



PROGRAM ON ENERGY AND  
SUSTAINABLE DEVELOPMENT



JAMES A. BAKER III  
INSTITUTE FOR PUBLIC POLICY  
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geopolitics of gas  
working paper series

# LIQUEFIED NATURAL GAS FROM INDONESIA: THE ARUN PROJECT

fred von der mehdien and steven w. lewis

# **Liquefied Natural Gas from Indonesia: The Arun Project**

Fred von der Mehden and Steven W. Lewis

Working Paper #25

May 2004

Prepared for the *Geopolitics of Natural Gas Study*, a joint project of the Program on Energy and Sustainable Development at Stanford University and the James A. Baker III Institute for Public Policy of Rice University.

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### **Program on Energy and Sustainable Development**

At the Center for Environmental Science and Policy

Stanford Institute for International Studies

Encina Hall East, Room 415

Stanford University

Stanford, CA 94305-6055

<http://pesd.stanford.edu>

[pesd-admin@lists.stanford.edu](mailto:pesd-admin@lists.stanford.edu)

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### **The James A. Baker III Institute for Public Policy**

Rice University—MS 40

P.O. Box 1892

Houston, TX 77251-1892

<http://www.bakerinstitute.org>

bipp@rice.edu

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Natural gas is rapidly gaining in geopolitical importance. Gas has grown from a marginal fuel consumed in regionally disconnected markets to a fuel that is transported across great distances for consumption in many different economic sectors. Increasingly, natural gas is the fuel of choice for consumers seeking its relatively low environmental impact, especially for electric power generation. As a result, world gas consumption is projected to more than double over the next three decades, rising from 23% to 28% of world total primary energy demand by 2030 and surpassing coal as the world's number two energy source and potentially overtaking oil's share in many large industrialized economies.

The growing importance of natural gas imports to modern economies will force new thinking about energy security. The Energy Forum of the James A. Baker III Institute for Public Policy and the Program on Energy and Sustainable Development at the Stanford University Institute for International Studies are completing a major effort to investigate the geopolitical consequences of a major shift to natural gas in world energy markets. The study utilizes historical case studies as well as advanced economic modeling to examine the interplay between economic and political factors in the development of natural gas resources; our aim is to shed light on the political challenges that may accompany a shift to a gas-fed world.

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## About the Authors

**Fred von der Mehden** served as Professor of Political Science at the University of Wisconsin at Madison from 1957 to 1968 where he was Director of East Asian Studies. From 1968 to 1998 he was Albert Thomas Professor of Political Science at Rice University and is now Emeritus and a scholar with the James A. Baker III Institute for Public Policy at Rice. Mr. Von der Mehden has written extensively on Islam in Southeast Asia and has completed field studies in the region assessing attitudes in the area towards the Middle East. He holds a Ph.D. from the University of California-Berkeley.

**Steven W. Lewis** is Senior Researcher in Asian Politics and Economics at the James A. Baker III Institute for Public Policy, and a lecturer in Asian Studies, at Rice University. He received his doctorate in political science from Washington University in St. Louis. His research interests are focused on the development of privatization experiments, energy policy and central-local government fiscal relations in China and other transition economies. He has also conducted studies on intellectual property rights for the National Bureau of Asian Research, on the decentralization and privatization of China's oil and gas companies for the Center for International Political Economy, and on China's energy policy and foreign policy for Japan's METI. As director of the Transnational China Project at the Baker Institute for Public Policy since 1997, he has worked with Rice faculty across many disciplines to explore the changes in contemporary Chinese culture associated with globalization. The project is currently beginning a three-year survey study, sponsored by the Henry Luce Foundation, of the impact of consumer advertising on nationalism in Chinese cities. He is a member of the International Economic Development Coordinating Committee of the Mayor's Office of Houston and of the board of advisors to the Asia Society of Texas.



# **Liquefied Natural Gas from Indonesia: The Arun Project**

*Fred von der Mehden and Steven W. Lewis<sup>1</sup>*

## **INTRODUCTION**

The Arun natural gas project in Northern Sumatra has been perceived as the most lucrative LNG operation in the twentieth century. This paper analyzes the issues involved in the transmission of that gas to potential buyers and why Japan became Arun's only foreign market in its first two decades. We base our analysis on the data, perceptions and rationales of the principal actors during this period. Following a description of the development of the Arun field and its LNG facilities, we review the agreements made with initial buyers. In order to provide the necessary background to understand the environment in which these evolved, there are analyses of Pertamina, the Indonesian national oil company, and of political and economic conditions in the Republic at the time. Other possible influences on the transmission of Arun's gas included regional organizations, alternate energy sources and other interest groups. Ultimately all of the initial gas from Arun went by LNG to Japan and considerable attention is given the long-term impact on the Japanese and NE Asian gas market, the contractual relations between Pertamina and Japanese buyers, and competition among those buyers. Finally, we turn our attention to possible alternatives to the Japanese including domestic customers in Indonesia, Singapore and the failed agreement for the sale of LNG to California utilities. Within this analysis we consider it important to emphasize the relatively immature level of industrialization and economic development in most of Asia during the ten to twenty years after the Arun discovery in the early 1970s. This factor severely limited alternative markets to Japan during the period under discussion. It is our contention that in the initial fifteen years following the discovery of Arun the only viable market was Japan.

## **DEVELOPMENT OF THE ARUN AND ASIAN LNG MARKET**

Indonesia (then the Dutch East Indies) was an early producer of petroleum, with drilling for oil beginning in the 1870s. Major companies involved in exploration and production included Royal Dutch Shell, the dominant early oil firm, and Stanvac and Caltex. Prior to World

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<sup>1</sup> The authors would like to thank the following for their help: the researchers and staff of PESD, our colleagues at the Baker Institute, our field research interviewees in Japan and Southeast Asia, two anonymous reviewers, case study authors and other participants at workshops in Palo Alto and Houston, many anonymous officials and industry experts in Southeast Asia, Japan and North America, and especially Don Emmerson and Al Troner. Meredith Williams deserves credit for her work in creating the map.

War II the Indies was producing 148,000 barrels of oil per day. The war brought a scorched earth policy by the colonial government, with more destruction from a four-year long nationalist conflict that did not end until late 1949. Pre-war production levels were not reached until 1951 (Arndt, 1983 and Hunter, 1966). Independent Indonesia became increasingly suspicious of foreign investors, and although oil production increased through the 1950s there was little new exploration. Political pressures for nationalization forced Royal Dutch Shell to leave its Indonesian operations, and by the mid-1960s it appeared that all foreign enterprises were endangered by the threat of nationalization.

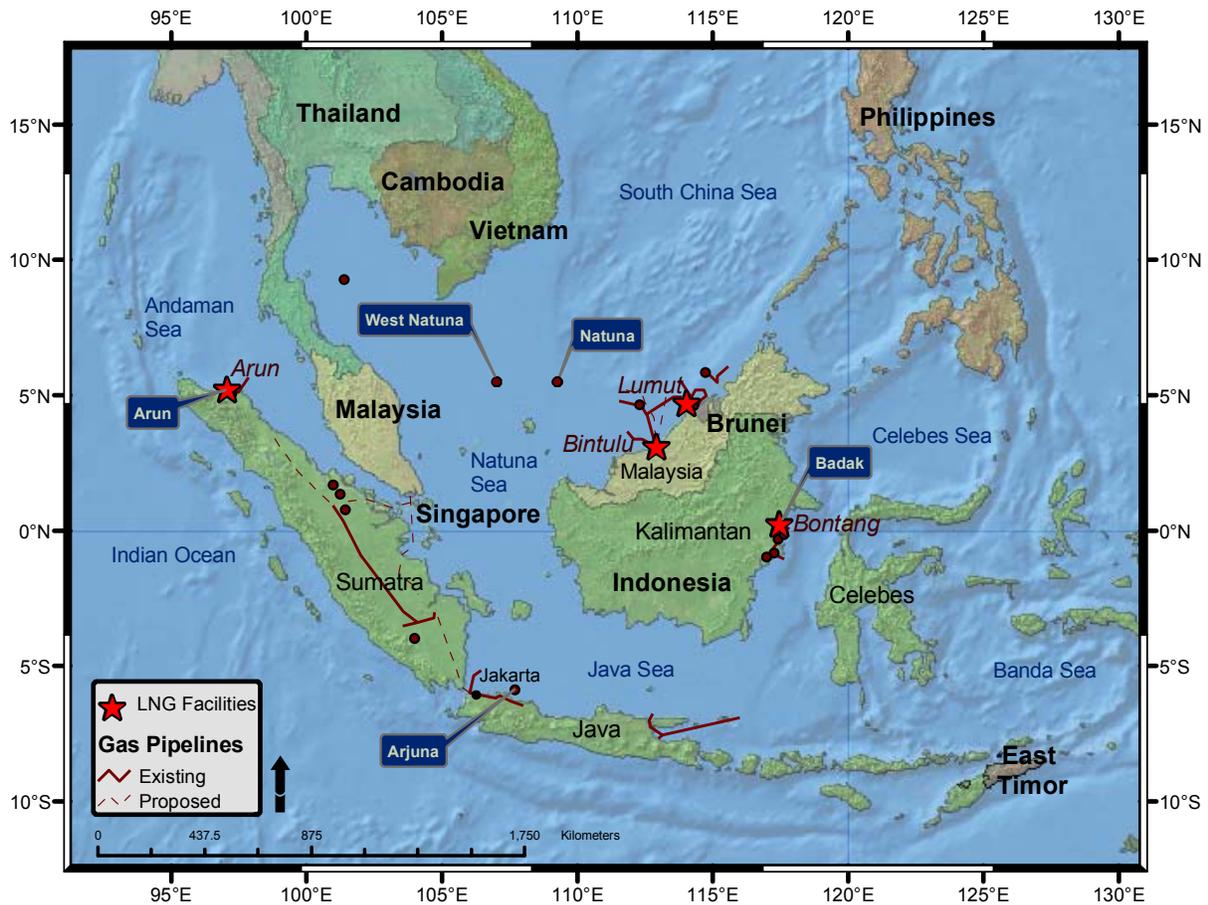
During this period natural gas played little or no role. Small amounts had been used for fuel by the oil industry that had also utilized gas injection for field lift in its fields since the 1920s. It was not until 1963 that gas was first used as feedstock in a fertilizer plant. As late as 1973 as much as 60 per cent of gas was either flared or capped (Ooi Jin Bee, 1980, 172).<sup>2</sup> The Indonesian government, however, was becoming increasingly cognizant of the potential for the export and, to a lesser extent, the domestic use of gas. Meanwhile internal events in the Republic were making the development of the oil and gas industry more feasible.

An aborted coup attempt in 1965 led to the ultimate attainment of power by a pro-foreign investment government under President Suharto (this is analyzed in detail in the section on the political context) and by the late 1960s exploration was developing again with the involvement of foreign companies. As part of these new conditions, in 1967 the Mobil Oil Corporation became a production-sharing partner of Pertamina, the Indonesian national oil company. Mobil began searching for oil in northern Sumatra and in the process of which in 1971 it discovered a vast natural gas field in the province of Aceh, approximately 12 miles southeast of the port of Lhoseumawe and 200 miles north of the major city of Medan. (Ooi Jin Bee, 1980 and 1982; Sugiono, 1997; Pertamina, 1979). This discovery became known as the Arun field and plant.

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<sup>2</sup> It was claimed that by 1979 only 23 per cent was lost in this manner, with the percentage dropping to 8.9 by 1984 (Migas, 1984).

**FIGURE 1. NATURAL GAS IN INDONESIA, MALAYSIA AND BRUNEI**



The original oval shaped field was three miles wide and 11 ½ miles long and 503 feet thick on average. According to Ooi Jin Bee, using the terminology, analysis methods and standards of that period, it was a find large enough to warrant development of LNG:

The gas reservoir is carbonate of Early and Middle Miocene age, underlain by a clastic sequence resting on basement rock of pre-Tertiary age. The reservoir is effectively enclosed in shales which, together with the organic material in the reef, are probably also the sources of hydrocarbons. The reservoir covers an area of about 17,000 ha. The average depth of the formation is about 3,048 metres, while the net pay thickness varies from 102 to 316 metres. Gas produced from the reservoir has a methane content of 72 per cent, a carbon dioxide content of nearly 15 per cent, a small nitrogen content and a trace of hydrogen sulphide. The high potential of the reservoir is indicated by well productivities of over a billion cu. ft per day, with significant quantities of condensate. Wet gas-in-place has been calculated at 17.15 trillion standard cu. Ft., or the equivalent of 3 billion barrels of oil. This will be sufficient to produce 2 billion cu. Ft. per day of gas for a twenty-year period (Ooi Jin Bee, 1982, pp. 165-66).

Initially, the Arun plant, built some 12 miles from the field, was projected to cost \$940 million, with four storage tanks and three production trains of gasification facilities. Ultimately, after three more trains were added in the early 1980s, Arun had a design capacity of 9 mtpa, with working capacity of more than ten mtpa.

The partners developing Arun established companies specifically to handle the operation of the field, and brought in others partners from Indonesia, Japan, Europe and North America to finance the enormous cost of the projects and to transport the LNG to Japan. The Indonesian oil and gas entity, Pertamina, contracted out the construction and operation of the liquefaction plant and pipelines to a joint Indonesian-Japanese company, P.T.Arun Natural Gas Liquefaction Company (55 per cent of which was owned by JILCO, a Japanese firm owned by a large group of utilities, manufacturers, trading houses and banks). In 1978 Pertamina and JILCO agreed to another \$187 million for LNG, with a European syndicate putting up a \$50 million dollar loan and the Indonesian Government providing another \$100 million. Burmah Tankers of Britain was to charter seven cryogenic ships built by General Dynamics and operated by Energy Transportation of New York. The first LNG was shipped to Japan in 1977.

It was initially reported that Indonesia was negotiating with the Far East Oil Trading Co. to ship 40 percent of Arun's production to Japan in 1978 (International Petroleum Encyclopedia, 1973, p. 108). Ultimately an agreement was signed in December 1973 with five Japanese companies covering LNG exports both from Arun and its sister project, Bontang (initially called Badak) in East Kalimantan. The original buyers were Chubu Electric Power Company, Kansai Electric, Osaka Gas, Kyushu Electric and Nippon Steel. The contract was for 8.18 mtpa from August 1977 to December 1999, with an extension of 8.45 mtpa from January 2000 to December 2010.

Even as it was negotiating with Japanese buyers, in 1973 Pertamina signed a twenty-year contract with Pacific Lighting Corporation of Los Angeles, with shipments to start in 1978. This became a joint venture between Pacific Lighting and Pacific Gas and Electric (PG&E) called Pacific Gas. When the agreement with Pacific Gas fell through in 1979-1980, Pertamina and Mobil looked for new buyers. In 1980-81 there were new negotiations between Pertamina and Tohoku Electric Power Company and Tokyo Electric. These discussions were complicated by the Indonesian desire that the expansion of facilities be done without their financial involvement, and a newly focused Japanese desire to direct government lending and negotiating support to Japanese buyers and trading firms (Chapman, 1985). In the end it was agreed that the Japanese would borrow funds from Japan's Exim Bank and other sources to buy in advance sufficient LNG to equal the funds required to finance the Arun and Bontang expansions. Other aspects of the agreement included a higher price, one completely tied to the price of Indonesian crude. Finally, because by the early 1980s Japanese firms were more and more interested in controlling access to the Japanese LNG market, shipping responsibility was transferred from Pertamina to the buyers, and trading firms began building the vessels in the shipyards of their fellow keiretsu members.

Arun was not the only major gas discovery in Indonesia during the 1970s and 1980s. At approximately the same time as the development of Arun, another American company, Huffco, had found and developed Bontang in East Kalimantan. Initial Pertamina gas and LNG policies were formulated with both Arun and Bontang in mind. In fact, in 1976 a Joint Management

Group (JMG) was formed with Mobil, Huffco and Pertamina to coordinate both operations after gas delivery. The JMG was to oversee “the flow of funds between the purchaser, the transporter, the lenders, the tax authorities, the plant operators and the equity interests in the gas” (Chapman, 1985, p. 80). Smaller finds were in Sulawesi and in the Java area. It was not until the 1980s and 1990s that there were other major discoveries in Irian Jaya, the Natuna area, Java, and other parts of Sumatra.

In the end, after many years of negotiation and expansion of the project plans, the complex financing of Arun and Bontang involved both considerable Japanese government support, as well as investment from commercial banks, the group of five major Japanese buyers, a new Japanese entity (JILCO) and the Indonesian government. Most directly, the Japanese government made loans from the Overseas Economic Cooperation Fund to the Indonesian government and Pertamina. The Indonesian government itself also made direct loans to Pertamina. Representing the bulk of the project financing, however, the Japanese government’s Ex-Im Bank and a group of associated commercial banks loaned funds to JILCO, with 60 percent of these guaranteed by JNOC, a state-owned oil and gas company, and 40 percent guaranteed by the consortium of five major buyers, which had support from the Ministry of International Trade and Industry (MITI) in the form of overseas investment insurance. In turn, JILCO then loaned money for project development to Pertamina. Payment on LNG from the five major buyers was sent to an escrow account, with funds sent to Pertamina and repayment to Japan Ex-Im Bank through JILCO (Miyamoto, 2002, pg. 125).

For LNG, Arun and Bontang were the major gas projects for two decades, with Arun initially considerably larger. Because of their production, by the late 1980s Indonesia had become the largest exporter of LNG in the world, providing some 40 per cent of the commercial market in 1988. Because of its consumption of natural gas, at this time Japan became the largest importer of LNG, with increasing efforts to diversify its sources of supply across Southeast Asia and the Gulf (see Table 1).

**TABLE 1. JAPANESE IMPORTS OF LNG BY COUNTRY, 1969-2001 (IN 1,000 METRIC TONS PER ANNUM)**

Fiscal Year	U.S.	Brunei	UAE	Indonesia	Malaysia	Australia	Algeria	Qatar	Oman	Total	Growth %
1969	182	-	-	-	-	-	-	-	-	182	-
1970	977	-	-	-	-	-	-	-	-	977	436.8
1971	969	-	-	-	-	-	-	-	-	969	-0.8
1972	872	196	-	-	-	-	-	-	-	1,068	10.2
1973	989	1,375	-	-	-	-	-	-	-	2,364	121.3
1974	933	2,816	-	-	-	-	-	-	-	3,748	58.5
1975	1,017	3,988	-	-	-	-	-	-	-	5,005	33.5
1976	934	4,969	-	-	-	-	-	-	-	5,903	17.9
1977	1,013	5,262	706	1,266	-	-	-	-	-	8,247	39.7
1978	958	5,297	1,185	4,245	-	-	-	-	-	11,685	41.7
1979	958	5,543	1,462	6,895	-	-	-	-	-	14,858	27.2
1980	872	5,418	2,001	8,674	-	-	-	-	-	16,965	14.2
1981	1,006	5,157	2,018	8,817	-	-	-	-	-	16,998	0.2
1982	1,014	5,197	2,163	9,210	109	-	-	-	-	17,693	4.1
1983	1,044	5,280	1,813	10,657	1,849	-	-	-	-	20,642	16.7
1984	987	5,212	2,118	14,643	3,912	-	-	-	-	26,872	30.2
1985	990	5,188	2,257	14,825	4,572	-	-	-	-	27,831	3.6
1986	963	5,195	2,112	15,030	5,470	-	-	-	-	28,770	3.4
1987	962	5,230	2,262	15,392	5,831	-	-	-	-	29,678	3.2
1988	963	5,445	2,286	16,433	6,232	-	-	-	-	31,348	5.7
1989	1,014	5,271	2,409	16,419	6,312	1,341	274	-	-	33,041	5.4
1990	982	5,254	2,272	17,609	6,775	3,185	-	-	-	36,077	9.2
1991	1,010	5,284	2,666	17,878	7,026	4,087	-	-	-	37,952	5.2
1992	1,009	5,277	2,513	18,414	7,169	4,595	-	-	-	38,976	2.7
1993	1,105	5,545	2,484	17,931	7,690	5,321	-	-	-	40,076	2.8
1994	1,173	5,481	3,488	18,498	7,580	6,155	-	-	-	42,374	5.7
1995	1,221	5,507	4,098	17,476	8,559	6,827	-	-	-	43,689	3.1
1996	1,338	5,511	4,418	18,120	9,489	7,276	-	293	-	46,445	6.3
1997	1,194	5,444	4,653	18,206	9,444	7,025	-	2,383	-	48,349	4.1
1998	1,304	5,330	4,523	17,987	9,789	7,235	-	3,310	-	49,478	2.3
1999	1,189	5,582	4,690	18,232	10,231	7,247	-	4,940	-	52,112	5.3
2000	1,260	5,715	4,802	18,123	10,923	7,154	-	6,000	123	54,100	3.8
2001	1,266	6,004	4,853	16,444	11,296	7,489	-	6,386	681	54,421	0.6
Shares											
1975	20%	80%	-	-	-	-	-	-	-	100%	
1980	5%	32%	12%	51%	-	-	-	-	-	100%	
1985	4%	19%	8%	53%	16%	-	-	-	-	100%	
1990	3%	15%	6%	49%	19%	9%	-	-	-	100%	
1995	3%	13%	9%	40%	20%	16%	-	-	-	100%	
2001	2%	11%	9%	30%	21%	14%	-	12%	1%	100%	

Source: Japan Exports & Imports (Ministry of Finance) in Energy Data and Modeling Center 2003, pg. 164.

Although the Japanese gas market is relatively under-developed in comparison with some other OECD countries (notably the UK and Germany), representing only some thirteen percent of its primary energy supply in 2001, (Energy Data and Modeling Center, 2003, p. 22) LNG played a key role in shifting Japan's energy mix away from coal, and in slowing its rising dependence on imported oil.

Prices for Indonesian gas and LNG changed over time, depending upon evolving relationships with major buyers. Prior to entering into LNG contracts, natural gas was sold domestically to the Pusri Fertilizer plants in Palembang at prices ranging from \$0.15 per million BTU to \$0.65, depending upon the investment entailed in transporting the gas differing distances from its sources. LNG prices differed from domestic gas and between the Japanese and United States buyers. The Japanese price was originally set at \$2.35 c.i.f. (cost, insurance, and freight) per million BTU. This was indexed upon a 90/10 ratio to the price of Indonesian crude (90 per cent in the 1973 contract and 100 per cent in the 1981 agreement) and had an annual 3 per cent escalator factor (putting the price at \$2.40 in 1978) (Ooi Jin Bee, 1982, p.168). After the 1978-1979 oil crisis fomented by the fall of the Shah of Iran, there was a spike in oil prices. This led to a 50 per cent increase in LNG prices over the following eighteen months. There were also disagreements over whether the price should be based upon the burner point (Japan's position) or the f.o.b. point of origin, and there were issues involving freight rates. All of these were negotiated over time.

Initially, American buyers were to pay \$0.63 per million BTU, but later negotiations increased the price to \$1.36 f.o.b. This was the result of a 1978 agreement that placed the U.S. price at half the U.S. wholesale price index for fuels and half the price of Indonesian crude. All of this came to naught when the contract was later dropped. In 1983 there was an agreement reached with the Korea Electric Power Corporation to deliver approximately two mtpa of LNG for twenty years. This contract followed the lines of the earlier agreement with the Japanese.

The Arun LNG case illustrates neatly the problems in using prices to compare the nature of emerging and developed markets. In 2003, as Indonesians and Japanese re-negotiate long-term contracts initially started in the 1970s, governments, producers, shippers and buyers were much more conscious of regional and global variations in gas prices. Gas project developers in Indonesia today feel they must consider the projected price of LNG from Qatar, Russia and Australia, and from natural gas piped from Malaysia to Singapore. (Jakarta Post, October 3, 2003; Xinhua News Agency, October 9, 2003). As interviews with the former Japan National Oil Corporation (JNOC) and Japan LNG managers reveal, Japanese investors in a deregulating energy market believe they must now take into account not only the potential price of gas piped in from Sakhalin, but also the prices after the entrance of new LNG buyers in California and China. (Interview Japan LNG and JNOC, September, 2003) The large Japanese trading firms, the most likely players in a regional spot or short-term contract market, are adopting a "wait-and-see" attitude in response to such perceived uncertainty. (Interview S Shimizu, September, 2003)

The Japanese and Indonesians did not face this type of uncertainty about prices in the 1970s. Indonesian suppliers in the 1970s viewed prices primarily as a measure of projected income, which they preferred to be steadily expanding and, for reasons mainly of organizational

consistency, to be linked to similar sources of revenue, notably oil. The prices eventually negotiated with the Japanese could also have included side payments between governments, individuals and corporations, both legal and illegal. Consider the conclusions of recent research demonstrating that Chevron and Texaco, through Caltex, had a perfectly legal arrangement with Pertamina such that a combination of excessive prices and extra-contract oil transfers allowed these two companies to avoid paying nearly \$9 billion in United States federal and local income taxes between 1964 and 2002 (Gramlich and Wheeler, 2003). Some research by Japanese scholars speculates about the existence of side payments to individuals in governments and corporations (Kunio, 1982).

Even if there were side payments, in these initial LNG projects Japanese buyers were primarily concerned with reducing supply uncertainty. As revealed in interviews with Osaka Gas, the lead buyer of the “Western Group” of gas utility, electricity and industrial buyers, Japanese investors in the projects were most focused on overcoming the significant technological and safety obstacles in order to make a successful transformation away from town gas dependent on coal supplies (interview Osaka Gas, September 2003). This meant finding ways to guarantee a steady, safe supply, and less concern about price volatility. Because there was no domestic competition in gas transmission, gas utilities in the 1970s, as today, felt that such uncertainty would be borne reasonably by consumers. Competition between regions – especially Tokyo and Osaka -- was focused on obtaining long-term overseas sources of LNG, even at high cost.

Japan’s central planners, who had played such a strong role in the 1960s in coordinating investment across economic sectors, and in controlling foreign trade and investment abroad through tariffs, currency controls and investment programs, may have inadvertently contributed to this situation through inaction. As Chalmers Johnson has argued, MITI saw a period of diminished control over much economic planning in the early 1970s because of reforms in the political administration of the bureaucracy in general, public antipathy in the light of environmental disasters and consciousness, and individual scandals involving politicians and ministerial officials (Johnson, 1982). Although MITI, Japan Ex-Im Bank and JNOC later came to play an important role in guaranteeing the financing of the Arun project, in the 1970s the credibility of the interest of the Japanese buyers was largely based on this perception of competition between regions. Even as the Japanese economy slowed after the first and second Oil Shocks, none of the negotiating partners questioned the long-term demand for natural gas in Western Japan.

Before returning to an examination of why Arun gas was developed as LNG and not as piped gas, it is worthwhile examining other ways that the Arun project affected the long-term development not only of production in Indonesia and consumption in Japan, but also the development of the infrastructure supporting the regional and global LNG market. This includes institutions supporting project finance, the inter-governmental and business-government means to deal with uncertainties in supply security and legal disputes, and the elimination of technological problems affecting the selection of piped gas versus LNG. Ironically, although the establishment of such uniquely large and intimate energy relations between Indonesia and Japan was intended to develop the economies of both nations, scholars and energy experts can agree that it has also contributed to the under-development of supply in Indonesia and consumption in Japan.

On the Indonesian side, for reasons discussed later in this study, the perceived success of the Arun project ultimately resulted in the under-development of piped gas, domestic and international, even when changes in the national economy and relations with its neighbors favored their selection over LNG, and even in the face of clear competition from other suppliers in the region, notably Malaysia. This dependence on LNG not only constrained the ability of government and corporate policy-makers to balance international energy ties in a way that promoted national economic goals, it also made it hard to balance local and national, public and private development plans. On the Japanese side, the Indonesian LNG projects, because of their cost and long-term institutional influence, established the core energy relations supporting the most advanced LNG receiving infrastructure in the world. In the 1970s and 1980s this enabled the rapid growth of competing, regional economies within Japan – part of the “Japanese Miracle” – but by the 1990s it had created significant institutional obstacles to the development of a national transmission system, (Miyamoto, 2002) and in doing so presented constraints on the ability of local and national, government and private policy-makers to promote national economic plans in an increasingly liberal and global international economic environment.

Because Arun and Bontang were largely viewed as successful, they presented a new model for international energy project development. They created a blueprint for how national governments, state-owned oil and gas companies and multi-national corporations in the energy industry (including subsidiaries of companies dedicated to exploration, production, shipping, trading and construction) could negotiate long-term LNG contracts across diverse legal systems and in an environment of considerable international and domestic risk, both political and economic. Remarkably, even when political uncertainty in both the producer and consumer markets would seem to call into question the ability of the actors to commit themselves to maintaining the contracts, the producers and buyers were able to identify third-party institutions – including international arbitration and courts in “neutral” countries such as the United States (Chapman, 1985 and interview S Shimizu September 2003) – to conclude negotiations.

Furthermore, competition between buyers in the off-take market, and also among traders supplying that market, may have established credibility in periods of uncertainty. The existence of such competition was made clear to the Indonesians in the negotiations in the early 1980s, when the switch from c.i.f. to f.o.b. was initiated and driven by the trading firm, and not the Japanese government. Nissho Iwai wanted to develop its own tanker fleet, and associated technology, in order to more effectively compete with the other Japanese trading firms, and saw the switch to f.o.b. as a means to constrain competition in shipping (Chapman, 1985 and interview S Shimizu, September 2003). Historically, competition among the Japanese trading firms has played a strong role in the selection and development of LNG projects (see Qatargas study).

At the same time, the Japanese government, through MITI and the Japan Ex-Im Bank (now Japan Bank for International Cooperation), has expanded the investment tools and strategies for working with foreign governments and corporations as it has gone about developing the Japanese gas market. The earliest LNG imports for Japan were either completely financed by foreign actors (Alaska in 1969), or involved loans from Japan Ex-Im Bank directed through the trading firms: Mitsubishi and Brunei in 1972, and Mitsui and Abu Dhabi in 1977. Arun and Bontang’s development did reflect the strong coordinating role of Nissho Iwai,

responding in competition with Mitsubishi and Mitsui. But because it also included direct government to government loans with Indonesia, overseas investment insurance by MITI, and import credit loans from Japan Ex-Im Bank to JILCO, a Japanese firm owned by a large group of utilities, manufacturers, trading houses and banks, it also reflected an expansion of investment tools for working with foreign governments, foreign companies and such new diverse forms of domestic incorporation as JILCO. Later projects, including Malaysia in 1983, Australia in 1989, and Qatar in 1997, saw even more loans by the Japanese government to both foreign governments and foreign members of joint ventures (Miyamoto, 2002). Overall, such government policies – consciously devised as such or not -- to support a greater number of actors in order to develop a gas market may indirectly provide a source of credibility in periods of uncertainty in negotiations between producers and buyers. Put more succinctly, they increased the potential number of chairs at the negotiating table. The success of the Arun case established the credibility of such policies.

The Arun case also made clear the range of technological obstacles involved in the establishment of long-distance, long-term LNG ties, and in doing so lowered the popularly-perceived cost of future LNG projects. Only after many years of successful operation has the Arun project established expectations of safety and environmental awareness in the minds of the Japanese public in Western Japan. Californians and Chinese might still question the safety of LNG off-take facilities, but Japanese now know that it is possible to have operations with few accidents and little environmental impact. Consequently, Japanese buyers are able to expand existing facilities with little popular opposition.

Producers, shippers and buyers have also used the Arun projects to identify and develop new sources of revenue. These include the production and sale of condensates, which Mobil later found to be lucrative, and the development of ancillary industries for buyers, including manufacturing (industries using freezing), and industrial technology consulting, which Osaka Gas found to be lucrative. As mentioned above, gains from the development of shipping technology were also valued by Nissho Iwai. Finally, off-take market gas utility buyers also benefited from LNG technology by exploiting the higher calorific value of LNG in comparison with gas produced from existing sources (especially coal). This enabled them to expand supply capacity – Tokyo Gas estimated it could double capacity -- while using much of the existing transmission systems (interviews Osaka Gas September 2003, Miyamoto, 2002; pg. 120).

## **PROFILE OF PERTAMINA**

To understand the main actors in the development and transmission of Indonesian gas, it is essential to analyze the character, history and powers of the national oil and gas company, Pertamina (Bartlett et al, 1972; Goldstone, 1977; Pertamina, 1974; Arief, 1979; ASEAN, 2000). Prior to the 1965 attempted coup and the subsequent establishment of the “New Order” government under then General Suharto, there were three state oil companies, *Permia*, *Pertamin* and *Permigan*. Permigan was allegedly tied to the Communist Party and folded. By 1968, under the aegis of Sutowo and the New Order leadership, *Permina* and *Pertamin* were integrated into a new organization, Pertamina. It has been Pertamina that has dominated the Indonesian oil and gas world since that period.

At the time of the discovery and development of the Arun field, Pertamina was based upon Indonesian Law No. 8 of 1971. Under this law, Pertamina was headed by a President Director and Chief Executive Officer (Ibnu Sutowo) appointed by President Suharto and managed by a Board of Directors. Following a serious case of financial malfeasance in the mid 1970s, the management of Pertamina became responsible to a Board of Commissioners composed initially of three, then four cabinet ministers. Overall, the Ministry of Mines was given responsibility for energy, and within the Ministry the Director of Oil and Gas had control over the petroleum industry. Energy policy was the purview of the National Energy Coordinating Board. The right of Pertamina to control Indonesian oil and gas has been based upon Article 33 of the country's Constitution that stated that all riches of land and water shall be used for the greatest welfare of the people. Under Law No. 44 of 1960, oil and natural gas are strategic enterprises to be controlled by the state and exploited by a state owned enterprise. Article 6 of Law No. 8 of 1971 assigned Pertamina to explore, process, transport and market oil and gas and to enter into agreements with other parties as necessary. These laws designated Pertamina to conduct oil and gas exploration, earn revenues from oil and gas and supply domestic markets.

It was under Sutowo that Pertamina perfected its production sharing arrangements in oil and gas (Arief, 1977; Rochmat, 1981). As formulated during the period when Arun was being developed, foreign firms were to be contractors for Pertamina, which maintained managerial control. Pertamina was to retain a share of the oil or gas produced. The contractor was required to provide the financial and technical assistance for the operation and be responsible for the costs and risks. Once initial costs, including capital investments were recouped, the balance of production was divided between the Indonesian government and the contractor at a ratio of 65/35. The contractor's corporate tax liabilities were included in the government's share. There were some modifications in this system in 1976 to meet generally accepted U.S. accounting principles. The term of the contract was for thirty years with an option to terminate or extend if no petroleum was discovered. (Since 1960 law petroleum meant oil and gas) If natural gas utilization was not economical it could be flared. If economical, the production sharing was to be the same as crude oil.

Initially, the larger foreign firms were reluctant to sign production-sharing contracts and it was the smaller independents that agreed. However, by 1971 all the majors had signed and during the 1970s they found that the system proved to be a profitable one. Pertamina was flexible in how it handled contractual provisions and companies were able to take 40 per cent off the top to recover costs. However, more than 40 per cent was possible. In addition, Pertamina's weakness in supervision allowed contractors flexibility in determining initial costs. However, contractors still were limited to their allotted fraction of production. Pertamina had sole control over all marketing of gas from Arun and Bontang.

However, the first decade of operations of the Arun project was one of transition for Pertamina. While Sutowo proved to be innovative in the development of the national oil company, he also showed himself to be an unwise manager. His emphasis upon growth rather than profits, reckless borrowing for a multitude of projects in and out of oil and gas interests, and inability to judge the market, all led to a financial crisis in the early 1970s (Goldstone, 1977). All of this came to a head in 1975 when the government called for an investigation and found

that Pertamina's debts had reached \$10.6 billion. Ibnu Suwoto was replaced, many of Pertamina's non-oil and gas activities were transferred to other agencies, settlements of debts were formulated and the system was streamlined.

The "Pertamina Crisis", combined with changing external conditions affected foreign petroleum firms. Pertamina gave major emphasis to increasing exploration and production, but the need for further revenues brought changes in the production-sharing contract in 1976. Instead of 65/35 the new ratio was 85/15 for oil. This brought a decline in exploration and the government had to offer new incentives, including a 50/50 split in exploration costs, after which there was the 85/15 split. This renewed exploration by 1978-79. Most of these changes took place after the initial development of the Arun field and the Pertamina leadership considered it necessary to maintain the 65/35 ratio for gas. The events of the mid 1970s did not appear to have a negative impact on government LNG revenues, which reached \$1,724.4 million in 1980/81 and \$3,851.8 million in 1985/86.

## **POLITICAL AND ECONOMIC CONTEXT**

The third major background element to be discussed is the Indonesian political and economic context within which the Arun operation developed. Greater national stability combined with isolated problems of local security characterized the political context of Indonesia during the period of 1971 to 1985 when the Arun project was developing. At the same time, this was a period of transition during which many investors displayed caution regarding major involvement in Indonesia's economy. The decade of the 1960s had been an era of instability, violence, serious threats of nationalization of foreign enterprises and the transition from a socialist-oriented government to one that was more market oriented. The first half of that decade saw an Indonesia led by an increasingly anti-Western government under then President Sukarno. He had significant backing from a large Communist Party whose labor wing made life difficult for foreign firms. Sukarno had established what was termed "Guided Democracy" which eschewed Western-type competitive politics and emphasized consensus and nationalism. The legislature was emasculated and key political opposition parties were outlawed. Internationally, the Sukarno government allied itself with more radical elements of the Third World and even presented Indonesia as a leader of those in opposition to Western political and economic interests. Opposed to these policies were the majority of the country's military officers, political activists outside Java, and conservative Muslim elements.

Economically, the first half of the 1960s was characterized by high inflation, a severely weakened local and national financial system, a deteriorating physical infrastructure and declining foreign involvement. Rampant inflation began in the early 1960s and the government made individual agreements with embassies and foreign firms regarding currency exchange rates. It became increasingly difficult to import foreign goods and factories found it almost impossible to import needed machinery and parts. Non-Indonesian firms faced the threat of state nationalization or takeover by militant political or labor groups. In the outlying provinces, where petroleum projects primarily were to be found, largely autonomous military units tended to control the local economy. The import and export of goods in these areas became the purview of corrupt military and civil authorities. Finally, in a display of nationalist ideology, President

Sukarno declared that Indonesia did not need foreign aid and external official economic support largely dried up.

In sum, the decade prior to 1965 was not one conducive to foreign investment or the development of new entrepreneurial projects. In the petroleum business, Dutch and British firms were being forced out and American companies feared that they would be next. New exploration for oil and gas was largely at a standstill as political and economic stability was largely absent.

Anti-Western and anti-foreign investment policies changed after the failed coup of 1965. The coup attempt by a group of military officers in which President Sukarno and the Communist Party became implicated was a turning point in Indonesian history. The Communist Party was eliminated by combined military and Muslim activist actions leading to the death of hundreds of thousands of communists and alleged communists and the imprisonment of many others. Sukarno died of natural causes in 1970, Sukarno, two years after having been slowly eased out of power. The so-called “New Order” replaced “Guided Democracy” and for the next more than thirty years Indonesian politics was dominated by the military under the leadership of General and then President Suharto.

The political and economic environment during the 1970s and 1980s when the Arun project was being implemented was far friendlier to foreign oil firms than was true under Sukarno. Instead of socialist-oriented policies, the military brought in the “Berkeley Mafia”; a group of University of California, Berkeley trained technocrats with market-oriented ideas. Efforts were made to attract foreign investments into the country and U.S. oil firms took advantage of the new economic climate. This employment of technocrats became a hallmark of the Suharto regime, as the military largely left the daily administration of the country to the civil service. The capabilities of the bureaucracy gradually improved from the previous administration, although corruption and inefficiencies were not eliminated. While those around Suharto became wealthy from these actions and corruption played a large part in the economic system, there was also a general “rising of all boats”. During the 1970s GDP grew 8.1 per cent a year and there were major increases in private and public consumption (Poot, et al, 1990, p. 16). Improved economic conditions after the debacle of the latter Sukarno years helped to weaken political opposition and reinforce stability until the financial disasters of the late 1990s.

Yet, the perceptions of the strength and stability of the economy during much of the 1970s were not uniformly favorable. Memories of the problems of the later Sukarno years were fresh. The initial liberalization of investment was followed from 1974 to 1986 by protectionist policies. Some sectors were closed to foreign investments, new regulations were put into place and there were increased nationalist reactions to expanding Japanese economic power (Setiawan, 2002, pp. 3-10). Although inflation was well down from the 85 per cent of 1968 and much higher levels of the earlier years, it spiked up from time to time. In the early 1970s inflation ranged from 20 to 33 per cent after a period of low rates and increased again in the late 1970s. The Pertamina crisis of the mid seventies and perceived dangers of national bankruptcy did not lead to high confidence in a bureaucracy that was infamous for its corrupt tendencies. Thus, while real economic progress took place, foreign investors tended to be wary.

A second result of the new regime was that a more stable political system was established. The “New Order” provided what could be termed a “façade democracy” replete with regular elections, an elected executive and legislature and most of the institutional elements of a democratic system. However, this was a tightly controlled democracy with the military limiting political activity, the legislature holding little power and the President (Suharto) indirectly elected with little or no opposition. This “façade democracy” had two elements conducive to stability. It provided a means of “letting off steam” by an opposition that at least had the opportunity to participate in the electoral process and it helped to forestall criticism from Western governments that were supplying major economic aid to the Republic.

Opposition to the New Order in the years under consideration came from three elements, two of which had little impact on the overall economy or the oil and gas industry. At the national level opposition political parties sought to expand their political power and to participate more fully in the operation of the state, but the government limited their role and eventually prohibited political party activity. Student groups were a second critic of this undemocratic system and its ties to foreign investors and corrupt practices. In spite of demonstrations and other vocal criticisms, they were unable to coalesce with other groups to develop an effective opposition until the late 1990s.

The third element of the opposition that did have a direct impact on the Arun operation came from local dissidents and particularly from those in Aceh that sought greater autonomy and even independence (Ross, 2002; Kell, 1995; Hill, 1989). This is a long and complex history that will only be outlined here. Aceh had a cherished history of independence prior to its final conquest by the Dutch at the beginning of the twentieth century. It had been a real power in the region that had cooperated militarily with the Ottoman Empire against the Portuguese in Malacca. With its historic heritage, ethnic homogeneity, strongly conservative Muslim roots and isolation from the rest of the Republic, it has long been a problem for the central government in Jakarta. Immediately after independence some Acehnese Muslim activists had joined the Java-based Dar ul Islam rebellion that had demanded the formation of an Islamic state. However, a generally strong economy in the province, the provision of greater provincial autonomy and the ability to migrate across the Straits to Malaysia and Singapore for jobs mitigated some of the previous dissatisfaction.

During the initial years following the discovery of gas at Arun there was general peace in Aceh. At first political leaders in the province did not actively oppose the Arun project. Although the government had wanted the processing plant and harbor to be built outside Aceh, this was rejected. The Arun construction employed 8,000 to 12,000 and daily operations ultimately employed 5,000 to 6,000. Mobil publications regularly emphasized the opportunities provided by the Arun projects.

However, by the mid 1970s there was increased dissatisfaction in Aceh. The Acehnese perceived that the Suharto regime had weakened the provincial powers they had enjoyed under Sukarno, as the special autonomy that had been granted was effectively lost. In addition, the province did not support the government Golkar Party and instead gave their vote to the Muslim opposition. More directly related to Arun was the view that non- Acehnese had been given management positions. A problem that foreign firms have wrestled with for some time has been

confusion over the meaning of Indonesianization. For people like the Acehnese, Indonesianization often meant the hiring of Javanese for upper-level positions. In addition there was objection to the fact that revenues from the exploitation of local natural resources went to the central government with little or no return to the provinces. According to the leader of the autonomy movement, Hasan M. di Tiro, “our country has been laid bare by the Javanese colonialists at the feet of then multinationals to be raped. Our mineral and forest resources have been put up to the world markets for clearance sale for quick sale for Javanese generals and their foreign backers” (Ross, 2002, p. 17). Mobil was increasingly identified with an oppressive government based in Jakarta. In the initial years of the Arun project, the Aceh problem did not have a major impact on its development. There were minor irritations such as the stealing of a payroll and sabotage, but in those early years they did not lead to a suspension of activities. However, these grievances ultimately led to a series of violent and non-violent attacks on Indonesian forces, Mobil assets and those opposing the rebels. These began in 1976, lasted for several years and were regenerated in later years. Since 1998 the conflict has become aggravated. This led to the temporary suspension of Arun operations and finally to full-scale central government military operations against the Acehnese rebels in 2003. The violence and sabotage accompanying these activities had serious repercussions on the Arun operation and Indonesian LNG in general.

Similar to perceptions of Indonesia’s economic stability, there was a certain disconnect between the growing political stability of the system and external views. Stability was not characterized by many observers as democracy. Human rights observers and many foreign academics criticized the undemocratic nature of the regime and highlighted opposition activities. Serious problems of corruption and bureaucratic inefficiency tainted perceptions. However, the geographic isolation of most oil and gas operations tended to insulate them from many of these issues. Given the new opportunities for exploration and production, the demise of the socialist-oriented Sukarno regime, and increased corporate profits, foreign petroleum firms had a generally positive perception of the “New Order”.

## **REGIONAL, NGO AND CORPORATE/MNC ENERGY INITIATIVES IN THE 1970s**

Other contextual factors that need to be assessed include regional, NGO and corporate influences, although, in general, these had little influence on Arun operations in the early years. During the decade following the Arun discovery, there was little influence from either regional organizations or NGOs on the development of the project. Regional official organizational energy initiatives were in their infancy in Southeast Asia in the 1970s and remained more in a planning rather than an implementation mode throughout the 1980s. There were United Nations regional economic organizations such as ECAFE (later called ESCAP). However their tasks were primarily information gathering and dissemination and did little to initiate actual regional energy programs.

Nor were there regional political organizations with effective economic programs. During the 1960s Indonesia participated in the largely symbolic bloc called Maphilindo (for Malaya, the Philippines and Indonesia), but this loosely knit grouping had no real economic agenda. It folded over issues involved in the formation of Malaysia in 1963. In 1967 the

Association of Southeast Asian States (ASEAN) was formed and initially included Indonesia, Singapore, Malaysia, Thailand and the Philippines. In 1984 Brunei joined, but it was not until the 1990s that the other four Southeast Asian states became members. The development of a trans-Asian gas pipeline system was the first major regional effort to enter into the gas transmission field and today is seen as the future for regional gas development. During the 1970s ASEAN was primarily a politically oriented bloc with a weak economic agenda. It played no important role in energy cooperation during the first two decades of its existence. Marcello Colleti, a senior executive of Italy's ENI, initially presented detailed ideas of a trans-ASEAN pipeline in 1989 (Troner comments 2003) and in that same year S. Talisayon published a book called Designing For Consensus: The ASEAN Grid. However, it was not until 1988-1990 that the ASEAN Council on Petroleum even launched a study on the potential of a gas pipeline in the region. In 1989 there was discussion of cooperation between ASEAN and the EEC on a Trans ASEAN gas line. By 1996 the ASEAN Ministers of Energy endorsed a "Master plan" on natural gas development and utilization and the next year there were statements of cooperation for an ASEAN Power Grid and a Trans-ASEAN Gas Pipeline. In 1999 ASEAN Energy Ministers agreed on a regional pipeline "Plan of Action" and the Trans-ASEAN Gas task Force was created. However, by the turn of the century there was no consensus on technical standards or general principles.

Meanwhile, even bilateral cross-national pipeline construction in the region was slow in coming. Negotiations for a Singapore-Malaysia pipeline began in the early 1980s but were delayed by price issues. It was not until the 1990s that Malaysian gas was piped to Singapore, and after 2000 before gas pipelines were completed between Natuna in Indonesia and Singapore. Malaysia and Thailand signed a memorandum of understanding to explore cooperation in developing their gas reserves in 1979, and later committed to a US\$2.42 billion contract for a 255-kilometer pipeline (Allison, 2000). However, environmental, economic and political roadblocks have stood in the way of the development of any pipeline between the two countries. Despite this, pipelines between Myanmar and Thailand in 1999 and 2000 were successfully completed. These efforts were initiated long after the Arun project was implemented and, in fact came to fruition at a time when Arun's gas production was diminishing. In reality, there was no effective regional energy program or completed cross-national gas pipeline or LNG system within Southeast Asia for two decades after Arun's gas was first discovered. According to gas industry private analyst A. Troner, important impediments to the development of pipelines rather than LNG also included the immaturity of markets, national jealousy, a lack of government support, the cost of developing a gas infrastructure and an inability of gas suppliers to organize gas markets (Troner comments, 2003).

Nor did NGO activities in the 1970s have a significant impact on either the development of the Arun field or the transmission of its gas. This is in contrast to later years when a variety of politically and environmentally oriented NGOs became far more involved in events in Aceh. Weak NGO reactions in the 1970s were followed by a wide array of publications, web sites, petitions and other pressures on governments and corporations. These variously supported Acehnese efforts to gain autonomy, criticized activities that were perceived as environmentally damaging by Western industries in Sumatra, attacked what was described as capitalist exploitation and assailed the human rights records of the Indonesian government and the Mobil

Corporation. However, in the 1970s these critics had as yet not organized themselves sufficiently to provide significant impediments to the Arun operation.

## **ALTERNATIVES**

An important aspect of this analysis is the consideration of possible alternative buyers of Arun's gas. As we have noted, Arun's natural gas initially was delivered to only one bidder, a group of Japanese firms. This section seeks to assess what other possible alternative there were to the Japanese at the time of the development of the project. Three major alternatives will be explored, although none of them could ultimately seriously compete with the Japanese. The first possibility was the sale of LNG to California utilities, an expectation rooted in a contractual arrangement signed between Pertamina and Pacific Gas in 1973, although this alternative became increasingly questionable in the ensuing years. The second possible alternative was the large-scale provision of natural gas to domestic buyers, either through the development of petrochemical facilities in the Aceh region or pipelines or LNG shipments to other parts of the archipelago for home and industrial use. Finally, what were the advantages and obstacles to the provision of natural gas to Singapore either by pipeline or LNG?

The reason for limiting possible alternatives to these three is a realistic assessment of development and industrialization elsewhere in Asia during the initial ten to fifteen years after the discovery of Arun. The rest of South and Southeast Asia remained primarily agricultural and economically underdeveloped. The rare more developed middle level countries such as Malaysia and Thailand had their own gas resources. In Northeast Asia, China was still coming out of the Cultural Revolution, while the Republic of Korea and Taiwan were in a process of development that would make them limited customers for Indonesian gas in later years.

## **THE DEMISE OF THE CALIFORNIA CONNECTION**

As previously noted, the second party to the sale of Arun LNG to Japan was the Pacific Lighting Corporation (later Pacific Gas). It had been decided in 1973 that, starting in 1978, 1.4 mtpa would be delivered to California, rising finally to over 3.8 mtpa. This would necessitate the construction of three more trains in Arun and would result in the largest single purchase of gas by California utilities in its history (Howell and Morrow, 1973). There were extraordinary claims at the time regarding the economic costs and gains of this project although at an early date critics questioned the viability of the agreement.

However, in the early 1970s this arrangement appeared desirable for both parties. For Jakarta, it provided a counter to Japan, which was becoming increasingly dominant in the Indonesian economy. This was an era of Southeast Asian suspicion of Japanese economic hegemony in the region and there was political and popular opposition expressed through demonstrations, speeches and editorials. In addition, elements in the Indonesian leadership considered that having Japan as the only buyer of LNG could place Indonesia in a difficult bargaining position on price and the California contract could be a useful bargaining chip (Sacerdoti, 1981).

There also were hopes for massive American investments in the development of Arun and other gas fields in the islands that could bolster a weakened Indonesian economy. On the California side, a coalition of business and labor interests, backed by then Governor Jerry Brown, saw LNG imports as having sound economic and environmental elements. Some have argued more questionable factors behind this support including alleged economic interests of the Brown family in Indonesian oil and gas. Also noted were the hopes of American bankers that the revenues from the sale of LNG would bolster an Indonesian government that had defaulted on billions in loans (Walters, 2001). Under Brown's leadership and against the opposition of environmentalists and consumer advocates, legislation was passed to build a LNG terminal at Point Conception, near Santa Barbara.

However, a series of forces finally led to the abandonment of this and other LNG projects in California. There were initial problems with pricing that were not settled until the late 1970s. The Point Conception site was prone to earthquakes and seismologists made dire predictions of future disasters. Environmentalists launched attacks on the safety of LNG tankers and argued that they might explode or run aground. Even the Chumash Indians got involved, identifying the chosen site as sacred ground. Placing any LNG project in further jeopardy was the deregulation of natural gas that produced increased supplies, making LNG appear to be less economically attractive. There was also the attraction of lower-cost gas supplies and alternative fuels from Canada, and the estimation of economists at the time that shipping costs from Southeast Asia to the US West Coast were prohibitively high (interview D. Hudson, former chief economist for Esso Eastern, February 2004). Ultimately, to this day no LNG terminals have found their way to the California Coast. During recent years, a proposal to build a terminal at Mare Island in Northern California has come to nothing.<sup>3</sup>

During the latter 1970s Indonesia waited for the expected fruition of the California project. Jakarta established a number of deadlines and upheld the legality of the contract, apparently still hoping to fulfill the original agreement. A review of oil and economic journals in the late 1970s finds numerous discussions about the probability of success or failure of the arrangement. It was not until the end of 1980 that the U.S. utility was formally released from the agreement to purchase gas from Indonesia. By that time, it was obvious that a LNG terminal in California was impossible. On the Indonesian side, there were also pressures and incentives. The Japanese were anxious to obtain a larger contractually safe portion of Indonesia's gas and were prepared to finance guaranteed purchases for an exclusive contract. As a consequence they put pressure on Jakarta to cut its ties with the potential U.S. buyer. The decline in oil production in Indonesia had made gas a greater foreign exchange earner than crude, making more desirable Japanese offers to help build more trains and purchase the expanded LNG production.

One possible result of this long series of negotiations and continued Indonesian hopes was that it might have helped to preclude any other efforts to find alternatives for the sale of Arun's gas. However, it should also be noted that the 1973 contract with the Japanese gave them the option for any Arun gas surplus. Theoretically, this could have been a crucial period for other possible buyers. By the early 1980s, Malaysia was in the process of developing its own natural gas pipeline system and Singapore could look to the possibility of purchasing gas from Malaysia

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<sup>3</sup> The Mexican government now supports the development of LNG terminals in Baja California to meet domestic and California demands, although environmentalists also oppose these projects.

or from new fields in Indonesia. Yet, given Japanese desires to obtain a secure supply and a weak market elsewhere in Asia, it is doubtful that the seven-year wait between the signing of the contract and its final abrogation would have brought other possible buyers.

## **DOMESTIC DISTRIBUTION**

The initial decision to sell Arun's gas overseas was based upon the understanding among Indonesian policy makers at the time that there was an insufficient domestic market within Indonesia. In the early 1970s the island of Java had almost two thirds of the total population of Indonesia and was the center for the country's limited manufacturing activities. The rest of the populace was spread throughout an archipelago three thousand miles long. Aceh was a considerable distance from the Javanese center of population and industry. With the projected high front-end investments needed to bring gas to Java it was considered more economical to develop other energy sources (Reksohadjiprodjo, 1980, p. 303). The shallow fields of Central and South Sumatra were also less expensive than the greater depth reservoir in North Sumatra. Additionally there were high capital costs involved in developing a consumer gas infrastructure. In 1978 Indonesian official energy policy was based upon an assumption that the country should exploit the export of gas and depend upon coal for domestic use after maximizing its hydropower and geothermal sources. Given the high export value of gas relative to coal, government policy was to emphasize coal as the foundation for electricity needs. Heavily subsidized gas was available on a limited basis for government sponsored projects and the very low price of gas for state enterprises discouraged foreign companies from selling domestically (Wijarso, 1988). By the end of the century there was still no gas pipeline from Sumatra to Java, although there was discussion of a pipeline grid to connect Sumatra, Kalimantan and Java and a pipeline from Natuna to Java (Rahardjo, 2000, pp. 549-553).

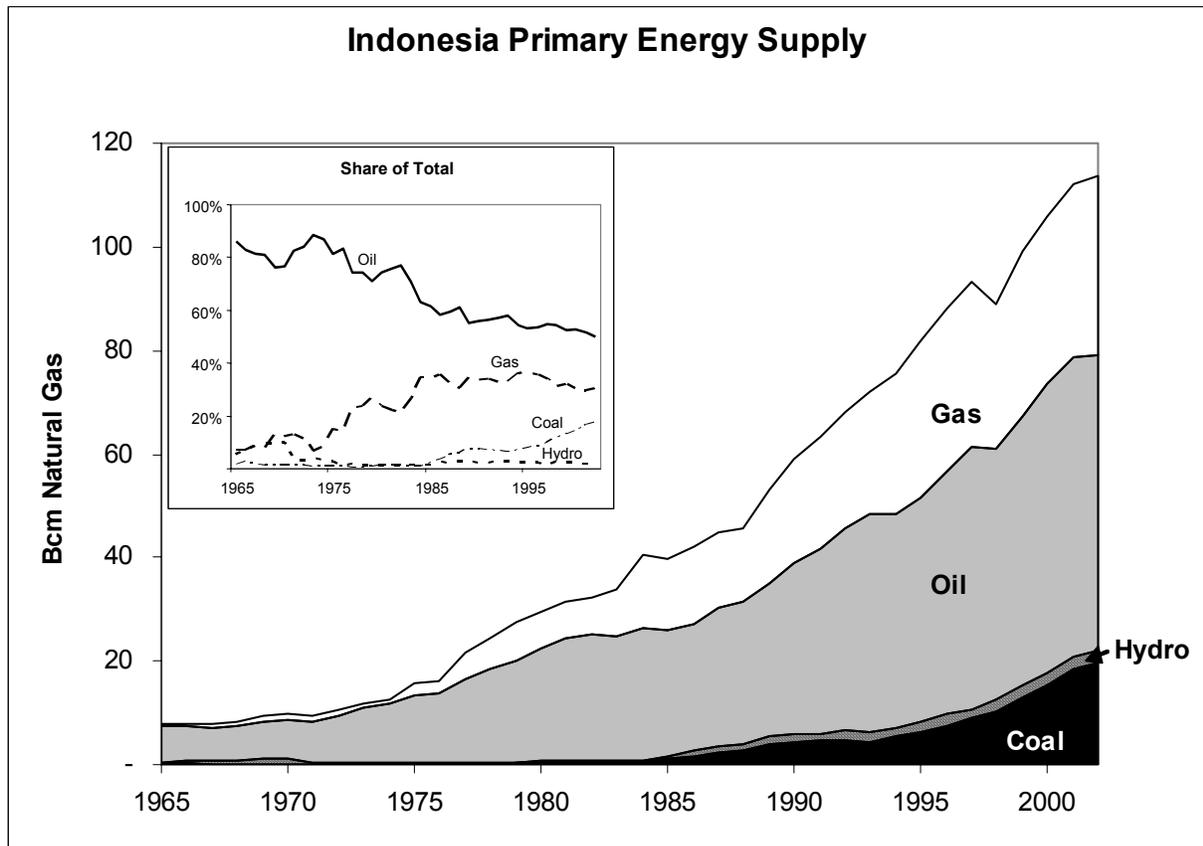
There was also the expectation that there would be a major development of a petrochemical industry in Indonesia, including fertilizer plants and industrial products, as well as electric power generation. There were large-scale plans for petrochemical activities in the Aceh region employing Arun's gas resources. An integrated complex for ethane, polyethylene, a glycol plant and vinyl chloride monomer production was envisioned at an estimated cost of \$1.6 billion (PertoMin, March 1980; Ooi Jin Bee, 1982, p. 164). There were regular projections of such activities throughout the 1980s. Yet, by the end of the 1980s Indonesia had only firmed up plans for an aromatics plant producing benzene, toluene, p-xylene, and ethylene supposedly to start up in 1992. In reality the high cost of development of petrochemical plants and the limited market in Asia at the time made such projects difficult to implement.

At the end of the century only a small amount of Arun's gas went to the regional petrochemical industry by way of a local fertilizer plant. Technically, the high methane content of Arun gas was not ideal for manufacturing petrochemicals such as ethane, ethylene, etc. In fact, medium and large-scale manufacturing was rare in Aceh and in 1980 it engaged only 2,500 workers. According to the World Bank, plans had been delayed by Pertamina's financial problems, a lack of a long-range development program, a poor balance of payments situation, and confusion about feedstock availability (Vergara and Babelon, 1990, p. 128). The Bank noted the base and resources were already present to develop major projects. Foreign investors

remained cautious in funding large –scale manufacturing in Indonesia. Suffice to say, the domestic utilization of Arun’s gas for transmission to major population centers or the development of a petrochemical program in Aceh proved more a vision than a reality. While these ideas may have been plausible alternatives to foreign sales, they failed in their implementation.

Other energy sources for Arun’s gas available to Indonesia also need to be assessed. During the 1970s and early 1980s the major source for energy production in Indonesia was oil. At the end of the first National Development Plan (1969/70-1973/74) the national Electric Company reported that some 61 per cent of electric power used fuel oil. In the late 1970s 90 percent of energy came from oil and 8 per cent from gas. Other sources of energy at that time were potential more than actual. There was considerable discussion of using Indonesia’s plentiful reserves of coal, but the availability of oil and long distance of coal deposits from Java (it was primarily in Sumatra) limited its use (Reksohadjiprodjo, 1980). In fact, although coal production increased from 175,673 metric tons in 1968 to an estimated 265,000 metric tons in 1978, it was less than pre-war levels. During the 1970s, coal was not expected to be a significant player in energy production, although a significant increase in availability was expected by the mid 1980s (Reksohadjiprodjo, 1980, p. 307). Coal production had dropped drastically from 1940 to the 1970s, but grew dramatically after 1983 rising from less than 1 million tons that year to an estimated 21 million tons in 1992. However, it only accounted for 8 per cent of Indonesia's energy consumption at that time. Hydroelectric power has been important in Indonesia, but again its source was largely off Java. Geothermal based power was not expected to be a major contributor.

**FIGURE 2. INDONESIA PRIMARY ENERGY SUPPLY BY FUEL (IN NATURAL GAS UNITS)**



In sum, energy requirements for Indonesia were not large at the time of the development of the Arun project. In 1970 it was the equivalent of about 8 Bcm of natural gas.

### THE SINGAPORE ALTERNATIVE

Singapore would appear to be a possible alternate buyer of Arun's gas in the decade after its discovery for a number of reasons. The city-state's economy was the envy of its neighbors. While its population had grown from 2,074,500 in 1970 to 2,558,000 in 1985, during that same period its GDP had risen from \$5,107 million to \$38,923.5 million. GDP per capita rose from S\$2,462 in 1970 to S\$6,565 in 1984. Annually on average in 1965-1984 Real Gross Domestic Product rose 7.8 per cent, outstripping every other country in Asia. In 1973 to 1984 Singapore had the lowest inflation of 17 upper middle-income countries and by 1984 it had the highest gross savings rate in the world (Sandhu and Wheatley, 1989; Sharma, 1989). The economy's average annual growth rate from 1965 to 1973 was 12.7 per cent and although GDP fell after the 1973 oil crisis, it still grew at 8.6 per cent from 1973 to 1984. Singapore would thus appear to be a viable market in economic terms.

Secondly, the city-state had a long history in utilizing gas, although the use of significant amounts of natural gas did not take place until the 1990s. The Singapore Gas Company was formed in 1861 and the first gasworks was built in 1862. Coal carbonizing plants were used until catalytic gasification plants came on line in 1958 until conversion to naphtha feedstocks. By 1972 there were 860.9 kilometers of gas mains, 104,900 gas consumers, and a steady increase in gas production and sales. Gas was the major source for Singapore's electrical generation and from 1970 to 1976 electrical generation grew by 7.5 per cent.

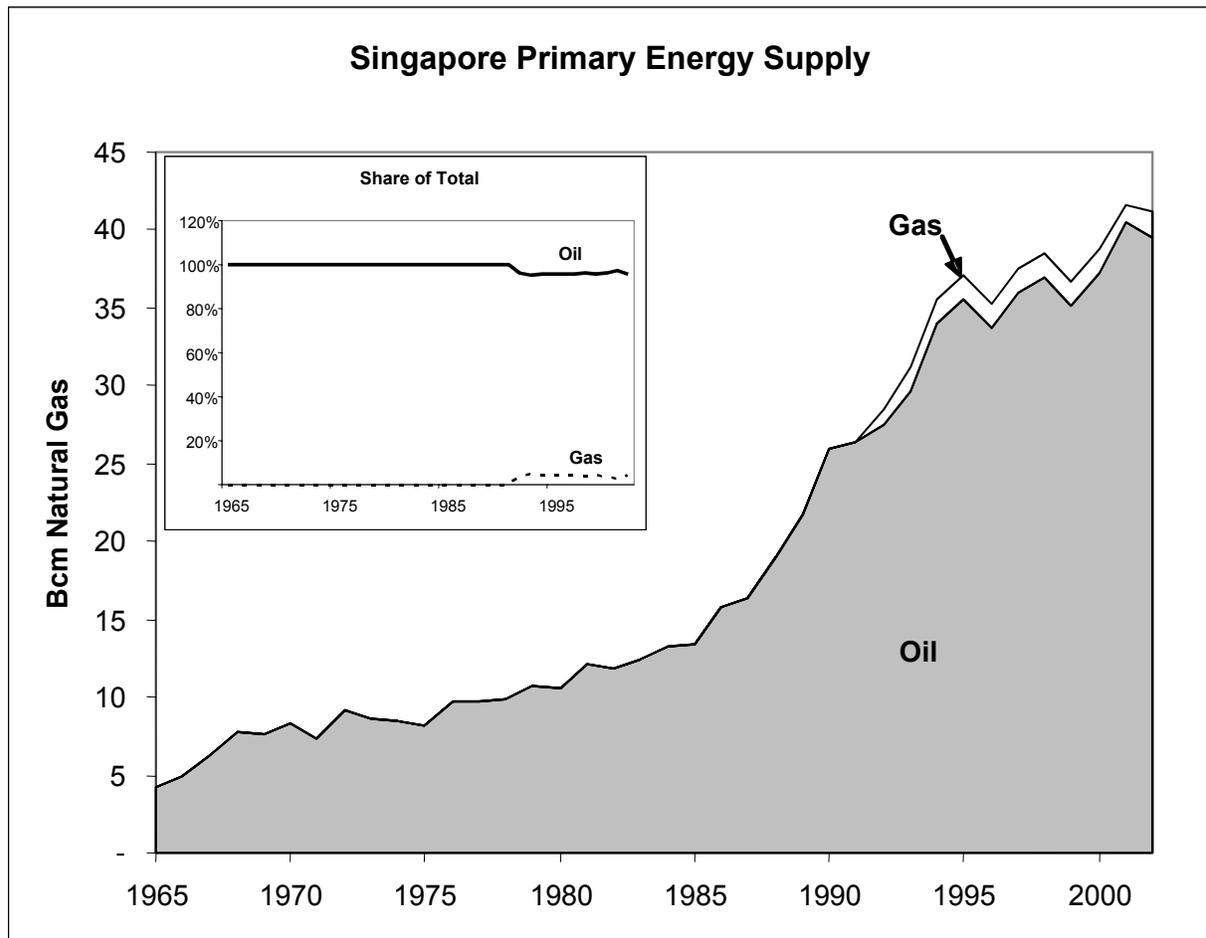
The 1970s also saw Singapore move into the petrochemical business in a major fashion. Plans were initiated at that time to reclaim an island off Singapore for a major project to be completed in 1982, although commissioning took place some time later. Much of the development was in joint venture with the Japanese and was seen as only the beginning of a new program for Singapore. While the initial feedstocks were naphtha and LPG, as the petrochemical industry grew it became more apparent that large supplies of natural gas would be desirable.

Thirdly, Singapore had shown an interest in importing natural gas from its neighbors since the early 1970s. The 1973 world oil crisis had a major impact on the city-state as it experienced oil shortfalls and increased prices. This brought into consideration both nuclear power and natural gas as long-run energy supplements. The government conducted feasibility studies at the time, but nothing came from them. Less than a decade later Singapore actively explored obtaining natural gas from its neighbors. Although Singapore-Indonesia relations frequently has been tenuous in previous decades, by 1982 there was considerable discussion in the press of building pipelines from Indonesia and particularly from Natuna (Straits Times, September 10, 1982; Far Eastern Economic Review, 1982, p. 84). The Singapore Prime Minister Lee Kuan Yew met with President Suharto regarding the issue and there were reports of negotiations between Pertamina and the Singapore National Oil Corporation (SNOC). The hope was that Indonesian natural gas would come into Singapore within another ten years, although little was implemented in the early years. In 1982 Singapore began discussions with Malaysia to bring in gas from off Trengganu on the East Coast of the peninsula. Representatives from SNOC and Malaysia's national oil company Petronas met in 1982 and discussed a pipeline that would reach Singapore by 1990.

This was also a period when Singapore and Indonesia were looking to develop the latter's Batam Island, some 20 kilometers south of Singapore. In the late 1960s, Pertamina decided that it would turn Batam into a logistical base for petroleum activities in Sumatra and Natuna. Then in 1973 a Presidential Decree set up the island as an industrial zone with a planned oil refinery, storage facilities and a harbor for supertankers (Murray and Perera, 1996; Regnier, 1991). The developing Pertamina scandal and economic problems in Indonesia shelved the petroleum part of the project, although Singapore and Indonesia became partners in building Batam as an industrial zone for Singaporean interests. In the late 1980s, Batam came to the fore again, this time as a basis for future natural gas projects and Singapore began developing its "Chemical Island" of Jurong. When the Natuna pipeline was finally built to supply Singapore at the turn of the century, Batam was its western terminus and much of the impetus for the project came from those involved in developing Natuna. Thus, Singapore was addressing the possibility of importing natural gas from its neighbors in the decade after the discovery of gas in Aceh.

Given these forces in favor of the Singapore alternative, why was it not implemented? It needs to be emphasized that any import of Arun gas by Singapore would not have been sufficient to replace the California contract, let alone Japanese needs. As seen in Figure 3, even in the late 1990s gas imports from Malaysia represented only a small part of Singapore's primary energy supply, or less than 1 mtpa of equivalent LNG. In contrast, as early as 1980 Japan was importing nearly 9 mtpa of LNG from Indonesia, with Arun alone reaching its capacity of nearly 10 mtpa in the early 1980s. And according to the contract with California, Arun was supposed to supply 4 mtpa by the early 1980s. In 1980, Singapore's total primary energy supply, predominantly met through oil, was the equivalent of just 7 mtpa. It is also unlikely that Singapore had the capital available to develop the Arun LNG project in the 1970s.

**FIGURE 3. SINGAPORE PRIMARY ENERGY SUPPLY**



Beyond the centrality of the relatively small Singapore market, there appear to be a number of issues, rather than any single point, that played a role in decisions in the Republic not to become involved in imports from Arun. Among the negative points expressed by public or private observers were:

1. A pipeline from Arun to Singapore was questioned in the 1970s on the grounds that it would cross one of the busiest sea-lanes in the world and its rupture might harm shipping.

The issue was not a technologically difficult problem of deep depth. Rather it was security fears based upon the shallow and narrow nature of the Straits of Malacca (which could have been met by armored pipelines). It should also be noted that Mobil corporate strategy was not enamored with pipelines. Among reasons given for this stance were negative experiences with sabotage and cross-national delays in the Middle East and the perception that LNG did not entail captive supply (interviews A. Troner 2003). On the Singapore side pipelines could tie it to one supplier and limit possibilities of diversification.

2. LNG for Singapore faced several problems. At the time and there were fears expressed about the dangers of bringing LNG ships into the ports of Singapore itself. There was also a cost factor which was illustrated in the late 1990s when proposals for developing LNG facilities were delayed after it became apparent that cheaper natural gas would be coming by pipeline from Malaysia and Natuna.
3. As noted previously, the long and fruitless effort to sell Arun's LNG to California had closed a door of opportunity for other buyers at a crucial time, even if Singapore was interested. However, the city-state did not appear to be ready to act expeditiously on any LNG or pipeline operation. As seen from the Malaysia and Natuna contracts, there was a lengthy period between initial discussions and the first gas deliveries.
4. At the time, Arun was perceived at the time to be too far away to be economically feasible via pipeline and LNG was believed to be too expensive for Singapore's small market. Arun was approximately 800 to 900 kilometers away and would have necessitated a pipeline down the coast of Sumatra and then across the Straits of Malacca or across the Straits to Malaysia and then south to Singapore.
5. In the period under consideration Singapore was in the process of becoming the third largest oil-refining center in the world. Its refineries received crude from the Middle East, Indonesia, Malaysia and Thailand and major by-products of these activities included the production of naphtha. It was also argued at the time that the emphasis given by Singapore refineries to crude oil led Singapore to neglect more innovative resources such as nuclear power and natural gas.
6. Singapore has not had a centrally directed petroleum policy, although there have been official studies and suggestions. The Singapore National Oil Corporation was really a small energy department in the government. It does not make long-range forecasts and does not regulate oil prices (Fesharaki, 1989 pp. 301-02). In this largely free enterprise system, the private sector sets priorities, with some guidance from the government. Given Singapore's small size, the expenditure of large up-front capital for building pipelines or LNG facilities and a change from traditional gas sources did not appear to be sufficiently profitable.

In sum, a combination of factors appears to have made the Singapore alternative unattractive at the time. If Arun had been discovered a decade later, Singapore would have been a natural possibility. Singapore's energy needs were different by then as its petrochemical industry was expanding. This was the time when the city-state began negotiations with both Malaysia and Indonesia for the development of natural gas pipelines and the Arun gas might have tied into the Malaysian pipeline developed in later years.

## CONCLUSIONS

The ultimate transmission of Arun's natural gas to its major users was a factor of place and time. Arun, like its sister project Bontang was perceived in the 1970s to be too far from both probable domestic and regional users to make a pipeline appear to be economically feasible. Neither Singapore nor the Indonesian government considered the cost an acceptable alternative to other energy sources.

Perhaps more importantly, the timing of Arun's development dictated the primary buyers. This was a period prior to the industrial growth of states such as the Republic of Korea, China, Taiwan and Singapore. Arun was discovered in 1971/72 and the first sales of LPG to the Republic of Korea were in 1986 and to Taiwan in 1990. The only East Asian economy that could successfully utilize large quantities of natural gas and provide the necessary financial support for the project was Japan. Major imports of LNG by other Asian states did not take place for over two decades after the discovery of Arun. With the withdrawal of the California contract, there was only one important buyer and this helped to frame the negotiations that took place. What competition that did take place was not between states, but between buyers within Japan.

If Arun had been developed ten to fifteen years later, there would have been several other countries that would have competed with Japan and there is the possibility that there would have been more domestic demand. There also might have been the possibility of a pipeline to connect to the Malaysian grid that was being developed in the 1990s. Additionally, Indonesian gas would have faced other potential suppliers from Russia, Australia, Southeast Asia and the Middle East.

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