened. Canadian governments appear to be confident that the system will ensure that gas requirements are met at market prices. They therefore do not intervene in the sector, apart of course from determining fiscal terms. Regulatory bodies that set prices and service terms for natural monopoly pipeline networks are the most important governmental actors affecting the sector.	

MALAYSIA – Gas Sector Development

Figure A5.4 Malaysia: Reserves and R/P Ratio



(Source: BP Statistical Review of World Energy 2009, World Bank staff calculations).

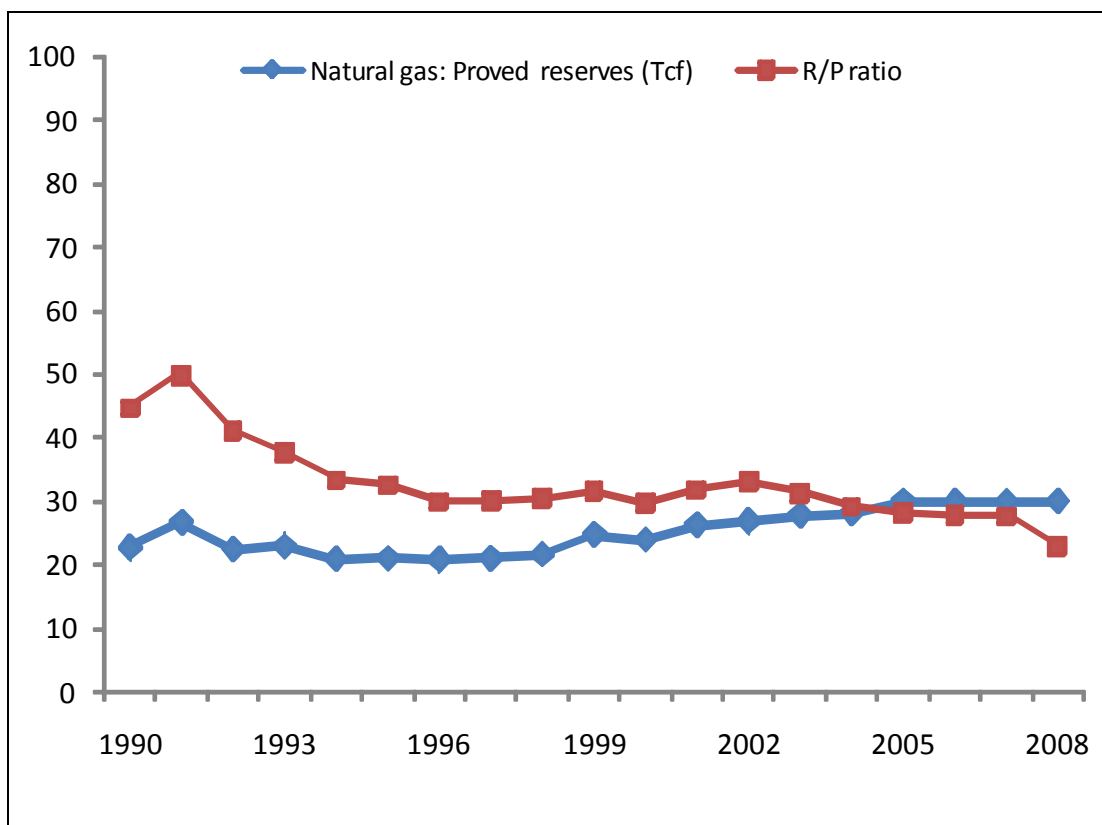
	1997	2008
Supply	Production: 3.7 bcf/day Consumption: 1.6 bcf Imports from the Malaysia-Thailand Joint Development Area (JDA) Export to Singapore for the Senoko power station Recoverable Reserves 68 Tcf (1996) (half of it offshore of Sarawak)	Production: 5.9 bcf/day Consumption: 2.7 bcf Imports from the Malaysia-Thailand Joint Development Area (JDA), Indonesia (West Natuna), and Vietnam (PM3); total 0.5 bcf/day Export to Singapore for the Senoko power station Recoverable Reserves 87.4 Tcf (mostly off-shore Sarawak)

MALAYSIA		
Demand Distribution?	Not available	Customer base: In November, 2008, Gas Malaysia (which serves non-power customers) served 31,379 residential and commercial customers, 631 industrial customers. Proportion of gas in primary energy: 44% Breakdown of end-uses: Power: 62.5% Industry: 31.2% Export: 6.3% (Singapore)
Infrastructure	Most of the country's population lives in Peninsular Malaysia. Gas production is fed through the 2,271 km Peninsular Gas Utilization (PGU) system owned and operated by Petronas Gas. The PGU has been built in phases. In 1984, PGU-1 started supply power generation and industry along the east coast. In 1992, PGU-2 started supply to Kuala Lumpur and south down to the west coast as well as a spur link to Singapore. In 1998, PGU-3 connected the west coast line north to Thailand. There are small, isolated distribution systems in Sarawak (owned by Petronas Gas) and Sabah. Petronas Gas operates six gas processing plants with a combined gas production capacity of 2 bcf/day. Gas Malaysia has a gas distribution network of 1535 km in Peninsular Malaysia. In 2007, Malaysia exported 29.8 bcm of gas (13% of global LNG sales) to Japan, South Korea, Taiwan, and India from the Petronas LNG complex at Bintulu, Sarawak. In 1983, Malaysia's first LNG plant, MLNG-I, was constructed at Bintulu by Petronas (65%), Shell (15%), Mitsubishi (15%), and Sarawak local government (5%). In 1996, a second plant, MLNG Dua, was completed at Bintulu by a consortium of Petronas (60%), Mitsubishi (15%), Shell (15%) and the Sarawak state government (10%). In 2003, a third plant, MLNG Tigi, was completed at Bintulu by a consortium comprising Petronas (60%), Shell (15%), Nippon Oil (10%), Diamond Gas (5%) and the Sarawak state government (10%). In 2007, the Petronas LNG Complex at Bintulu remained the world's largest LNG production facility in a single location.	
Institutional Structure & Sector Management	The Petroleum Development Act (1974) established Petronas as the national petroleum company responsible for exploration, development, refining, processing, manufacturing, marketing and distribution of petroleum products; Petronas, wholly owned by the Government of Malaysia, has exclusive rights of ownership, exploration and production in the upstream sector under the direct purview of the Prime Minister (through the Economic Planning Unit of the Prime Minister's Department). Petronas is responsible for the planning, investment and regulation of all up-stream activities as well as LNG (through its subsidiary Malaysia LNG). Petronas exercises the Government's ownership, management and control of upstream petroleum resources and activities through production sharing agreements with E&P companies. In addition to its oil and gas businesses, Petronas also has stakes in petrochemicals, logistics and maritime businesses.	

	In 2002, the Energy Commission of the Ministry of Energy, Water, and Communication took over the regulation and oversight of the gas reticulation industry including natural gas and LPG (these functions were previously held by the Department of Electricity and Gas Supply as defined in the Electricity Supply Act of 1990 and the Gas Supply Act of 1993; these laws were amended). In the electricity sector, the Energy Commission is the regulator for the entire chain from generation to retail as well as electricity tariffs. The Energy Commission is responsible for the technical and safety-related regulation of gas supply downstream from the citygates but gas prices are issued by the Economic Planning Unit of the Prime Minister's Department. Under the National Depletion Policy of 1980, an upper limit of 2 bcf/day has been imposed on gas production in Peninsular Malaysia.
Market Structure	E&P: In 1997, Shell and Exxon were the largest gas producers in Malaysia under production sharing contracts with Petronas. In 2007, 67 production sharing contracts were in operation. The NOC, Petronas, appears not to be a major operator on its own account in its home country. Transmission & Distribution: Petronas Gas is the arm of Petronas (60% equity) responsible for gas processing, transmission, and wholesale. Petronas Gas is Malaysia's sole supplier of processed gas and is listed on the Kuala Lumpur Stock Exchange. Gas Malaysia—owned by MMC-Shapadu Holdings (55%), Tokyo Gas-Mitsui (25%), and Petronas Gas (20%)—is the regulated distributor of natural gas and LPG in Peninsular Malaysia to non-power gas customers.
Pricing	There appears to be some kind of value pricing principle, possibly embodied in the PSCs.. Downstream gas pricing is determined by the Economic Planning Unit of the Prime Minister's Department.
Rent Distribution	Rent collected by Petronas is sometimes used to subsidize retail electricity prices; Petronas provides subsidies to retail gas customers in periods of high gas prices.
Role of NOCs	Petronas dominates all aspects of the petroleum sector. In the upstream sector, it operates as an E&P company (through its subsidiary Petronas Carigali), regulator as well as the Government's representative in PSCs with other E&P companies. It also owns the gas T&D systems through Petronas Gas and Gas Malaysia. Petronas has expanded overseas and has upstream, mid-stream, and downstream interests in over 30 countries.
Appraisal	Malaysia has developed a large domestic gas economy integrated with the global energy sector with significant expansion of the gas network over the past three decades. The upstream rents available to Malaysia from its hydrocarbon exports have allowed the NOC to lead this expansion in partnership with private players. While there is generic pricing upstream, downstream gas prices are still set by the government. The NOC continues to dominate each link of the gas chain through its subsidiaries and has expanded to 30 countries overseas. The upstream rents can be seen as a major reason for the continuance of this NOC-dominated single-buyer model.

PAKISTAN – Gas Sector Development

Figure A5.5 Pakistan: Reserves and R/P Ratio



(Source: BP Statistical Review of World Energy 2009, World Bank staff calculations).

	1997	2008
Supply	Production: 1.9 bcf/day Consumption: 0.6 bcf No import/export Recoverable Reserves 21.1 Tcf Exploration activity peaked in the late 1990s with discoveries leading to a doubling of gas production between 1997 and 2007	Production: 3.9 bcf/day Consumption: 1.2 bcf No import/export Recoverable Reserves 32.4 Tcf ⁷⁸

⁷⁸ Equivalent to 28.18 Tcf if normalized to 900Btu/scf.

PAKISTAN		
Demand	Proportion of gas in primary energy:	Customer base: 4.9 million (4.8 million domestic, 67,000 commercial, 7,600 industrial) Proportion of gas in primary energy: 50% Breakdown of consumption: Power: 35% Fertilizer: 16% Domestic: 15% General Industry: 25% Commercial: 3% CNG: 5% Cement: 1%
Infrastructure	One major high-pressure transmission network (9,432km at end-FY07) owned and operated by the two state-owned, publicly listed T&D utilities (SNGPL for Punjab and NWFP provinces and SSGC for Sindh and Baluchistan provinces); Mari Gas Company, supplies a small medium-BTU system to bulk customers near Mari Gas field; a few additional small dedicated high pressure transmission pipelines. The T&D utilities also operate large distribution networks (81,657km cumulative at end-FY07). With major gas discoveries of late 1990s, the T&D utilities completed large investment programs to increase their delivery capacity from 1.7mmcf/d in 2000 to 2.6 mmcf/d in 2004 financed mostly through domestic debt. Planning philosophy of T&D utilities not geared to meet demand but to find markets for the gas they are committed to buy.	
Market Structure	E&P: mostly local firms and medium-sized IOCs dominated by SOE's Oil & Gas Development Company (OGDCL – 22%) and Pakistan Petroleum (PPL – 21%); 13 E&P companies were operating at end-FY07 Transmission & Distribution: Most gas (nearly 80% at end-FY07) is distributed by two state-owned T&D utilities: Sui Northern Gas Pipelines (SNGPL – 50%) and Sui Southern Gas Company (SSGC – 30%); the rest is distributed by independently-owned gas-to-power and gas-to-fertilizer pipelines under license from OGRA; GOP has planned to privatize the T&D utilities for the last few years.	
Institutional Structure & Sector Management	All commercial and regulatory decisions made by Ministry of Petroleum and Natural Resources through the Director General Gas (DGG) until 2000.	Resource Management: The Directorate General for Petroleum Concessions (DGPC) in the Ministry of Petroleum and Natural Resources is the main agency involved in the upkeep of the petroleum database, promotion of acreage, negotiation and award of licenses, and monitoring of contracts Regulation of midstream and downstream: Oil & Gas Regulatory Authority (OGRA).

Vietnam Gas Sector Development Framework – The World Bank and the Ministry of Industry and Trade

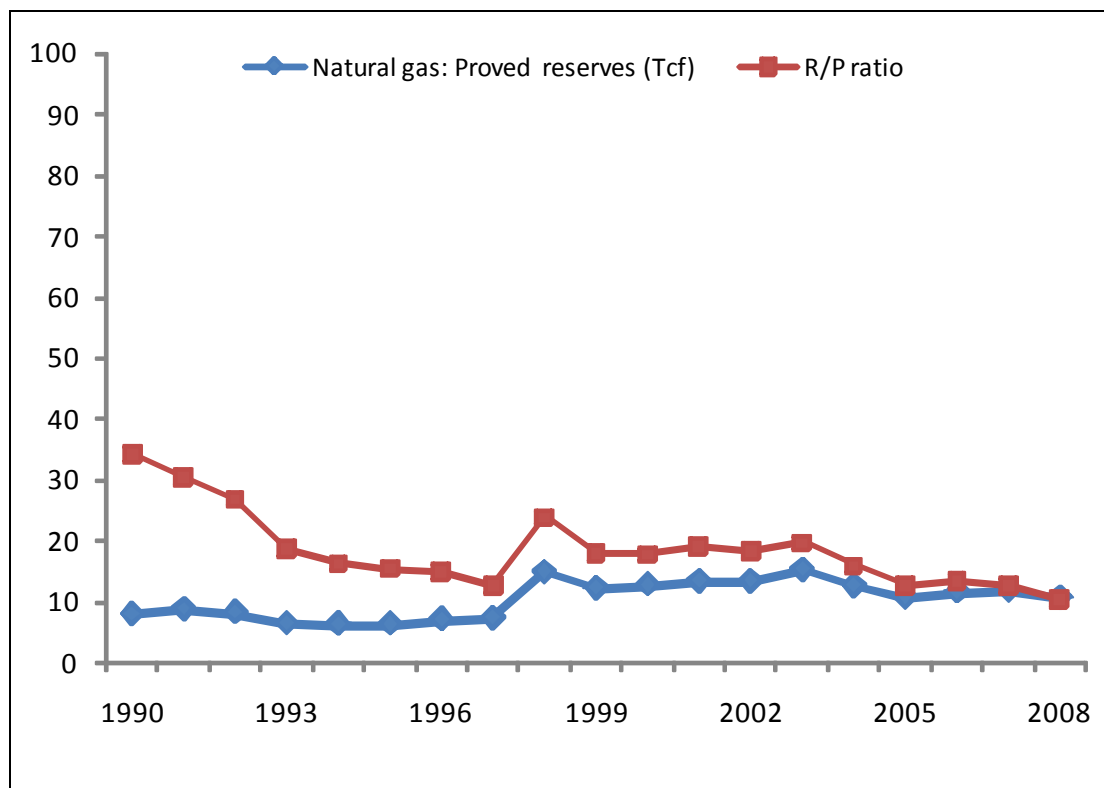
PAKISTAN	
	For gas, OGRA's mandate is to pursue quality and efficiency (financial and operational) in the midstream and downstream sectors through: - licensing of regulated activities: construction of gas infrastructure (pipelines, storage facilities, etc.), T&D, sale. - enforcement of performance and service standards, - determination of a reasonable rate of return to the natural gas licensees, in consultation with GOP - oversight the capital expenditures of the T&D utilities - resolution of disputes between licensees - determination of the revenue requirement for the T&D utilities (cost of gas + T&D cost + prescribed return) and proposal of tariff schedules to GOP - implementation of GOP policy guidelines (including gas retail tariffs issued by GOP) OGRA determines the prescribed tariffs for each customer category based on the cost of delivering gas to them. GOP determines the retail tariffs to be charged by the utilities. The difference between prescribed and retail tariffs accrues to the government as the Gas Development Surcharge (GDS). SNGPL and SSGC are to earn a stipulated return on average net assets of 17.5% and 17.0%. And the final level of (GDS) is adjusted every year on the basis of the actual financial results of the utilities to ensure that they earn precisely their stipulated returns. This virtually implies that the companies operate on a cost-plus basis which means they have few incentives to improve their efficiencies. OGRA tries to encourage efficiencies through rigorous reviews of expenditure plans to reduce Unaccounted For Gas (UFG, losses). Development of OGRA: Natural Gas Regulatory Authority (NGRA) Ordinance issued in January, 2000. The Authority was established in August, 2000, with a three-member board: Chairman, Member (Technical), and Member (Finance) selected through an open competitive process. Other professionals in engineering, economics, law, and finance were subsequently inducted. Initially, the NGRA was placed in the Ministry of Law and Justice. But soon, all regulatory authorities were placed under the Cabinet division (reporting to the Prime Minister) to allow independent operation. The last Director General (Gas) was selected as Chairman. The Government only gave some US\$1 million as seed money to establish NGRA and required it to become self-financing. Draft licensing rules were prepared with WB grant support within three months but their approval by the Government after consultation took two years. NGRA Licensing Rules were promulgated in February, 2002. Funding during this period came from SNGPL and SSGC which become 'deemed licensees' liable to pay OGRA fees. During the 2000-2002 period, preparation was carried out for establishing an Oil & Gas Regulatory Authority (OGRA) for mid-stream and downstream regulation of oil and gas sectors (inclusion of upstream functions under OGRA was considered detrimental to investment in E&P). OGRA was established through the OGRA Ordinance in March, 2002, for the entire midstream and downstream petroleum sector. Natural gas regulation was transferred from MPNR to OGRA with the issuance of the Ordinance. LPG and CNG sectors were transferred to OGRA in March, 2003, and the oil sector in March, 2006. The pricing of petroleum products was shifted to OGRA in April, 2006. In June, 2008, OGRA had 76 professionals, 24 other executives, and 108 support staff. OGRA was established with the intention of separating the policy and regulatory

	functions between the government and the regulatory agency. While this has been largely upheld since OGRA came into being, there continue to be instances in which government policymakers place this separation under stress.
PAKISTAN	
Pricing	<u>UPSTREAM</u> Pre-1985: Wellhead prices for all fields that declared commercial production until 1985 set on a cost-plus basis 1985-1991: Wellhead prices for new discoveries linked to 66% of price of high-sulfur fuel oil (HSFO) minus negotiated discounts Exploration policies were revised for rounds in 1991, 1994, 1997, 2001 to make framework more attractive to IOCs: 1991-1992: Linkage increased to 75% of HSFO price minus negotiated discounts; 1992-1993: Linkage increased to 100% of HSFO price minus negotiated discounts 1993-1994: Floor price of US\$80 per tonne plus 50% of remaining equivalent HSFO price different (if positive) 1994 & 1997: Country divided into three zones based on gas prospectivity and availability of transmission infrastructure; wellhead prices linked to 77.5%, 72.5%, and 67.5% of the C&F price of a basket of Arabian/Persian Gulf crude oils for Zone I, II, and III (most prospective – Lower Indus River Basin) Dec 1999: A new inflection point based pricing framework with a discounting mechanism was introduced. The applicable price was generated whenever the C&F price of a basket of imported Arabian/Persian Gulf crude oils exceeded US\$15/bbl during the six months prior to price notification. <i>Ruling price: applicable price</i> <i>Below US\$ 10/bbl:</i> Fixed at US\$10/bbl (floor) <i>US\$10-15/bbl:</i> 100% of ruling price <i>US\$15-20/bbl:</i> US\$15 plus 50% of the amount by which the price exceeds US\$15/bbl <i>US\$20-25/bbl:</i> US\$17.50 plus 30% of the amount by which the price exceeds US\$25/bbl <i>Above US\$25/bbl:</i> US\$19 plus 20% of the amount by which the price exceeds US\$25/bbl May 2000: Dec 1999 mechanism modified to account for oil price inflation. After first four years of GSA under Dec 1999 mechanism, inflection points of US\$15-20-25/bbl were raised by US\$1. 2001: Mechanism further modified by adding a ceiling price of US\$36/bbl. Petroleum policy 2007: Mechanism based on the C&F price of a basket of Arabian/Persian Gulf crude oils for Zone I, II, and III Zone III <i>US\$ 10/bbl:</i> US\$1.5/MMBTU (floor) <i>US\$10-20/bbl:</i> Proportionate sliding scale from US\$1.5 to 2.5/MMBTU <i>US\$ 20/bbl:</i> US\$2.5/MMBTU <i>US\$20-45/bbl:</i> Proportionate sliding scale from US\$2.5 to 3.0/MMBTU <i>US\$ 45/bbl:</i> US\$3.0/MMBTU

	<i>Above US\$45/bbl:</i> Sliding scale from \$3.0/MMBTU based on proportionate to crude price difference with US\$45/bbl and ‘gas price gradient’ bid between 0.2 and 1.0	
	<u>DOWNSTREAM</u> For consumers: gas sales prices issued by GOP by customer category and regulated by OGRA.	
PAKISTAN		
Commercial		T&D utilities enter into long-term take-or-pay agreements with gas producers. Delays caused in reaching agreement because producers reluctant to invest in field appraisal before off-take is confirmed and T&D utilities reluctant to invest in requisite infrastructure before production levels are confirmed.
Rent Distribution	Household customers and fertilizer industry enjoy gas price subsidy	Household customers and fertilizer industry enjoy gas price subsidy
Role of NOCs		Upstream: Among 13 E&P companies, the state-owned Oil and Gas Development Company (OGDC) and Pakistan Petroleum Limited (PPL) dominate the upstream sector. Downstream: Two state-owned, publicly listed T&D companies (SSGC and SNGPL) account for 80 percent of gas sales.
Appraisal	Pakistan has developed a large gas distribution network with a sizable retail customer base using the ‘modified single-buyer model’. During the late 1990s and early 2000s, the country’s gas economy significantly expanded (to serve an expanding power generation sector). Some key steps to enable this expansion were: the introduction of generic upstream gas pricing linked to international crude oil prices to attract IOCs, the establishment of a federal directorate for upstream gas resource management as well as a regulator for the two financially robust T&D utilities. NOCs continue to dominate the upstream sector but with many IOCs and domestic private players. NOCs also dominate the downstream sector but under effective cost-plus regulation.	

THAILAND - EXPERIENCE IN DEVELOPING THE GAS SECTOR

Figure A5.6 Thailand: Reserves and R/P Ratio



(Source: BP Statistical Review of World Energy 2009, World Bank staff calculations).

	1997	2008
Supply/Demand balance	Production & consumption 567 Bcf	Production 900 Bcf, imports (from Myanmar) 340, consumption 1240. A 5 million tons per annum (250Bcf) LNG import project is being constructed at a cost of some \$US540 million for completion in 2011.
Recoverable reserves (est.)	7.35 Tcf	11.65 Tcf
Proportion of gas in primary energy	N/A	37%
Distribution of Demand	N/A	N/A

THAILAND		
Infrastructure	The NOC, the Petroleum Authority of Thailand (PTT), is responsible for all aspects of the petroleum industry and is the owner and operator of the transmission system and, with one important exception, of the distribution system as well. The exception is a joint venture between PTT and a European investor in Bangkok area gas distribution.	The PTT is partially privatized (30%) in 2001. PTT retains its dominant role in downstream gas infrastructure.
Market Structure	PTT has an interest in many gas fields, but the bulk of gas production is by IOCs. Chevron alone accounts for some 70% of national gas production. PTT is the single buyer, transporter and reseller of all gas,	Conditions in the upstream are unchanged. There are plans to unbundle PTT's gas marketing and transportation businesses and to bring greater transparency to transmission tariff setting and pipeline access.
Institutional Structure and Sector Management	There are energy-related units in 20 agencies and 9 ministries of the Government of Thailand. This hinders overall energy operations due to the fact that many of them follow different policies and are governed by different legislation. A Bureau of Energy was established in 2001 which became the MOE in 2002. PTT is in effect its own regulator.	The National Energy Policy Office (NEPO) chaired by the Prime Minister and comprising mostly senior ministers has the authority to make decisions, establish Cabinet policies and assign government agencies and state enterprises to implement these policies. The Ministry of Energy (MOE) established in 2002 is a small-sized ministry responsible for carrying out the government's immediate missions. All government energy-related units and state enterprises, including PTT, are concentrated under the MOE. There are longstanding plans to create an independent regulator, the National Energy Regulatory Commission, to deal with both the natural gas and the electricity supply industries but these plans have not yet been implemented.

	PTT downstream transportation tariffs are not transparent and this is a major gas pricing issue.	The new regulator and plans to liberalize the gas market would relate only to “new” gas supply and demand. All existing supply arrangements would be left intact. Note the comments below under “pricing experience” regarding the role of the Energy Policy and Planning Office (EPPO) rather than PTT in setting transportation tariffs. The downstream transportation tariff setting role has been taken away from PTT and conferred on an advisory body, the EPPO, which has introduced a flat regulated transportation fee for all gas fields to all power plants (about \$US0.50/MMBTU). This will allow monitoring of PTT’s rate of return on pipeline assets.
Pricing (upstream)	Upstream gas prices are set according to formulae specified in the different confidential gas sales agreements. Most of these agreements incorporate one of more of the following: a basket of medium fuel oils from Singapore; the Thai wholesale price index; the US Index of Export Pries; the Producer Price of Oilfield Machinery and Tools Index; and the US\$/Bhat exchange rate. The weightings of these elements vary as between contracts. The extensive gas infrastructure and the linking of many different gas fields has allowed PTT to establish a gas pool price, and the gas price for the national electric generator (EGAT) and the IPPs is the pool price plus 1.75% supply margin plus a fixed transmission tariff. Because PTT is vertically integrated, gas sector planning is internalized.	
Rent distribution	To the extent that there is fuel value pricing of natural gas, rents will tend to be concentrated in the upstream. To the extent that PTT’s rate of return on pipeline assets may have been high in relation to business risk, some rents may have been retained in the downstream.	
Role of NOCs	Upstream, IOCs—principally Chevron—have accounted for the bulk of gas production. Downstream, the NOC (now partly privatized and listed) is the dominant investor.	

THAILAND	
Assessment	Thailand has built a large gas industry by working a modest resource base hard (the reserves/production ratio is an efficient 13). It has successfully supplemented that supply with pipeline imports which account for more than 25% of consumption. An LNG import project is under construction. The resource is characterized by numbers of medium-sized fields. New fields are routinely brought into production on the basis of arrangements which, while differing in detail, have always embodied important elements of “fuel value pricing”. The “single buyer” model persists and downstream infrastructure is dominated by the NOC but its tariffs are now subject to regulation. The following are lessons for Vietnam from Thailand’s experience as highlighted in a recent independent consultant report: • It requires great political determination to carry through regulatory reform in the energy industry. • Separation of the functions of policy development, regulation and company operation is important. • Even if a degree of competition is developed in the energy markets regulation is still required, particularly for the monopoly aspects of the industry. One regulatory authority covering gas and electricity is an effective way of reducing overheads and ensuring that similar regulatory regimes are established for both energy types. • Open access regimes with regulated published tariffs are required for gas and electricity transmission. • The benefits of establishing a national gas quality standard, linking the various gas sources and establishing a gas pool price should be investigated. • The Master Plans should not be fixed, but should be revised as market conditions change.