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ENERGY DEVELOPMENT IN ASEAN COUNTRIES AND SINO-ASEAN ENERGY COOPERATION

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S. RAJARATNAM SCHOOL
OF INTERNATIONAL STUDIES
A Graduate School of Nanyang Technological University

Energy Development in ASEAN Countries and Sino-ASEAN Energy Cooperation

Xue Li

S. Rajaratnam School of International Studies

Singapore

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Abstract

East Asia is one of the three main economic blocks in the world. Association of Southeast Asian Nations (ASEAN) countries - as New Industrial Economies (NIEs) - and China - as an emerging power - are promoting regional integration. The paper examines energy development and cooperation, an important component of economic collaboration, in this region. The paper outlines the energy products in eight ASEAN countries, presents the details of energy exploration and production in them, analyzes the South China Sea issue, and details the energy cooperation between those countries and China. Based on these factors, the author then suggests that ASEAN countries and China should continue their energy cooperation on the one hand, and on the other set up a multi-lateral framework (South China Sea Energy Development Organization, SEDO) to tackle South China Sea disputes. By doing so, energy resources under the sea will be converted from being the source of disputes to becoming a positive factor for East Asian integration. The paper also argues that China, as a major power in the region, has a special responsibility in helping smaller neighbouring countries. As far as the field of energy cooperation is concerned, China, besides making profitable energy investments in ASEAN countries, should increase official development assistance (ODA) to help develop energy resources in countries that lack hydrocarbon resources.

Dr Xue Li is the Deputy Director of the Department of International Strategy in the Institute of World Economics and Politics (IWEP) based in the Chinese Academy of Social Sciences (CASS), Beijing, China. He is also the Secretary-General of the Center for Foreign Affairs and Strategy at IWEP/CASS. After working as a medical doctor during the period 1987-2001, Dr Xue decided to study international relations. He received his Master degree in International Relations from the Tsinghua University in 2004 and his PhD degree in International Politics from the Graduate School of CASS in 2007. His current research interests are Pan-East Asian integration and energy politics. He has written dozens of articles related to the two fields that have been published in papers, magazines and journals, at home and abroad. He is a recipient of the NTS-Asia 2008-2009 Research Fellowship, of which this paper serves as his contribution.

Energy Development in ASEAN Countries and Sino-ASEAN Energy Cooperation

Introduction

Both China and ASEAN function as active drivers of East Asian integration. Since reaching an agreement on establishing a China-ASEAN Free Trade Area during the fifth ASEAN-China (10+1) Summit in 2001, economic relations between the two sides have progressed rapidly, reaching a trade sum US$200 billion in 2008. Energy cooperation, a component of East Asian integration, developed rapidly on the one hand but encountered some issues on the other. The South China Sea dispute is the main issue between both parties. Energy ties between both sides will no doubt continually develop. However, maximising the positive aspect of the energy relationship, and minimising the negative aspect is a critical issue for China and ASEAN member states. The author contributes to the field of study by evaluating energy development in individual ASEAN countries, analysing the results of energy cooperation, highlighting issues and their implications. The paper will be developed in four parts: The first part introduces energy resources and products in eight ASEAN countries; the second describes the details of energy exploration and production (E&P) in these eight countries, especially energy cooperation between China and each individual country; the third analyses the South China Sea disputes; while the last portion presents the author's conclusion and formula for future Sino-ASEAN energy cooperation, particularly with regard to the South China Sea dispute.

1. Energy Resources and Products in ASEAN Member States

Energy in this paper refers collectively to hydrocarbons, nuclear power and renewable energy resources (henceforth 'renewables'). But I will mainly focus on oil, natural gas, coal, nuclear power, and hydroelectricity in this paper. Other forms of energy are mentioned only in some cases. Nuclear power and renewables will be analysed under the topic of electricity, for they are almost always used for electricity generation,

Energy resources in ASEAN member states as a whole are rich but unevenly distributed. For instance, Indonesia, Malaysia and Brunei export crude oil, but the others have to import oil products and/or crude oil. Renewables such as hydroelectricity and solar energy while abundant are seriously underdeveloped due to a lack of technology and funding.

1.1 Oil As the main form of fossil fuel energy, oil takes on an important role in the energy consumption of ASEAN countries. Crude oil has been discovered in some of these countries; however they lack sufficient refining capacities and therefore have to cooperate with foreign companies for oil refining. For instance, Royal Dutch Shell owns the sole refinery in Brunei, while many foreign oil refineries can be found in Vietnam, Indonesia and Malaysia. See Table 1 for the distribution of crude oil reserves in the ASEAN member countries and their refining capacities.

Table 1 Proven oil reserves, production, consumption and refining capacity of ASEAN countries in 2006

	Proven reserves British Petroleum (Tbbl/d)	Proven reserves Oil and Gas Journal Bbbl	Production (Tbbl/d)	Consumption (Tbbl/d)	Refining Capacity (Tbbl/d)
Brunei	1.1	1.100	221	10	9
Myanmar		0.050	17.5		57
Cambodia		0			0
Indonesia	4.3	4.300	1071	1031	993
Laos		0			0
Malaysia	4.2	3.000	747	499	545
Philippines		0.139	336	307	333
Singapore		0		853	1337
Thailand	0.5	0.290	286	926	729
Vietnam	3.3	0.600	367	276	0
Total	13.4	9.479	2692	3616	4003

Sources:

1) British Petroleum proven reserves, production and consumption: *BP Statistical Review of World Energy June 2007*, pp. 6-11.

2) Oil and Gas Journal proven reserves, refining capacity: *International Energy Annual 2006*, available at http://www.eia.doe.gov/emeu/international/oilother.html.

3) Vietnam's production: Energy Information Administration (EIA), Vietnam Country Analysis Brief for 2006; Philippine's production: EIA Philippines Country Analysis Brief, for 2007.

4) Myanmar's production: Chinese Embassy in Myanmar: available at http://mm.mofcom.gov.cn.

5) Brunei's consumption: China-ASEAN EXPO official website, available at http://www.caexpo.org/gb/news/special/shiyou/gaikuang/t20051007_51534.html.

Note: Tbbl/d refers to Thousand Barrels Per Day.

Proven oil reserves are mainly found in Brunei, Indonesia, Malaysia and Vietnam. Indonesia's oil production exceeds the rest, but its output is 1071 thousand barrels per day (Tbbl/d), lower than the Organization of the Petroleum Exporting Countries' (OPEC) production quota of 1400 Tbbl/d. Compared with its low proven reserves, Thailand has relatively high oil production. Vietnam's production meets 80 per cent of its domestic demand. Before the first refinery started production in February 2009, it had to import crude oil and oil production technology. Indonesia consumes most of its own crude oil, but its refining capacity is unable to meet domestic demand. Malaysia exports a small proportion of crude oil and oil production. Thailand's refineries obtain 40 per cent of their crude oil locally, and this meets 40 per cent of the domestic demand. Singapore is the Southeast Asian Energy hub. 36 per cent of its oil production goes abroad, though it does not produce crude oil. ASEAN countries as a whole produce a total of 2692 Tbbl/d, or 98.26 million barrels per year. It implies that the Reserves-to-production ratio (R/P) is 1363 years in this region. Hence, it is possible for the bloc to sharply increase the supply of crude oil in the region by increasing production.

1.2 Natural gas More and more countries in the world are focusing on increasing the usage of natural gas because natural gas produces more calorific value and less greenhouse gases than oil and coal. In addition, proven natural gas reserves are much higher than oil. Among ASEAN countries, Indonesia, Malaysia and Brunei are exporters of natural gas. Further exploration may dramatically boost the natural gas

reserves in this region. Natural gas will gradually assume a central role in the field of energy cooperation between ASEAN and other countries.

Table 2 Proven natural gas, production, consumption and export in ASEAN countries

	Proven reserves (Tcf)		Production (2005)	Consumption (2005)	Export (2005)
	2005	2009	(Bcf/y)	(Bcf/y)	(Bcf/y)
Brunei	13.800	13.800	406	83	323
Myanmar	10.000	10.000	459	146	313
Cambodia			0	0	0
Indonesia	90.300	106.000	2,606	1,352	1,282
Laos			0	0	0
Malaysia	75.000	83.000	2,243	1,172	1,070
Philippines	3.770	3.480	102	102	0
Singapore			0	233	0
Thailand	13.340	11.198	837	1,150	0
Vietnam	6.800	6.800	141	141	0
Total	213.01	234.278	6,794	4,379	2,988

Source: EIA, *International Energy Annual 2006*. Available at http://www.eia.doe.gov/oil_gas/natural_gas/info_glance/natural_gas.html.
Note: Tcf refers to Trillion Cubic Feet. Bcf/y refers to Billion Cubic Feet Per Year.

According to Table 2, there are no natural gas reserves in Singapore, Cambodia and Laos. Production in Indonesia and Malaysia is increasing, while in Thailand and the Philippines it is decreasing. It has been maintained at constant levels in Brunei,

Myanmar and Vietnam. Total proven reserves increased by 12.178 trillion cubic feet (Tcf). Brunei and Myanmar export most of their natural gas. According to a 20-year agreement signed in 1999, 85 per cent of Brunei's natural gas is exported to Japan with 11 per cent to South Korea.[1] Indonesia and Malaysia export half of their natural gas production respectively. Vietnam and the Philippines can meet their domestic demands while Thailand and Singapore are net importers.

It is questionable whether Myanmar's proven gas reserves are of the same levels in 2005 and 2009. Ample evidence points to active exploration in this country in the past few years. The *BP Statistical Review of World Energy June 2008* showed that Myanmar's gas reserves for 2005 was about 19.06 Tcf, almost two times the figure found in data from the Energy Information Administration's (EIA). All of its reserves are located offshore off the Rakhine Coast and in the Gulf of Martaban. Leading Chinese financial magazine – *Cai Jing* (*Finance*), reported on December 28, 2008 that the amount was 89.66 Tcf, slightly lower than that of Indonesia's. Natural gas reserves found in Sittwe's block A alone amounted to 13.33 trillion cubic metres.[2] If Myanmar sustains its level of natural gas E&P, it would probably become the largest natural gas exporter in ASEAN in the near future.

1.3 Coal There are recoverable coal reserves in six countries: Indonesia, Malaysia, Myanmar, the Philippines, Thailand and Vietnam. Indonesia possesses 70.34 per cent

[1] "China and Southeast Asia Energy Market Situation". Ministry of Commerce, The People's Republic of China, 17 May 2007. Available at http://anhui.mofcom.gov.cn/aarticle/sjdixiansw/200705/20070504679378.html.
[2] "China and Myanmar Signs 30 Years Natural Gas Agreement Myanmar gas enters Yunnan province in 2013". sina.com.cn blog, 28 December 2008. Available at http://blog.sina.com.cn/s/blog_4c201f650100c29e.html.

of the coal reserves in this region and Thailand has a 22.01 per cent share. Vietnam's share is only 2.43 per cent with its coal being of the anthracite and bituminous variety.

Two-thirds of the coal reserves in Indonesia are located on Sumatra Island with the remaining found on the islands of Kalimantan, Java and Sulawesi. Coal production increased by 68 per cent between 2000 and 2004. A new coal policy to further promote the utilisation of coal was instituted in 2004 to limited effect.[3]

Table 3 Recoverable coal reserves, production and consumption in ASEAN countries

	Anthracite and Bituminous (Mst)	Lignite and Sub-bituminous (Mst)	Total Reserves (Mst)	Production		Consumption	
				2005	2006	2005	2006
Brunei	--	--	--	0	0	0	0
Myanmar	2	--	2	1.50	1.53	0.216	0.263
Cambodia	--	--	--	0	0	0	0
Indonesia	1,897	2,874	4,771	168.03	213.17	25.470	24.071
Laos	--	--	--	0.33	0.33	0.132	0.132
Malaysia	4	--	4	0.75	0.72	12.045	13.143
Philippines	45	303	348	3.17	2.60	11.813	11.184
Singapore	--	--	--	0	0	0.003	0.008
Thailand	0	1,493	1,493	23.62	21.02	33.248	31.571
Vietnam	165	0	165	38.39	45.06	18.670	20.619
Total	2,113	4,670	6,783	235.79	84.43	101.597	100.991

Note: Mst refers to million short tonnes.

Source: EIA, *International Energy Annual 2006*. Available at http://www.eia.doe.gov/fuelcoal.html.

[3] "Country Analysis Briefs – Indonesia". EIA, January 2007. Available at http://www.eia.doe.gov/emeu/cabs/Indonesia/pdf.pdf.

ASEAN as a whole is a net coal exporter. It exported 134.193 short tonnes of coal in 2005 and 183.439 short tonnes in 2006. During this period, Indonesia, the second-largest exporter in the world, exported 85 per cent and 89 per cent of its coal production respectively, while Vietnam exported 51 per cent and 54 per cent. Thailand exported over 100 short tonnes and Laos exported 200 short tonnes. No available data was found concerning coal exports for Brunei and Cambodia. Singapore, Thailand, Malaysia and the Philippines are net importers, among which the Philippines and Thailand imported 80 000 and 100 000 short tonnes, respectively.

1.4 Electricity Electricity is generated in different ways. Conventional thermal electricity refers to power from fossil fuels, including oil, natural gas and coal. Electricity from nuclear generation and renewables are not subjected to the same concept. Hydroelectricity is the most popular form of renewable electricity.

Table 4: Electricity generation, consumption, export and import in ASEAN countries 2006

	Total Electricity Generation (Bkwh)	Thermal Electricity Generation (Bkwh)	Total Consumption (Bkwh)	Hydro Electricity Consumption (Bkwh)	Electricity Export (Bkwh)	Electricity Import (Bkwh)
Brunei	3.10	3.10	2.92	0	0	0
Myanmar	5.96	2.67	4.29	3.29	0	0
Cambodia	1.16	1.11	1.18	0.05	0	0.110
Indonesia	125.67	109.82	110.71	9.53	0	0

Laos	1.64	0.05	1.34	1.59	0.547	0.367
Malaysia	99.08	93.13	95.98	5.95	2.524	0
Philippines	53.93	34.15	47.04	9.84	0	0
Singapore	37.08	37.08	35.13	0	0	0
Thailand	130.68	119.83	123.91	7.87	0.750	5.159
Vietnam	54.28	30.92	48.08	23.36	0	0
Total	512.80	431.86	470.58	61.48	3.821	5.636

Note: Bkwh refers to billion kilowatt hours.

Source: EIA, *International Energy Annual 2006*. Available at http://www.eia.doe.gov/fuelelectric.html and http://www.eia.doe.gov/fuelrenewable.html.

We may draw some conclusions from Table 4:

- Electricity generation capacity in ASEAN exceeds consumption by 8.23 per cent, or 42.22 billion kilowatt hours (Bkwh), and this excess is probably exported to non-ASEAN countries.
- Conventional thermal electricity contributes 84.21 per cent to total electricity. Hydroelectricity consumption only comprises a 13.06 per cent share of total electricity consumption. It implies that the development of hydroelectric power in this region is relative low, although the use of hydroelectricity for some individual countries is quite high: 48.59 per cent for Vietnam and 76.69 per cent for Myanmar. Closed agricultural societies in this region like Myanmar are inclined to meet its very low demand by developing hydroelectricity.

- Cambodia and Laos hope to grow into new foreign direct investment (FDI) destinations, because of their rich hydroelectricity potential, social stability and strong penchant for development.

1.4.1 Nuclear Power According to the *International Energy Annual 2006*, there are no nuclear power plants in ASEAN countries. However, it does not mean that ASEAN countries are not interested in the peaceful use of nuclear power. There are three reactors in Yogyakarta in central Java. After a decade's delay, the Indonesian Government has decided to initiate construction of its first nuclear power plant in 2010. The total installed capacity is 4 Mkw.[4] The Philippines built its first nuclear plant in 1986 although the plant has never generated electricity for safety reasons. It was recently reported that the government would re-evaluate the project in order to commence operations.[5] Russia built a nuclear reactor in Da Lat city, which is 250 kilometres, northeast of Ho Chi Minh city, Vietnam. The Vietnamese government, with help from the American government, will build a nuclear plant there in 2015.[6] Thailand views nuclear power as green energy and has decided to build a nuclear plant with an installed capacity of 4 Mkw before 2020.[7] Malaysia also plans to construct a nuclear plant with a 100 Mkw installed

[4] "Indonesia Will Build Nuclear Plant". *Xinmin Daily*, 19 April 2005. Available at http://news.sohu.com/20050419/n225248057.shtml.

[5] "IAEA Inspected Philippines' Sealed Nuclear Plant". *Xinhua News Agency*, 29 January 2008. Available at http://news.sohu.com/20080129/n254948712.shtml.

[6] "Vietnam Gets Help From the United Sates After Giving Its Condense Uranium Back to Russia". *Xinhua News Agency*. 18 September 2008. Available at http://news.china.com/zh_cn/news100/11038989/20070918/14349995.html.

[7] "Nuclear Plant in Thailand Will be Built in 13 Years". *China Power.com.cn*, 18 October 2007. Available at http://www.chinapower.com.cn/newsarticle/1055/new1055081.asp.
"Thailand Will Invest 6 Billion US dollars on its First Nuclear Plant". *Mysteel.com*, 13 June 2007. Available at http://www.mysteel.com/gc/cjzh/jcjs/2007/06/13/083817,1609418.html.

capacity. [8]

1.4.2 Hydroelectricity Many big rivers are located in this region and consequently most ASEAN countries are rich in hydroelectricity potential. They are in an advantageous position to develop green energy.

Table 5 Hydroelectricity installed capacity and consumption in ASEAN countries, 1990-2006

	Installed capacity 1990 (Mkw)	Consumption 1990 (Tkwh)	Installed capacity 2000 (Mkw)	Consumption 2000 (Tkwh)	Installed capacity 2006 (Mkw)	Consumption 2006 (Tkwh)
Brunei	0	0	0	0	0	0
Myanmar	0.258	1.18	0.340	1.87	0.803	3.29
Cambodia	0.010	0.06	0.010	0.05	0.013	0.05
Indonesia	2.971	6.67	4.373	9.92	4.567	9.53
Laos	0.200	0.82	0.415	1.53	0.673	1.59
Malaysia	1.437	3.95	1.814	7.34	2.091	5.95
Philippines	2.162	6.00	2.304	7.72	3.222	9.84
Singapore	0	0	0	0	0	0
Thailand	2.274	4.93	2.923	5.97	3.476	7.87
Vietnam	0.550	5.33	2.862	14.41	4.155	23.36
Total	9.862	28.94	15.041	48.81	19.00	61.48

[8] "Malaysia Will Develop Nuclear Power Before 2023". *China Power.com.cn*, 16 October 2008. Available at http://news.bjx.com.cn/html/20081016/151686.shtml

Note: Mkw refers to million kilowatts, Tkwh refers to trillion kilowatt hours. The data, based on information from *EIA International Energy Annual 2006*, was calculated by the author. It is available at http://www.eia.doe.gov/fuelrenewable.html.

ASEAN countries except Brunei and Singapore are advancing their hydroelectricity development plans. Total installed capacity for ASEAN rose to 19 million kilowatts (Mkw) in 2006 from 9.862 Mkw in 1990. Consumption rose from 28.94 Bkwh to 61.48 Bkwh during the same period. Individually, the Philippines', Thailand's and Indonesia's consumption increased by 50 per cent. The rate of consumption grew the fastest in Vietnam, Laos and Myanmar.

Indonesia shows the most potential for the development of hydroelectricity than any other country in ASEAN. This is because 80 per cent of its population lives on the islands of Java and Bali Madura, while the hydroelectricity potential in the islands of Sumatra and Kalimantan remains undeveloped.

1.4.3 Electricity from Other Renewables Countries in this region have developed geothermal energy, solar energy, wind energy, marine energy and biomass energy for a couple of years. Generally speaking, it takes time for renewables to play an important role in energy consumption in these countries. As recently as 2006, Indonesia had 58.82 Mkw installed capacity in electricity from renewable energy, the Philippines had 19.95 Mkw and Thailand had 0.5 Mkw.[9]

[9] "World Net Geothermal, Solar, Wind, Wood and Waste Electricity Installed Capacity, January 1, 1980 - January 1, 2006". EIA. Available at http://www.eia.doe.gov/fuelrenewable.html.

2. Energy Exploration and Production in ASEAN Countries

With Vietnam's retreat from Cambodia and the end of the Cold War, ASEAN started to expand and the economies of its member states grew. To meet the growing demand for energy, most of the bloc's members increased energy investment as well as put in place attractive energy policies to entice international oil companies to set up operations in their countries. At this point, I will try to present the different country case studies in ASEAN. Because information on Cambodia and Laos is rarely represented in energy statistics, I will only describe eight ASEAN countries here. They are Brunei, Myanmar, Indonesia, Malaysia, the Philippines, Singapore, Thailand and Vietnam.

BRUNEI Brunei is rich in hydrocarbon energy resources. Proven oil reserves and natural gas reserves are 1.1 billion barrels and 13.8 Tcf, respectively. Hydrocarbon production accounts for 66 per cent of Brunei's gross domestic product (GDP) and 93.6 per cent of income earned from exports. The country's proven oil reserves is the highest among ASEAN countries with only Indonesia's reserves equalling that of Brunei's. It is also the second largest liquefied natural gas (LNG) exporter in the world.[10]

The oil industry in Brunei is almost wholly controlled by the Brunei Shell Petroleum Company (BSP). The Bruneian government and the Royal Dutch Shell

[10] "Brunei Economy Brief". The Economic and Commercial Counsellor's Office of the Embassy of the People's Republic of China in Negara Brunei Darussalam, 6 November 2006. Available at http://bn.mofcom.gov.cn/aarticle/ddgk/zwjingji/200611/20061103642135.html.

each hold a 50 per cent share of BSP. The main offshore oil fields BSP operates are the Champion field, Southwest Ampa field, Fairley field, Fairley-Baram field, Gannet field, Mapie field and Iron Duke field. There are two other fields on land, the Rasau and Seria-Tali fields. BSP is developing oil in the Egret field. Total S.A., the French oil and gas company, was granted a license to explore the deep-water Block J in 2002. Brunei exports oil to Japan, South Korea, Indonesia, Australia, the United States, China, India, Thailand and New Zealand. Its LNG exports mainly go to Japan (91.6 per cent) and South Korea (8.4 per cent).[11] BSP also owns the sole refinery in Brunei.

BSP produces 90 per cent of natural gas and Total manufactures the rest. Brunei became the first LNG exporter in Asia in 1972. The potential to increase the production of natural gas and LNG is so high that the Bruneian government is planning to develop the petrochemical industry and other industries. The government and Alcoa - an American aluminium manufacturer - signed a Memorandum of Understanding (MoU) to build an aluminium factory in Seria. The investment for the programme amounted to US$1.5 billion and natural gas will be used for fuel.

To reduce the heavy dependence on oil and natural gas, Brunei began developing other industries in 1994. According to Brunei's 2003 "Double Wings Strategy", the country would strive to be Southeast Asia's logistics hub. It also made efforts in promoting the manufacturing and service industries like finance. As a result, income

[11] "Brunei Oil and Natural Gas Situation", *Oilnews.com.cn*, 10 August 2004. Available at http://www.oilnews.com.cn/gb/misc/2004-08/10/content_582122.htm.

from non-energy industries has grown by 21 per cent since 2005. [12]

Energy Cooperation between China and Brunei China energy companies have not invested in Brunei. Oil trading serves as the focal point of energy cooperation between both countries. China imported 1.3 million tonnes of oil per year, of which 20 per cent of oil imports came from Brunei during the period of 2000-2003. Because Brunei's oil price is US$3 higher than the market price, China started reducing oil imports from Brunei beginning from the second half of 2004.[13]

MYANMAR After assuming power in 1988, the Myanmar military government gradually replaced a "Socialist Planning Economy" with a market economy instead. Since then, it has been promoting private entrepreneurship and attracting FDI. The average annual GDP growth rate was 8 per cent between 1992 and 2001 and 12.8 per cent in 2002-2006. GDP for 2007 reached US$17 billion with per capita GDP registering at US$307.

The Department of Energy is the key federal institution in charge of energy issues. The Myanmar Oil and Gas Enterprise (MOGE) dominates the exploration and production of oil and natural gas in the country.[14] Foreign energy companies in Myanmar before 2003 were mainly from Indonesia, the Bahamas, the United

[12] "The New Economy Trend in Brunei". The Economic and Commercial Counsellor's Office of the Embassy of the People's Republic of China in Negara Brunei Darussalam, 27 February 2003. Available at http://bn.mofcom.gov.cn/aarticle/ddgk/zwjingji/200302/20030200071581.html.

[13] "Brunei Economy Brief", The Economic and Commercial Counsellor's Office of the Embassy of the People's Republic of China in Negara Brunei Darussalam, 6 November 2006. Available at http://bn.mofcom.gov.cn/aarticle/ddgk/zwjingji/200611/20061103642135.html.

[14] "Myanmar Politics". Embassy of the People's Republic of China in the Union of Myanmar, June 2008. Available at http://mm.china-embassy.org/chn/ljmd/abad/t469167.htm.

Kingdom (UK), Cyprus and China. Offshore fields were concentrated off the Rakhine coast, the Tanintharyi Coast and in the Gulf of Martaban. Fields off the Tanintharyi Coast and in the Gulf of Martaban started to produce oil before 2003 with natural gas being sold to Thailand.[15] Production of natural gas in the natural gas fields off the Rakhine Coast has yet to commence but the production of this natural gas may be exported to India, Malaysia and China.

There are oil reserves and natural gas reserves inland and under the sea in Myanmar, though production in these areas is still low. In 2006, E&P activities started on 18 land oil fields and three land and offshore natural fields. Myanmar has 112 kilometres of oil pipelines and 2241 kilometres of natural gas pipelines on land. Many rivers, especially the Ayeyarwady River and the Thanlwin River, are rich in hydroelectricity potential. Nevertheless, they are generally underdeveloped.[16]

FDI in Myanmar was US$15.597 billion in August 2008. The top three industries were hydroelectricity generation, oil and natural gas production and manufacturing. These three industries comprised 40.46 per cent, 20.80 per cent and 10.44 per cent of GDP in 2008 respectively. There were 419 investment projects by companies from 28 countries that year, among which the top four were Thailand, the UK, Singapore and China. These four countries accounted for 47.39 per cent, 11.93 per cent, 9.96 per cent and 8.53 per cent of the total capital invested respectively.[17]

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[15] "A Brief on Myanmar Oil and Natural Gas Production in 2002". Chembb.com, 23 February 2003. Available at http://www.chembb.com/InfoCenter/news/complex_deatils.asp?profession_sort=07&sort=ICA07&id=A07030226004.

[16] "Myanmar Economy". Embassy of the People's Republic of China in the Union of Myanmar, June 2008. Available at http://mm.china-embassy.org/chn/ljmd/abad/t469163.htm.

[17] "China's FDI in Myanmar Ranks Fourth". The Economic and Commercial Counsellor's Office of the Embassy of the People's Republic of China in Myanmar, 6 October 2008. Available at http://mm.mofcom.gov.cn/aarticle/zxhz/hzjj/200810/20081005813463.html

Energy Cooperation between China and Myanmar Statistics from the Myanmar government revealed that as of 31 August 2008, China had invested in 28 projects, with the total sum invested amounting to US$1.331 billion.[18]

Myanmar serves as a flourishing market for China's energy companies. Most of China's main energy companies have entered Myanmar. Energy cooperation between the two countries focuses on two fields: offshore energy resources and the China-Myanmar oil and gas pipeline. The total offshore E&P area for the China National Petroleum Corporation (CNPC), China Petroleum and Chemical Corporation (SINOPEC) and China National Offshore Oil Corporation (CNOOC) is about 10 square kilometres, which is larger than the area of the Bohai Sea in northern China. The proposed route for the oil and gas pipeline runs from Kyaukryu Island to Mandalay, then to Ruili and finally to Kunming. The 900 kilometre-long pipeline will pump 20 million barrels of crude oil to China, which amounts to a quarter of oil shipped via the Straits of Malacca. The piped amount for gas however, is still unclear. It was reported that the gas pipeline will be constructed first to transport natural gas from the Myanmar fields and the oil pipeline would be considered after Myanmar's 2010 general election.[19]

The main projects in hydrocarbon resources were as follows: CNOOC and MOGE signed a product-sharing contract (PSC) for three hydrocarbon blocks in January 2005. The total area for the three blocks amounted to 20000 square

[18] "Data for China-Myanmar Cooperation on Economy and Trade in 2008", The Economic and Commercial Counsellor's Office of the Embassy of the People's Republic of China in Myanmar, 11 February 2009, available at http://mm.mofcom.gov.cn/aarticle/zxhz/hzjj/200902/20090206038342.html

[19] "Official Launch of China-Myanmar Pipeline: Resolution of 'Malacca Dilemma' Possible". www.pmnet.cn, 7 August 2008. Available at http://china.pmnet.cn/Info/156215/Index.shtml.

kilometres. MOGE also started to explore oil and natural gas resources with SINOPEC in Myanmar in August 2005.[20] With CNPC, MOGE signed a PSC, and undertook a feasibility study of pipelines in 2007.[21]

China's power giants also rushed to enter Myanmar last year. Three significant events happened in 2008. The China Gezhouba Group, the main constructor for the Three Gorges Power Station (TGPS), became the principle constructor for the Tasang Power Station located in the eastern Shan state of Myanmar. US$6 billion will be invested to build "Myanmar's TGPS".[22] The China Electricity Investments Group (CEIG) announced that it would be spending RMB$120 billion (approximately US$17.1 million) to build a 16.5 Mkw hydroelectricity generation power plant in Myanmar.[23] China Southern Power Grid and its Chinese partners signed an agreement on developing hydroelectricity programmes in the Thalwan Basin.[24]

INDONESIA Indonesia has the largest amount of energy resources among the ASEAN countries. Its oil industry relies heavily on investment by foreign companies. By 1971, the country was found to possess 80 per cent of proven commercial oil reserves. However, foreign companies were only offered the opportunity to develop 5 per cent of the country's oil and gas reserves after 1990.

[20] Zhao Wen, "Current Situation and Trend For Oil and Gas Cooperation Between China and ASEAN". www.webtextiles.com, 3 March 2006. Available at http://ctc.webtextiles.com/info/2006-3-3@146236.htm.
[21] "China and Myanmar Arrange Comprehensive Energy Program. Total Area for Oil E&P exceeds Bohai Sea". www.singtaonet.com, 18 January 2007. Available at http://www.stnn.cc/euro_asia/200702/t20070201_457441.html.
[22] "China Gezhouba Group to Construct Over Half of Largest Power Station in Myanmar". china.com.cn, 20 November 2007. Available at http://www.china.com.cn/economic/txt/2007-11/20/content_9254337.htm.
[23] "Electricity Generation From a 'Myanmar Hydroelectric Power Station' Invested by CEIG May Exceed TGPS". sina.com.cn blog, 11 November 2008 Available at http://blog.sina.com.cn/s/blog_457606c10100b8ys.html.
[24] "Three Hydro Giants Cooperate For Myanmar's Thalwan Programme". hexun.com, 28 April 2008. Available at http://news.hexun.com/2008-04-28/105604122.html?from=rss.

Following the 1997 Asian financial crisis, E&P contracts for foreign companies dropped to 1 from 22 in the period 1998-2001. PERTAMINA, the state-owned oil company, monopolised administration for upstream E&P activities for three decades. This was viewed as one important factor that accounted for the decrease in E&P projects in the country. In October 2001, Indonesia's oil sector experienced significant reforms with the passage of the new Oil and Gas Law No. 22/2001. The law forced state-owned PERTAMINA to relinquish its role in granting new oil development licenses and limited the company's monopoly in upstream activities. PERTAMINA's regulatory and administrative functions were transferred to the new regulatory body, Badan Perlaksanaan Minyak Gas (BP Migas). PERTAMINA became the limited liability company PT PERTAMINA (Persero) by presidential decree in 2003, although it remains a state-owned entity. Indonesia also took efforts to make its E&P contracts more attractive. The country used to have one of the strictest E&P regulations in the world.[25]

Indonesia's oil sector is dominated by several international oil companies. The single largest oil producer is Chevron, which manages Indonesia's largest oil fields: the Minas field and Duri field. BP, ConocoPhillips, ExxonMobil, PETRONAS, Mitsubishi Nippon Oil, Inpex, KG and Total are also significant oil producers in the country, with China's state-owned companies CNOOC and PetroChina, which is a subsidiary of CNPC, also making their presence felt in the country.[26]

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[25] Yang Xueyan, *Environment and Strategy of International Operation for China's Oil Companies*, Beijing: Beijing Petroleum Publishing House, 2004, pp. 283–5.

[26] "Country Analysis Brief - Indonesia". General Background, EIA, January 2007. Available at http://www.eia.doe.gov/emeu/cabs/Indonesia/Background.html.

Table 6 Crude oil production and consumption in Indonesia (1997-2007)

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Production (Tbbl/d)	1557	1520	1408	1456	1389	1289	1183	1129	1087	1017	969
Consumption (Tbbl/d)	963	914	980	1064	1086	1137	1142	1225	1232	1139	1157

Source: *BP Statistical Review of World Energy June 2007*, p. 8 & 11.

Note: Tbbl/d refers to thousand barrels per day.

Indonesia has explored 22 basins of its 60 oil-containing basins. To promote oil E&P, the government waived import taxes on capital goods for oil and natural gas exploration and production. BP Migas has also held several competitive bidding rounds for new upstream projects throughout Indonesia. In 2006, BP Migas concluded its fifth round of acreage offerings. The introduction of advanced technology from international oil companies has not yet arrested the decrease of oil production. Indonesia became a net importer in 2004 but its oil consumption has stabilised since 2002. The country suspended its OPEC membership in 2008. One of Indonesia's last undeveloped oil fields is the Cepu block, located in both Eastern and Central Java. In March 2006, ExxonMobil and PT PERTAMINA signed a Joint Operation Agreement (JOA) for the Cepu field. The project began production in 2008. Peak production is expected to reach 180 Tbbl/d, which will probably add another 18 per cent to Indonesia's oil production.[27]

[27] "SINOPEC Probably Invests in Refinery in Indonesia. SINOPEC Keeps Mum About It". www.tpclub.com, 26 July 2005. Available at http://www.tpclub.com/tax/info_content.php?id=NDMzMjI=.

The country is the tenth largest holder of proven natural gas reserves in the world and the single largest in the Asia-Pacific region. According to the Indonesian government, more than 70 per cent of the country's natural gas reserves are located offshore, with the largest reserves found off Natuna Island, East Kalimantan, South Sumatra, and Pulau Irian. PT PERTAMINA and six major international companies dominate Indonesia's natural gas industry, accounting for more than 90 per cent of the country's production. According to Table 2 on page 9, half of the country's gas production is meant for export. The main destination countries are Japan (70 per cent), South Korea (20 per cent) and Taiwan (15 per cent). The Tanguh LNG project in Pulau Irian will produce natural gas for the international market. Indonesia has played a leading role in the discussions of the proposed Trans-ASEAN Gas Pipeline (TAGP), which envisions the establishment of a transnational pipeline network linking the major natural gas producers and consumers in Southeast Asia.

The Indonesian government hopes to fill the oil demand and supply gap with natural gas. Natural gas transmission and distribution activities are carried out by the state-owned utility company Perusahaan Gas Negara (PGN). The company has a 87 per cent share of the local natural gas market as it operates more than 3100 miles (approximately 4988 kilometres) of natural gas distribution and transmission lines.[28] It has plans to build four additional domestic natural gas pipelines to improve the country's natural gas network connectivity, known as the Integrated Gas Transportation System (IGTS). The IGTS is designed to eventually link the islands

[28] OECD/IEA (2008), *Energy Policy Review of Indonesia*, p. 141.

of Sumatra, Java, and Kalimantan via a 2600-mile-long (approximately 4183 kilometres) pipeline. The pipeline is scheduled to be fully operational in 2010 with a capacity to transport 803 Tcf per year of natural gas, accounting for two-thirds of Indonesia's production in 2005.

Indonesia's power generation sector is dominated by the state-owned electric utility company, Perseroan Terbatas Perusahaan Listrik Negara (PT PLN). The 45 power plants operated by PT PLN roughly comprise two-thirds of the country's generating capacity. Indonesia's electricity sector faces severe under-investment. According to the 2002 Electricity Law, certain markets for power generation opened for competition in 2007. The government also opened competition to the retail market in 2008, allowing power producers to sell directly to their customers rather than through PT PLN.[29]

Energy Cooperation between China and Indonesia The sum of Chinese energy investment in Indonesia reached US$9.47 billion in 2002. Large-scale investments are as follows: CNOOC purchased five block assets from Spanish oil and gas company, Repsol YPF, at the cost of US$0.591 billion in 2002, making it the largest offshore oil producer in Indonesia.[30] China Huadian Corporation and PT PLN announced their decision in 2006 to pump US$2 billion into building an electricity generation plant on South Sumatra Island. SINOPEC and PT PERTAMINA conducted a feasibility study on building the Tuban refinery on East

[29] "Country Analysis Brief - Indonesia". General Background, EIA, January 2007.
[30] Yang, *Environment*, pp. 282–3.

Java Island at a joint investment figure of US$1 billion in 2006. CNOOC and an Indonesian planter SMARK Tbk signed a US$5.5 billion agreement to develop palm oil plantations on Kalimantan Island and Pulau Irian to produce biodiesel.[31] CNOOC also paid for a 16.96 per cent share of the Tangguh Project which will produce 2.6 million LNG yearly for 25 years.[32]

MALAYSIA PETRONAS, Malaysia's national oil company dominates both upstream and downstream operations in the country's oil sector. PETRONAS holds exclusive ownership rights to all E&P projects in Malaysia, and all foreign and private companies must operate through Production Sharing Contracts (PSCs) with the national oil company. PETRONAS is a major player in the retail and marketing sector, but faces competition from Shell, Chevron, and BP. ExxonMobil - through its local subsidiary Esso Production Malaysia Inc. – has the largest presence in the country by production volume.

Malaysia's oil reserves are mainly located in offshore Malay Peninsula and are of high quality. Tapis blend, its benchmark crude oil, is very light and sweet with an American Petroleum Institute gravity of 44 and sulphur content of 0.08 per cent by weight.

Malaysia's proven oil reserves have declined in recent years, and its production has dropped from its peak in 2005. The majority of new E&P projects are deepwater projects. The Kikeh block operated by Murphy Oil produced 120 Tbbl/d of oil in

[31] "Planting Oil Palm For Diesel CNOOC Further Spends US$5.5 Billion in Indonesia". www.jxsme.gov.cn, 10 January 2007. Available at http://www.jxsme.gov.cn/web/news1_con.asp?ID=35582.
[32] "Country Analysis Brief - Indonesia". General Background, EIA, January 2007.

late 2008. The Shell-operated Gumusut/Kakap fields are scheduled to begin production in 2010, possibly reaching 150 Tbbl/d by 2011. Shell also expects to begin oil production on the Malikai field by 2012.[33]

There are six refineries in Malaysia: Three owned by PETRONAS, two by Shell and one by ExxonMobil. The majority are located in the EIA-named Melaka Refinery Complex in Malacca. The total refining capacity has surpassed consumption in Malaysia, which makes the country a competitor in the oil sector in the region.

An aggressive international oil company, PETRONAS is present in 29 countries and has entered the upstream oil sector in 23 of them. It is involved in the E&P project in Iran's South Pars gas field and Sirri oil field. It also owns a 25 per cent share of British Premier. In 2000, overseas businesses accounted for 23 per cent of its profit.[34]

In Malaysia's natural gas sector, PETRONAS dominates upstream activities and is a leading player in downstream activities as well. The country's gas production and consumption has boomed since 2000. It is a large LNG exporter, taking up a 15 per cent share of the world market. In 2007, PETRONAS expanded its Sabah Oil and Gas Terminal which handles 300 Tbbl/d of oil and 1 billion cubic feet per day (Bcf/d) of gas for foreign markets. The offshore area of east Malaysia contributes to the majority of the country's natural gas production. Murphy Oil's deepwater field in offshore Sabah produced 120 million cubic feet per day of gas (Mcf/d) in 2008. PETRONAS's SK-311 and SK-309 in offshore Sarawak will produce 130 Mcf/d of

[33] "Country Analysis Brief - Malaysia". General Background, EIA, March 2007. Available at http://www.eia.doe.gov/emeu/cabs/Malaysia/Background.html.
[34] Wu Lei, *China's Petroleum Security,* Beijing: China Social Sciences Press, 2003, p. 237.

gas in 2009.

One of the most active areas for natural gas E&P continues to be the Malaysia-Thailand Joint Development Area (JDA), located in the lower part of the Gulf of Thailand. The area is rich in natural gas and divided into three blocks: Block A-18, Block B-17, and Block C-19, and is administered by the Malaysia-Thailand Joint Authority, with each country owning 50 per cent of the JDA's hydrocarbon resources.

Energy observers are impressed by the development of Malaysia's plan for a natural gas pipeline system. The 1400 kilometre-long Peninsular Gas Utilization (PGU) pipeline project, completed in 1998, has the capacity to transport 2 Bcf/d of gas. It is a great push by the country to boost the domestic use of natural gas. Natural gas from the Malaysia-Thailand JDA was piped to the PGU via the Trans-Thailand-Malaysia Gas Pipeline System completed in 2006. These pipes will probably be a component of the proposed TAGP system. If this happens, Malaysia will be making a big leap towards realising its dream of becoming the TAGP hub in Southeast Asia.

Malaysia adopted the "Four Energy Policy" in the mid-1980s, which indicated the country's plan to reduce its dependence on oil by boosting the use of natural gas, coal and hydroelectricity.[35] In fact, the share of oil in energy consumption dropped to 41.11 per cent in 2007 from 50 per cent in 2000. Natural gas comprised the

[35] Lai Xiangjun (Ed.), *Oil and Natural Gas: Opportunity and Challenge*, Beijing: Chemical Industry Press, 2005, p. 248.

largest share of primary energy consumption in 2007.[36]

Energy Cooperation between China and Malaysia PETRONAS and China's oil companies are partners for many projects in third countries. It is widely known that CNPC and PETRONAS are major shareholders of the Greater Nile Petroleum Operating Company, the largest oil company in Sudan. They own 40 per cent and 30 per cent of the total company shares respectively. The two companies are also jointly exploring a block in Indonesia, which produces 24 Tbbl/d of oil.[37] PETRONAS and CNOOC signed a contract to produce 3 million tonnes of LNG a year for the Shanghai LNG Project for a 25-year period. China's energy companies have also invested in a few projects in Malaysia. The China National Electric Equipment Corporation was contracted to build a coal electricity generation plant in Sabah.[38] Separately, the Three Gorges General Corporation was authorised to construct a hydroelectricity plant in Sarawak.[39]

THE PHILIPPINES The Philippines Department of Energy issues E&P licenses and supervises compliance to relevant legislation. The Philippines National Oil Company (PNOC) dominates the country's oil sector. To promote the oil and natural gas industries, the Philippines started to de-regulate the industries in 1988.

[36] Fu Qingyun, *World Energy Outlook*, Beijing: China Da Di Press, 2004, p. 16; *BP Statistical Review of World Energy June 2008*, pp. 40–1.
[37] Zhang Yingxing, "Oil and Gas Situation in Sudan", www.lrn.cn, 6 June 2006. Available at http://www.lrn.cn/figures/expertpaper/200606/t20060602_93322.htm.
[38] "CNOOC Inks Contract With Malaysia For Natural Gas Supply". sina.com.cn blog, 18 September 2006. Available at http://blog.sina.com.cn/s/blog_4943345f010005jg.html.
[39] "Three Gorges Corporation Contracted to Build Malaysian Hydro Plant". www.newenergy.com.cn, 21 October 2008. Available at http://www.newenergy.org.cn/html/00810/10210822114.html.

The Philippines is now almost a fully de-regulated market, except for the price setting of petroleum products. Unlike Indonesia, the country does not subsidise gasoline.

Ninety-nine per cent of the Philippines' oil consumption depends on imports, mainly from the Middle East. The country is relatively rich in recoverable coal reserves. In 2000, oil and coal comprised 60.2 per cent and 17 per cent of primary energy consumption respectively.[40] The structure of primary energy consumption in 2005 was as follows: 53 per cent of consumption was from oil, 19 per cent from coal, 15 per cent from renewables, 7 per cent from natural gas and 6 per cent from hydroelectricity. It implied that the domestic supply could only meet 40 per cent of the domestic energy consumption. According to the Philippines' 2005 Energy Plan, the country should be able to reach a 60 per cent level of self-sufficiency by 2010. 500 billion pesos (around US$9 billion) of government funds will be used to explore and produce oil and natural gas found in the South China Sea, Sulu Sea, North Luzon Island, Visayan Island and Mindanao Island, as well as to develop hydroelectricity, geothermal energy, coal energy and biomass energy.[41]

The Philippines invited bids for 46 blocks in the offshore Palawan and Sulu Seas in 2004. 16 international oil companies participated in the bidding round. 28 service contracts resulted from the Philippine Energy Contracting Round (PECR). The main programmes in 2007 were three exploration well projects: the first oil well project was led by UK oil company, Premier Oil, in the Raygay Gulf. PETRONAS

[40] Fu, *World Energy Outlook*, p. 9.; "Country Analysis Brief – The Philippines". General Background, EIA, August 2008. Available at http://www.eia.doe.gov/emeu/cabs/Philippines/Background.html. Data for the Philippines was mainly cited from this book and this brief.

[41] Guo Chunju, "The Philippines: Exploring South China Sea Implications For Nan Sha Island (the Spratly Islands)". *Can Kao Xiao Xi* (Reference News), 1 April 2004.

conducted the second oil well project in offshore Mindoro and the Japan Petroleum Exploration conducted the third oil well exploration project in the offshore Tanon Strait.

The Northwest Palawan Basin holds an estimated 23.5 million barrels of proven and probable oil reserves. The Calauit field, holding an estimated 40 million barrels of oil is due to come on-stream in 2009 after several delays. The field is expected to flow at a rate of between 10 to 15 Tbbl/d when it comes on-stream. The two largest proposed refinery projects are led by Pilipinas Shell and Petron. Pilipinas Shell is considering a $321 million upgrade of its Tabango refinery. Petron has spent $100 million on upgrading its facilities to produce cleaner fuels. Without a significant increase in refining capacity, the Philippines will experience a net deficit in oil products.[42]

Most of the Philippines' natural gas production is from the Malampaya field. The Malampaya gas field, discovered in 1992, lies 80 kilometres off the island of Palawan in the South China Sea, and can provide as much as 3000 megawatts of clean energy for the Luzon grid over a 20-year period.

The Malampaya Project was officially inaugurated in 2001 and is operated by Shell, Chevron and PNOC. These companies have come together to form the $4.5 billion Malampaya Deepwater Gas-to-Power Project. Foreign oil company, Forum Energy, plans to test drill at Sampaguita in the future and to consider a LNG project if the drill test confirms substantial natural gas reserves.

[42] "Country Analysis Brief – The Philippines". General Background, EIA, August 2008.

Thailand's Petroleum Authority of Thailand (PTT) Public Company Ltd is undertaking a feasibility study for a $700 million pipeline project in the Philippines. The new pipeline would be built to pump gas from an offshore field to Manila. The Philippines decided recently to promote the use of compressed natural gas (CNG) in vehicles. CNG was specifically targeted as natural gas is produced domestically and can help reduce dependence on diesel. The National Gas Vehicle Program for Public Transport seeks to supply around 200 CNG-fed buses.

In 2005, electricity generation reached 53.7 Bkwh. Half of the electricity was supplied by the National Power Corporation (NAPOCOR). In February 2007, PNOC started its commercial operations providing additional power capacity for the Visayas grid. Plans for the Nasulo Geothermal Power Project in Palinpinon and the Mindanao III in Mt. Apo, North Cotabato are already in order. Currently there are 14 mini-hydropower projects with completed feasibility studies. The volume of recoverable coal reserves in the Philippines ranks as the third largest among ASEAN countries. But the impetus to advance the coal industry remains largely absent. Two-thirds of the coal consumed domestically is imported from Indonesia, China and Australia.

Energy Cooperation between China and The Philippines Sino-Philippines energy cooperation began more than 30 years ago. China has been supplying 1.2 million tonnes of oil per year to the Philippines since 1979 under a trading agreement

signed in 1978.[43] Compared to energy investments in other ASEAN countries, China's energy companies in the Philippines are not quite as active. The situation has improved in recent years, however. China's Nanning Yongkai Industrial Company signed contracts with three Philippines partners to build three ethanol manufacturers in 2007.[44] In 2008, CNOOC was awarded a service contract by PNOC, and the Shenhua Group - the largest coal producer in China - promised to offer 1.82 million tonnes of coal under a renewed contract with NAPOCOR.[45] In January 2009, China's National Power Grid, invested US$3.9 billion to manage the Philippines' National Power Transmission System for a period of 25 years. It is to date, China's largest energy project in the Philippines.[46]

SINGAPORE Although Singapore has no oil and natural gas reserves, the country has a huge refining capacity, which accounts for 33.4 per cent of refined oil and natural gas in ASEAN. 10 per cent of Singapore's GDP is derived from the energy industry.

Singapore focuses its energy policy on maintaining its status as an oil refining & trading hub in Southeast Asia. Hence it emphasises two aspects: On the one hand, it encourages overseas investments and strengthens its relationships with oil producers;

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[43] Chen Hongyu, *Politics and Foreign Policy in ASEAN Countries*, Taipei: Bohaitang Culture Co., 1992, p. 69.

[44] "China and the Philippines to Cooperate to Build Three Ethanol Factories". Yiyuanshijie.com, 16 June 2007. Available at http://www.39kf.com/yyjj/biotechnology/03/2007-06-16-381200.shtml.

[45] "CNOOC and PNOC Signed Contract For Oil Field Technology Service". *Xinhua.net*, 17 January 2008. Available at http://news.xinhuanet.com/energy/2008-01/17/content_7441235.htm.
"Filipino NAPOCOR and Shenhua Group Signed Coal Contract". www.chinamining.com, 23 March 2007. Available at http://www.chinamining.com.cn/news/listnews.asp?classId=159&siteId=99401.

[46] "National Power Grid Receives Permission to Manage Filipino National Power Transmission System". State Grid Corporation of China site, 16 January 2009. Available at http://www.sgcc.com.cn/xwzx/gsyw/2009/0/180198.shtml.

on the other hand, it tries to attract more FDI to the oil refining and petrochemical industry, as well as encourage more oil products trading in its market. As far as the first aspect is concerned, Singapore's energy companies have made substantial investments in ASEAN countries, the Middle East, South Africa and South America. The Singapore Petroleum Company (SPC) has E&P operations in Vietnam's Song Hong Basin, the offshore East Java island, the lower part of the Gulf of Thailand, and Myanmar's Rakhine Coast. Singapore Power and its partner Babcock & Brown jointly forked out S$17.1 billion (approximately US$4.4 billion) to purchase Alinta, the largest energy company in Australia.[47]

There are three refineries in Singapore: ExxonMobil's 605 Tbbl/d Pulau Ayer Chawan facility on Jurong Island; Royal Dutch Shell's 458 Tbbld/ complex on Bukom Island; and SPC's Pulau Merlimau 273.6 Tbbl/d refinery. The artificial Jurong Island is the centre of Singapore's expanding petrochemicals industry, and is linked to the second aspect of Singapore's energy policy. ExxonMobil, Shell and Sumitomo Chemical have plans to commence large-scale projects concerning the production of ethylene, propylene and naphtha on the island. Chevron, BP, Total, Marubeni and Mitsui also have plans to build smaller petrochemical facilities there.

To promote foreign investment, the Singaporean government lowered its 50 per cent company tax levied on foreign oil companies based in Singapore. Singapore's Prime Minister, Lee Hsien Loong, and other officials have made 10 visits to Iran and the Middle East. The country and Jordan inked a free trade agreement in 2004.

[47] "Singapore Power and Babcock & Brown May Raise Offer For Alinta to Compete with Macquarie Bank". In-En.com, 17 April 2007. Available at ttp://www.in-en.com/newenergy/news/intl/2007/04/INEN_82081.html.

Singapore and the Gulf Cooperation Council did likewise in 2008.

Singapore imports natural gas from Malaysia and Indonesia via pipelines. Natural gas usage is rising rapidly, as the government promotes policies aimed at reducing carbon dioxide and sulphur emissions, ensuring energy security, and promoting the country as a regional hub for an integrated gas pipeline network. In 2003, the country reached its target of having 60 per cent of its electricity generated from natural gas. After the June 2004 power outages, the Energy System Review Committee suggested diversifying its sources of natural gas. Singapore is currently studying the viability of building a LNG facility, which may free the country of its dependence on neighbouring states' natural gas supplies. The government set aside land for the terminal in September 1999 at Tuas View, but the project was stalled for several years because LNG is more expensive than piped gas.

PowerSeraya, Senoko Power and Tuas Power are three state-owned electricity companies which supply 90 per cent of the city-state's electricity installed capacity. The government decided to privatise the electricity sector in 2001. In 2008, Senoko Power was sold to Marubeni Corporation and Tuas Power was purchased by China's Huaneng Group.[48]

Energy Cooperation between China and Singapore Singapore is the hub of oil refining, petrochemicals and trading in Southeast Asia, and China's energy companies predictably invest there. To date, over US$10 billion of Chinese

[48] "DJ Temasek has initiated the Procedure to Sell PowerSerava". CaiHuaNet.com, 7 October 2008. Available at http://www.caihuanet.com/zhuanlan/meiti/dowjones/200810/t20081007_321475.shtml.

investment dollars have flowed into the country. The following are some typical cases: China National Aviation Oil (Singapore) Ltd. (CAO) became the second largest shareholder of SPC in 2004.[49] The Universal Terminal, the largest commercial oil terminal in Asia with a storage capacity of 14.2 million barrels, located on Jurong Island, was completed in 2007. The terminal is a joint-venture between PetroChina, which holds a 35 per cent share, and Singapore's Hin Leong Trading Company which has a 65 per cent share. China's Huaneng Group paid S$4.235 billion (US$960 million) in cash to buy out Tuas Power in 2008.[50] It was reported that CNPC intends to finance several billion US dollars to build a world-class refinery in Singapore, which will have a refining capability of 4 to 5 billion barrels per day.[51]

THAILAND The Petroleum Authority of Thailand (PTT) is the administrative and managing institution for the country's oil and natural gas industry. Among its many subsidiaries is PTT Exploration and Production (PTT-EP), which dominates upstream activities while the Thailand Oil Company and the Banchack Petroleum Company are the main oil refining companies in the country.[52] Thailand entices foreign oil companies with its stable politics, open E&P market and attractive financial policies. Shell, ExxonMobil, Total, Chevron, Hess, Mitsui Oil Exploration

[49] "CAO Purchases Partial Rights of SPC". www.finance.sina.com, 18 August 2004. Available at http://finance.sina.com.cn/g/20040818/2338958701.shtml.
[50] "China's Huaneng Spends RMB 21 Billion on Purchasing Singapore's Tuas Power". www.cnfol.com, 17 March 2008. Available at http://hkstock.cnfol.com/080317/132,1709,3913045,00.shtml.
[51] "CNPC is Considering to Build a World Class Refinery in Singapore". www.jrj.com, 4 March 2008. Available at http://fund2.jrj.com.cn/news/2008-03-04/000003360419.html.
[52] "Petroleum Authority of Thailand, PTT". news.cnpc.com.cn, 2 March 2007. Available at http://www.oilnews.com.cn/bk/system/2007/03/02/001064719.shtml.

Company and CNPC are major international oil companies there.[53]

Thailand imports 99 per cent of its oil consumption, mainly from the Middle East. It initiated plans to explore land oil fields in the early 1960s, but the subsequent oil production was quite low. After the first oil crisis of 1973-1974, the country started to diversify energy consumption and strengthened the E&P of oil and natural gas reserves, especially offshore energy resources. 80 per cent of oil and natural gas production in the country are from the Mergwi Basin in the Andaman Sea and the Gulf of Thailand. However, future E&P projects will concentrate on the Khorat Plateau and the southern part of the Gulf of Thailand.

A diversification policy of energy consumption led to Thailand's decreased dependence on imported energy to 63 per cent in 1995 from 96 per cent in 1980.[54] The downward trend continued after that. Primary energy consumption in this country amounted to 63.7 million tonnes oil equivalent (Mtoe) in 2000, and the proportion of primary energy consumption from oil, natural gas and coal were 57.8 per cent, 25 per cent and 9.3 per cent respectively.[55] In 2007, Thailand's energy consumption grew to 85.6 Mtoe, but the proportion of consumption from oil, natural gas and coal were 50.23 per cent, 25 per cent, and 8.9 per cent, respectively.[56] From this, we see that the country had decreased its dependence on oil and alternatively rapidly increased its dependence on natural gas in primary energy consumption. Natural gas from the JDA Project in the southern region of the Gulf of Thailand will

[53] Yang, *Environment*, pp. 288–90.
[54] Lai (Ed.), *Oil and Natural Gas*, p. 247.
[55] Fu, *World Energy Outlook*, p. 27.
[56] *BP Statistical Review of World Energy*, pp. 40–1.

continually lift the share of natural gas in primary energy consumption. The share of hydroelectricity, which was 2.1 per cent in 2007, will definitely rise as the major portion of hydroelectricity produced in the Tasang plant will be sent to Thailand. The giant plant is a Sino-Thai joint venture and the Chinese call it "Myanmar's Three Gorges Power Station".

Table 7 Energy consumption in Thailand (1997-2007)

Year	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Consumption (Mtoe)	62.7	59.7	61.4	63.7	65.6	71.5	77.0	83.3	80.5	82.7	85.6

Source: *BP Statistical Review of World Energy June 2000*, p. 40.
Note: Mtoe refers to million tonnes oil equivalent.

Thailand has been rapidly expanding its refining capacity and petrochemical industry. In 2005, its refining capacity met 78.72 per cent of home demand though oil production met only 30.88 per cent of domestic demand; imported natural gas met 27.21 of the domestic demand, which amounted to 313 Tcf. The three blocks in the southern part of the Gulf of Thailand offers 317.55 trillion cubic feet annually. Other fields will probably increase production of natural gas too. Based on these figures, Thailand will realise its goal of becoming a 100 per cent self-sufficient in natural gas and even take on the role of a gas exporter.[57]

Thailand harbours an ambition of becoming a regional energy hub. It has made

[57] "Country Analysis Brief – Malaysia". March 2007.

some effort in trying to achieve this. The first step was to build the Sriracha Oil Centre, which contained facilities for oil trading, refining, petrochemical storage and transportation. A new refinery refines 1 million barrels of oil per day although there are currently a total of six refineries. The remaining refineries are only in partial operation and they collectively refine 600 Tbbl/d. The centre is located in an oil free trade zone which offers a special taxation policy. A pipeline was also built to transport oil products from the centre to the north and northeast of Thailand, and even to the southwest of China. In doing so, the centre connects producers and consumers - especially those in India, Vietnam and China - with the region.[58]

The second step is to develop the Isthmus of Kra. A proposal was put forth to develop a Kra Canal, with a proposed size of 102 kilometres in length, 400 metres in width and 25 metres in depth, but this plan, although sound, has been put on hold at least for the next decade. An alternative plan for the canal is to construct a 260-kilometres-long cross-Isthmus oil pipeline, with the capacity to transport at least 1.5 billion barrels of crude oil a day, as well as to the capacity to store 20 million barrels of oil. Economic effects of the project are controversial and, the project has yet to be implemented due to the lack of government funds, partly because of Thailand's unstable political situation in recent years.

Energy Cooperation between China and Thailand Energy companies from the two countries are seemingly interested in cooperation in third countries. The

[58] Yuan Yuan, "Thailand Plans to Build Pipeline on Isthmus of Kra". *Can Kao Xiao Xi* (Reference News), 26 February 2004.

Tasang Power Station in Myanmar is a joint construction project built by China's Gezhouba Group and Thailand's MDX Group.[59] CNOOC and PTT-EP also conducted joint explorations in Myanmar's Gulf of Martaban in 2008.[60] However, China's energy companies are not quite active in Thailand except for CNPC. In 2003, CNPC won an acreage offering in central Thailand.[61] Two years later, it was reported that CNPC was spending US$900 million to build a gas-based cracker project at Sichol, Nakhon Si Thammarat.[62] In addition, China's Sinohydro Corporation was contracted in 1999 to take on the Kelongtaidan project, which involved developing the world's leading giant concrete pipes.[63]

VIETNAM Vietnam opened its energy resources for E&P to international companies in 1987, a year after the implementation of its "Innovation and Open-up Policy". The production of oil and natural gas in the country rapidly increased and 79 per cent of oil production was channelled for export in 1995. That Vietnam made an amendment to its energy law in 2000 functioned as a strong impetus for foreign oil companies to set up shop there. The country has become a main hydrocarbon energy producer in ASEAN and will probably grow into a main natural gas exporter in the region. Vietsovpetro (VSP), a Vietnam-Russia joint-venture, is the largest oil and

[59] "SINOPEC Imports 2400 Tonnes of LPG From Thailand This Year". www.guojin.cn, 4 April 2005. Available at http://www.boho.com.cn/news.asp?id=152856&typeid=1000000.
[60] "Thailand and CNPC Cooperate to Explore Oil and Gas in Myanmar". www.nengyuan.net, 21 February 2008. Available at http://www.nengyuan.net/shiyouhuagong/synews/2008/2/21/NY333FD1CG.html.
[61] "CNPC Clinched E&P Contract in Thailand". china.com.cn, 25 July 2003. Available at http://www.china.com.cn/chinese/jingji/373245.htm.
[62] "CNPC Plans to Build a Gas-based Cracker Plant". chem99.com, 5 May 2005. Available at http://chem.chem99.com/news/19941.html.
[63] "China Water Conservancy and Hydropower Construction Corporation – SINOHYDRO: Efforts to Implement Strategy of 'Coming Out' in the International Market Continuously Seeking Greater Development". Available at http://www.robroad.com/data/2006/0723/article_95878_1.htm.

gas producer in the country. Vietnam Oil and Gas Corporation (Petrovietnam), a giant company under the control of the Minister of Industry, dominates the oil sector. All oil production in the country is carried out either by Petrovietnam, or through PSCs or joint-ventures. The company has formed partnerships with many foreign oil companies such as BP, ConocoPhillips, Korea National Oil Corporation (KNOC), Malaysia's PETRONAS, Nippon Oil of Japan, Norway's Statoil and Canada's Talisman. Petrovietnam also controls Vietnam's downstream oil sector through various subsidiaries. The government began privatising the national oil company's non-oil-related business units in 2006.

Vietnam currently produces oil from nine offshore fields, the largest of which is the Bach Ho (White Tiger) field operated by Vietsovpetro. The field produces about half of the country's crude oil.[64] Its declining output is largely linked to the decrease of Vietnam's oil production in recent years.[65] The main fields in the offshore Cuu Long Basin are Su Tu field, Phuong Dong field and Ca Ngu Vang field. E&P activities in the Malay Basin and Nam Con Son Basin are quite active. Energy resources in the Song Hong Basin are estimated to be 5 billion tonnes of oil equivalent. Vietnam offered seven blocks for bidding in 2007.

Vietnam mainly exports crude oil to Australia, the United States, Japan, Singapore and Thailand while its coal goes to China and Japan. Vietnam imports all of its oil products because of the lack of local oil refineries. Petrolimex - a subsidiary of Petrovietnam - imports 60 per cent of oil products and owns 300 miles

[64] "Country Analysis Brief – Vietnam". General Background, EIA, July 2007. Available at http://www.eia.doe.gov/emeu/cabs/Vietnam/Background.html.
[65] *BP Statistical Review of World Energy June 2008*, p. 8.

(approximately 483 kilometres) of oil pipelines. The situation is beginning to change for four refineries will be constructed in the next decade. Vietnam's first refinery, located in the Dung Quat Economic Zone of central Vietnam's Quang Ngai province, started to manufacture oil products in February 2009. Its refining capacity is 140 Tbbl/d.[66] The second refinery with a 160 Tbbl/d refining capacity is the Vung Ro refinery, which is located in South Vietnam's Dong Hoa district in Phu Yen province. The Nghi Son Industrial Zone in the north will have the third refinery with a refining capacity of 200 Tbbl/d. The fourth one will be constructed in Nha Trang city, Khanh Hoa province of central Vietnam and will add a 200 Tbbl/d refining capacity to the other three. This will bring the total refining capacity of Vietnam to 700 Tbbl/d. Vietnam consumed 276 Tbbl/d in 2006. The difference of 424 000 barrels is slightly more than Singapore's export volume in 2005. Vietnam will not consume the difference in one decade. We therefore may safely conclude that Vietnam will become another oil exporter in ASEAN.[67]

Petrovietnam also dominates Vietnam's gas sector. Most of the country's natural gas is used for manufacturing and electricity generation. The largest gas project in Vietnam is the $1.3-billion Nam Con Son Gas Project (NCSGP). The NCSGP is an integrated gas-to-power project that delivers natural gas supplies from the offshore oil fields to the Phu My power complex via a 230-mile (approximately 370 kilometres) subsea pipeline.[68] KNOC and Petrovietnam also started natural gas

[66] "Petrovietnam Increases Investment to Dung Quat Refinery". oil.IN-EN.com, 20 February 2009. Available at http://www.in-en.com/oil/html/oil-1707170785303347.html.
[67] "Petrovietnam Authorises Contract For Design of Nghi Son Refinery". www.oilchina.com, 23 July 2008. Available at http://www.oilchina.com/syxw/20080723/news200807230352491593 4.html.
[68] "Vietnam Starts Use of its Largest Electricity Syndicate". Chinapower.com.cn, 21 April 2005. Available at

production at two new fields in the Nam Con Son Basin, the Rong Doi (Twin Dragon) and Rong Doi Tay (Twin Dragon West) fields in November 2006. Cuu Long Basin and Song Hong Basin are another two areas that produce natural gas.

Vietnam intends to build 74 power stations in 2020 and natural gas will play a critical role in this plan. A nuclear power plant is in the works. State-owned Electricité de Vietnam (EVN) dominates the generation, transmission, distribution, and sale of electricity in Vietnam. Barriers to foreign and private company participation have been lifted as of 2002. Independent power producers currently account for 19 per cent of Vietnam's electricity generating capacity.

Petrovietnam has extended its business to overseas markets. Involvement in foreign upstream oil sectors in energy exploration has been stepped up by its overseas subsidiaries in Algeria, Iraq, Madagascar, Venezuela, Mongolia, Indonesia and Malaysia.[69]

Energy Cooperation between China and Vietnam The booming Vietnamese energy market appears attractive to Chinese energy companies. They have invested over US$6 billion in Vietnam since 2006. China's Harbin Electricity Engineering Company and Vietnam's Cam Pha Thermal Electricity Generation Holding Company are jointly financing US$348 million to build a thermal electricity generation plant in Cam Pha Town, Quang Ninh province. CNOOC and Petrovietnam are cooperating

http://www.chnapower.com.cn/newsarticle/1022/new1022547.asp; "Largest Electricity-generation Facility in Vietnam Built in Vung Tau Province". Chinapower.com.cn, 14 April 2005. Available at http://www.chinapower.com.cn/newsarticle/1022/new1022407.asp.

[69] "Petrovietnam Learns From CNPC". China Energy Investment Net, 10 October 2007. Available at http://www.ccei.org.cn/shownews.asp?ID=24581.

to explore oil and natural gas in the Beibu Gulf (the Gulf of Tokin). CNPC won a contract to construct a coal-to-chemical fertilizer project.[70] China's Southern Power Grid and Vietnam Coal & Mining Group will build a RMB 8 billion (US$1.14 billion) thermal electricity plant in Vinh Tan, Binh Thuan province.[71] US$4.5 billion will also be given by SINOPEC and Petrolimex to build the Nha Trang refinery.[72]

The pages above show evidence of energy development as well as bilateral energy cooperation between China and eight ASEAN countries. Progress has also been made in regional energy cooperation. According to the ASEAN Petroleum Security Agreement (APSA) signed in 1986, signatories promised to cooperate when indicators point to an emerging oil supply shortage. APSA would be triggered once the oil supply for importing countries drops to 80 per cent of its demand.[73] ASEAN initiated trans-national arrangements for electricity, natural gas and water resources in 1997. These agreements are steps in the right direction. Besides the TAGP, ASEAN countries also signed a MoU on building the Trans-ASEAN Power Grid (TAPG) in 2007.[74]

[70] "CNPC, CNOOC and Vietnam Sign Agreement on Oil and Gas Cooperation". www.cust.com.cn, 24 November 2006. Available at http://www.cust.com.cn/detail_jkjt.aspx?sid=58002.
[71] "Southern Power Grid and Vietnam Partner to Jointly Invest in Building Top Programme". www.sina.com.cn, 13 September 2007. Available at http://finance.sina.com.cn/g/20070913/15231664770.shtml.
[72] "SINOPEC Will Build a Joint-Venture Refinery in Vietnam". tech.QQ.com, 22 July 2008. Available at http://tech.qq.com/a/20080722/000246.htm.
[73] Wu, *China Petroleum Security*, p. 242.
[74] "Memorandum of Understanding on the ASEAN Power Grid". www.aseansec.org, 2008. Available at http://www.aseansec.org/20918.htm.

3. The South China Sea Issue: a Cooperative Zone for Energy Exploration?

The South China Sea definitely serves as a main platform for energy cooperation between China and ASEAN. The South China Sea is a huge body of water where hundreds of small islands are located. There are four archipelagos in this area. These are namely the Dong Sha Islands (the Pratas Islands) in the northeast, the Zhong Sha Islands (the Macclesfield Islands) in the centre and east of the South China Sea, the Xi Sha Islands (the Paracel Islands) in the west, and the Nan Sha Islands (the Spratly Islands) in the south. Brunei, Indonesia, Malaysia, the Philippines, Vietnam, China and Taiwan are the respective six countries and seven parties who claim sovereignty over islands in the South China Sea, with the main islands of dispute being the Spratly Islands. There are 258 named islands (including reefs, shoals and continental shelves) in the South China Sea, among which 230 are found in the area surrounding the Spratly Islands.[75]

China has not explored energy resources in the Spratly Islands. The other five countries have offered bids to over 200 companies that have drilled more than 1000 wells. Oil production from those wells amount to 500 billion tonnes per year in 2004.[76] To give a comparison, Daqing field, the largest field in China, only produced about 400 million tonnes annually in recent years.

70 per cent of hydrocarbons found in the South China Sea come in the form of natural gas. The US Geological Survey estimated the total sum of discovered

[75] Jiang Huai, "Nan Sha Islands: China Owns Absolute Sovereignty". *World Affairs*, no. 5, 2009, pp. 28–9.
[76] Wu Shicun, "Time to Explore South China Sea Energy". *Can Kao Xiao Xi* (Reference News), April 2004.

reserves and undiscovered resources in the offshore basins of the South China Sea at 28 billion barrels.[77] China's scholars estimated the potential oil resources found in the South China Sea to be as high as 294 billion barrels of oil, of which 26.8 billion tonnes (196.98 billion barrels) of oil and 41 trillion cubic metres (144.73 Tcf) of natural gas are located in the Spratly Islands.[78]

Oil and natural gas in the South China Sea are critical energy resources for Brunei, Indonesia, Malaysia, the Philippines and Vietnam.

According to the United Nations Convention on the Law of the Sea (UNCLOS), all signatories must submit their claims on their country's Exclusive Economic Zone (EEZ) and continental shelf by May 13, 2009. The related committee will then handle the territorial disputes between signatories. This led recently to some countries issuing formal claims on disputed islands.

Table 8 Claims by country

Country	**South China Sea**	**Spratly Islands**	**Paracel Islands**
Brunei	UNCLOS	No formal claim	No
China	All*	All (11)	All
Indonesia	UNCLOS	No	No
Malaysia	UNCLOS	6 islands	No
The Philippines	Significant portions	9 islands	No
Taiwan	All*	All (1)	All
Vietnam	All*	All (28)	All

Sources:

1) "Unpredictable Events Emerge in South China Sea Again". Hexun.com, 12 March 2009. Available at http://finance.baidu.com/2009-03-12/115561883.html.
2) EIA report, "South China Sea Territorial Issues". EIA, March 2008. Available at http://www.eia.doe.gov/emeu/cabs/South_China_Sea/SouthChinaSeaTerritorialIssues.html.

Note: *excluding buffer zone along littoral states (calculations for buffer unknown). The numbers in the brackets refer to islands under actual control.

[77] "South China Sea Oil & Natural Gas". EIA, March 2008. Available at http://www.eia.doe.gov/emeu/cabs/South_China_Sea/OilNaturalGas.html.
[78] Wu, April 2004.

Brunei Brunei claims sovereignty over the Nan Tong reef in its EEZ. The Brunei-Sabah Basin is rich in oil & natural gas resources, with bidding blocks for Brunei and Malaysia overlapping each other. The Malaysian navy repelled Total S.A. from the block offered by Brunei when the French oil company explored the disputed area in 2003. This led to a six-year halt in E&P activities in the area.

Discoveries of oil in 2002 and 2004 (by Murphy Oil and Shell Malaysia, respectively) off the coast of Sabah have contributed to the dispute between Malaysia and Brunei over offshore rights. When Brunei gave up claims of sovereignty for the Limbang area of Sarawak, Malaysia agreed to develop energy resources in the disputed offshore area with Brunei.[79]

Indonesia Indonesia claims an EEZ and continental shelf in the South China Sea, but it has not made a claim for the Spratly Islands. The Natuna Islands are rich in natural gas with recoverable reserves of 46 Tcf. The D-Alpha field, the largest gas field in Indonesia, is located in the northeast Natuna Islands, 225 kilometres away from the island. Natural gas extracted from the field is exported via the 400-mile (approximately 644 kilometres), 325 Mcf/d subsea pipeline from West Natuna to Singapore. A part of the East Natuna Basin is in the waters claimed by China. Before a viable solution to resolve the dispute of waters and lands surrounding the Spratly Islands is found, Indonesia intends to simply matters by avoiding being part of the current dispute, and intends to focus on natural gas E&P activities instead.

[79] "Brunei and Malaysia Reaches 'Territory for Oil' Agreement". www.sina.com.cn, 18 March 2009. Available at http://news.sina.com.cn/w/2009-03-18/023915323959s.shtml.

Malaysia Malaysia demarcated its boundary using the continental shelf and EEZ principles. It occupies six islands of the Spratly Islands. Many Malaysian natural gas fields located in offshore Sarawak are also claimed by China. However, China to date has not specifically objected to their development.[80]

The waters claimed by Malaysia contain 50 per cent of its oil reserves and 49 per cent of its natural gas reserves.[81] By exploring 90 wells, Malaysia harvested half of its oil production from the Spratly Islands in 2004.[82] It has been rapidly drawing oil and natural gas in this area while attempting to obtain a resolution on the boundary issue in its favour from the UN committee simultaneously. Former Malaysian Prime Minister, Abdullah Ahmad Badawi, declared Malaysia's "sovereignty" and laid territorial claim over the disputed area, and established a presence on Dan Wan reef and Xing Zai reef on March 5, 2009.[83]

The Philippines The Philippines endeavours to divide the South China Sea in accordance with the continental shelf principle and claims sovereignty for about half of the South China Sea. Through E&P projects in the Spratly Islands (known as the Kalayaan Islands in the Philippines), the Philippines has explored the Malampaya field and the Camago field. Both fields are estimated to contain a combined amount of 2.3 to 4.4 Tcf of natural gas reserves. The Philippines has proceeded with the

[80] "South China Sea Territorial Issues", EIA, March 2008. Available at http://www.eia.doe.gov/emeu/cabs/South_China_Sea/SouthChinaSeaTerritorialIssues.html.
[81] "Statistics of Oil and Natural Gas in South China Sea and Waters off Nan Sha Islands". www.nansha.org.cn, 7 June 2005. Available at http://www.nansha.org.cn/statistics/1/index.html.
[82] Michael Richardson, "Oil and Natural Gas Resources in Sea Links to China's Future", *The Strait Times*, 9 July 2004; Lai (Ed.), *Oil and Natural Gas*, pp. 247–8.
[83] "Unpredictable Developments Emerge in South China Sea". Hexun.com, 12 March 2009.

development of the fields and linked gas output to three of its power plants via a 312-mile-long (about 502 kilometre-long) pipeline. There have been no objections so far from China regarding this development. The Malampaya field has an estimated 150 million barrels worth of oil as of January 2008. Plans are underway to begin international bidding rounds for the development of the field. The Philippines actually occupies nine islands and has built a military centre to govern affairs concerning the Spratly Islands on Zhong Ye Island, a main island located within the cluster of the Spratly Islands.

On February 17, 2009, the Philippines laid claim to Huang Yan island, the sole island above water in the Dong Sha Islands (Macclesfield Islands), and some islands of the Spratly Islands when the president of the Philippines, Gloria Macapagal-Arroyo signed a bill that made the territorial claim passed by the Philippine Congress into law.[84]

The waters claimed by the Philippines partially overlap with the waters claimed by China, Vietnam and Malaysia. Hence, it probably holds a positive attitude towards resolving the maritime dispute through multi-lateral cooperation.

Vietnam Vietnam claims a significant portion of the South China Sea as its own, according to its EEZ and the continental shelf principle. Vietnam laid its territorial claim on all of the Paracel Islands (known as the Hoang Sa Islands in Vietnam) and all of the Spratly Islands (known as the Truong Sa Islands in Vietnam).

[84] "Unpredictable Events Emerge in South China Sea Again." Hexun.com, 12 March 2009.

The country currently occupies 28 of the more than 230 islands in the area. It has built a logistical base for offshore E&P activities on Nan Wei Island.

Most of Vietnam's crude oil and natural gas are produced in offshore Vung Tau and northwest of the Spratly Islands. Fields in the Song Hong Basin have yet to be tapped for energy production. Both the White Tiger field and Dragon field are 150 kilometres away from Vung Tau. The Big Bear field is 250 kilometres away from the city and lies close to the Vietnam-China border. Blue field, located in Wan An shoal, is 400 kilometres away from the coast and is situated in China's territory. But Vietnam has staked its claim over it, saying that the Wan An shoal lies in its continental shelf.[85]

Positive Sino-Vietnamese relations have led to the swift resolution of disputes related to continental boundaries and the Gulf of Tokin. Both countries are already undertaking a joint exploration project in the gulf. The South China Sea dispute is not a critical and emergent issue for them. Vietnam would not stage a political showdown with China over it. Therefore, it is possible for these two countries to establish a zone of bilateral cooperation in the Spratly Islands.

China China has control over all islands in the area of the Paracel Islands since 1974. China's claims to the South China Sea are based on the EEZ and continental shelf principle as well as on historical records of the Han (110 AD) and Ming (1403-1433 AD) Dynasties. It lays claim to almost all of the South China Sea and

[85] Zhuan Zaizi, "Vietnam Develops Offshore Oil Fields". National Institute for South China Sea Studies, 22 March 2006. Available at http://www.nanhai.org.cn/news/news_info.asp?ArticleID=462.

all of the Spratly Islands, occupying 11 islands of the Spratly Islands.

China's offshore E&P projects are limited to the Pearl River Mouth Basin and the coastal area of Hainan province. It has no E&P projects in the Spratly Islands. CNOOC, which was then China's only oil company in charge of offshore E&P projects, offered a five-year-bid to America's Crestone Energy Company in 1992. The block named Wan An North-21 block, is located to the west of the Spratly Islands, and spans an area of 25 000 square kilometres. No exploration activities however, were conducted until the bid was sold to Baken Oscar Company in 1996 because of objections from Vietnam.[86] In 2005, Vietnam participated in the Joint Marine Seismic Undertaking (JMSU) signed in 2004. The oil and gas exploration agreement expired in 2008 and has since not been extended as a result of domestic politics in the Philippines.[87]

China's standpoint is clear. It wants to avoid maritime disputes, conduct joint E&P activities and resolve disputes by peaceful means. Now the ball seems to be in the ASEAN countries' court. Since 2004, the annual Philippine-US joint military exercise named "Shoulder to Shoulder" was moved to Zhongye Island, a main island of the Spratly Islands. Malaysia, the Philippines and Vietnam continue to conduct E&P activities in their so-called continental shelves.

China will probably continue to adhere to its anti-conflict position. The UN

[86] Zha Daojiong, *China's Petroleum Security: an International Political Economy Perspective*, Beijing: Contemporary Press 2005, pp. 195–6.

[87] Abigail L. Ho, "RP-China-Vietnam Exploration Deal On Spratlys Lapses 2008-07", *Philippine Daily Enquirer*, 15 July 2008. Available at http://www.nansha.org.cn/forum/viewtopic.php?p=2928#p2928. A Filipino scholar told me that domestic politics prevented his government to move beyond seismic undertakings which are viewed as academic research in the Philippines. Antonio Cailao, president of the Philippine National Oil Company also stressed that "the tripartite deal was purely a commercial agreement and not at all political, even with the inclusion of the disputed Spratlys."

committee on boundary issues provides an additional platform for multi-lateral collaboration.

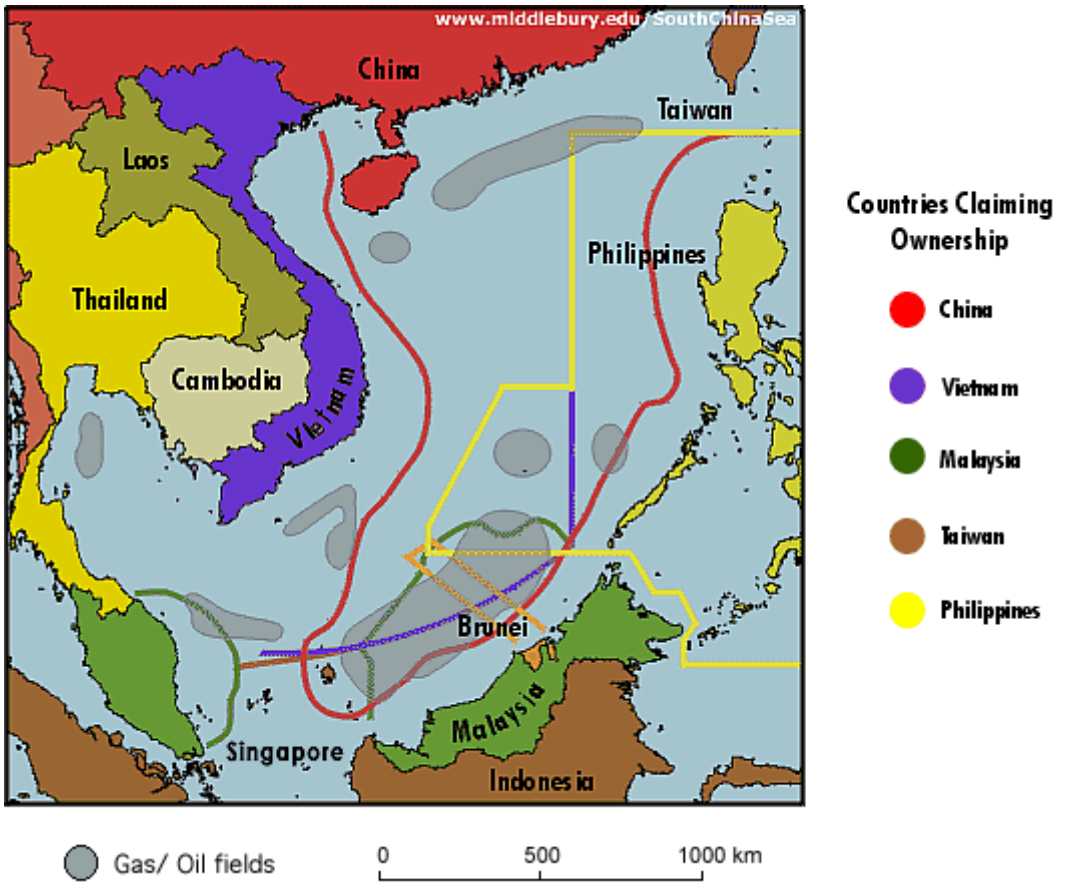
Taiwan The boundary it claims is similar to that of mainland China. Taiwan has since 1946, occupied Taiping island, the largest of the Spratly Islands. Taiwan also occupies the Pratas Islands. It has minimal E&P projects in the South China Sea. It was nevertheless reported in 2008 that Taiwan's China Petroleum Company (CPC) and CNOOC would jointly explore energy resources in the East China Sea.[88]

Figures 1 and 2 show that the areas claimed by the Six Countries and Seven Parties in the South China Sea overlap, particularly in relation to the Spratly Islands. This indicates that the South China Sea maritime dispute should be and can only be resolved under a bilateral framework. China and ASEAN countries have promised to "undertake to resolve their territorial and jurisdictional disputes by peaceful means" without "resorting to the threat or the use of force" in accordance with the Declaration on the Code of Conduct on the South China Sea. Signatories of the Cebu Declaration on East Asian Energy Security agreed to create an open, competitive regional and international market. However, these are political declarations and lack legal constraints for participating countries. Any unilateral attempts to stake territorial claims over parts of the disputed waters will definitely result in conflict and destroy the peace and stability in the region. Self-restraint, which has been practised

[88] "CNOOC and Taiwan Oil Company Join Hands to Explore Oil in East China Sea". www.wefweb.com, 3 September 2008. Available at http://www.wefweb.com/news/200893/1442314707.shtml.

for the past two decades, by the six countries and seven parties involved, especially by China and Taiwan, is absolutely necessary on the one hand but is definitely not enough to solve the dispute on the other. The time is ripe for all seven parties to work out a multi-lateral framework for regular interaction over the South China Sea issue. That is probably the best way forward to develop further constructive measures on the E&P of energy resources in the area. To sum it up, all six countries and seven parties need to gradually integrate their standpoints in order to make the South China Sea issue a positive factor in Sino-ASEAN energy cooperation and East Asian integration.

Figure 1 South China Sea boundary lines claimed by countries



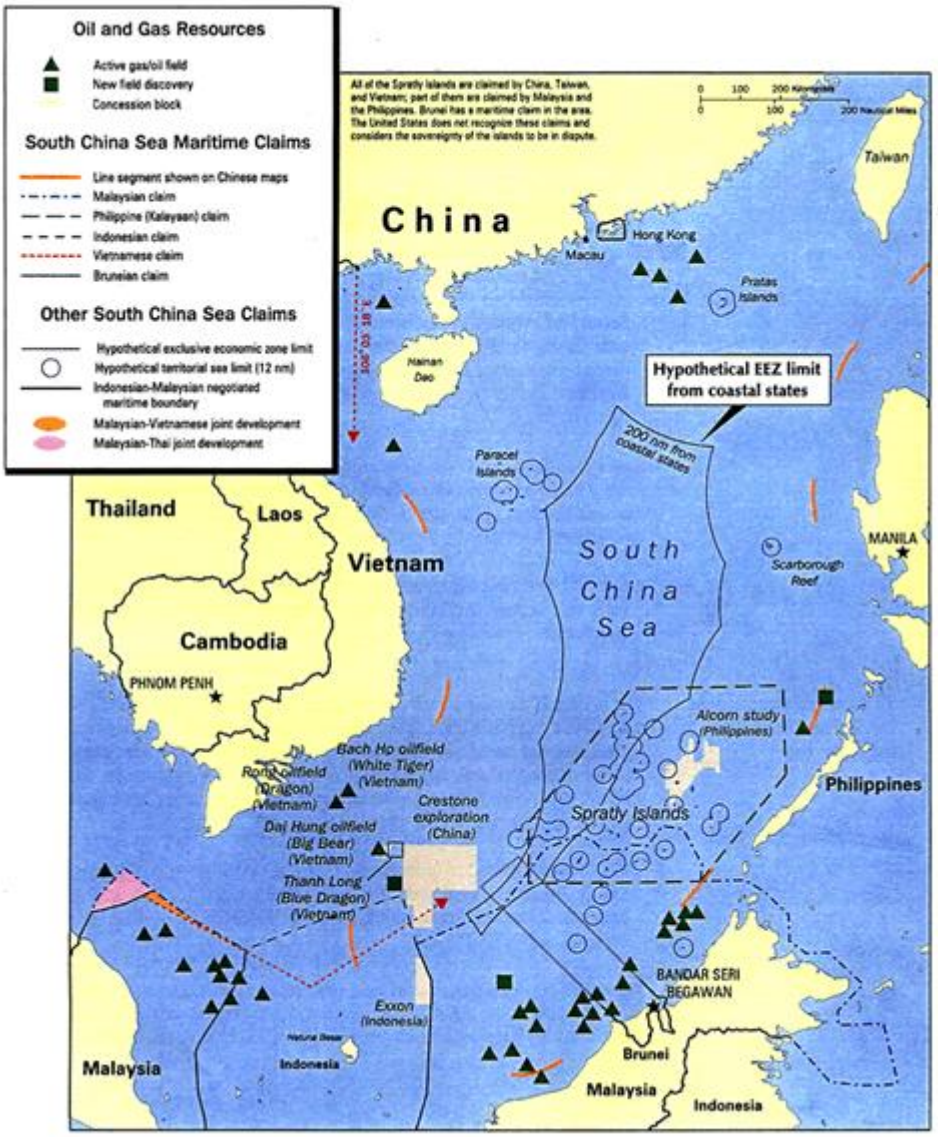
Source: "South China Sea Territorial Issues", EIA, March 2008. Available at http://www.eia.doe.gov/emeu/cabs/South_China_Sea/SouthChinaSeaTerritorialIssues.html.

The practical way forward for South China Sea energy exploration is to suspend all sovereignty disputes and to develop bilateral or multi-lateral E&P cooperation. China, Vietnam and the Philippines have taken a mutually-beneficial step with the signing of the JMSU. The agreement allowed the state oil firms of the Philippines, China and Vietnam to conduct seismic studies in disputed areas of the South China Sea, including the Spratly Islands that were being claimed by the three countries and other nations. The agreement covered 142 886 square kilometres and allowed for seismic information acquisition, processing and interpretation, but did not include actual exploration. The agreement was born from the need to find indigenous energy resources, not only for individual countries but also for the entire region, said Antonio Cailao, president of the Philippine National Oil Company[89] The Wan An shoal also serves as a milestone in Sino-Vietnam joint energy exploration in the Paracel Islands.[90]

[89] Abigail L. Ho, "RP-China-Vietnam Exploration Deal On Spratlys Lapses", *Philippine Daily Enquirer*, 15 July 2008. Available at http://www.nansha.org.cn/forum/viewtopic.php?p=2928.

[90] I discussed this issue with scholars from the Vietnamese Academy of Social Sciences when visiting Vietnam in early October 2008. We suggested having a Track Two discussion by scholars from two countries, which would present a joint E&P plan to governments.

Figure 2: Competing claims in the South China Sea

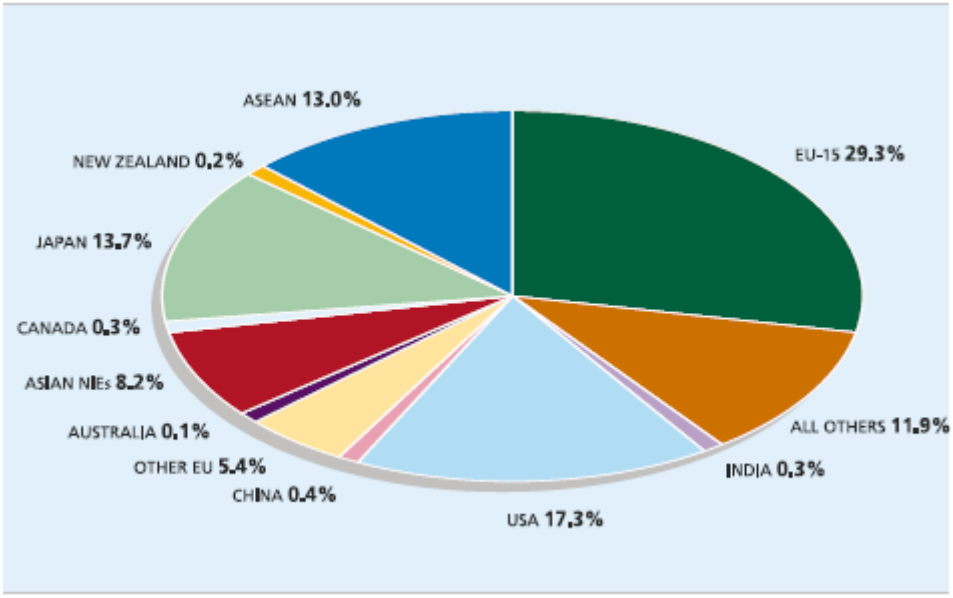


Source: Central Intelligence Agency.

4. Conclusion and Suggestions

China's FDI in ASEAN plays an important role in Sino-ASEAN energy cooperation. Figure 3 represents world foreign direct investment in ASEAN from 1995 to 2004 and Table 9 sums up China's FDI in the bloc during the same period.

Figure 3 World Foreign Direct Investment in ASEAN by Source Country, 1995-2004



China's FDI in ASEAN is US$1.018 billion or 0.4 per cent of total FDI, falling within the same range as the investment levels of India and Canada in the bloc, but much less than that of Japan (13.7 per cent), the US (17.3 per cent) and the European Union (29.3 per cent). FDI figures of these countries in ASEAN vary over the years. Only after 2003 has the FDI trend moved upwards. The second part of this paper shows that China has since 2005 sharply increased its FDI in the energy sectors of the countries in this region. China's total investment figures in the many energy development projects in ASEAN exceed US$10 billion. It implies that China does pay more attention to Sino-ASEAN energy cooperation with the growth of economic power. Nevertheless, we should look beyond narrow perspectives and adopt a broader overview of Sino-ASEAN cooperation which is a component of East Asian integration.

Table 9 China's FDI in ASEAN, 1995-2004 (US$ million)

Year	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	**Total**
Sum	136.7	117.9	62.1	291.3	62.5	-133.4	147.3	-80.9	188.7	225.9	1,018.0

Source: ASEAN Secretariat, *ASEAN Statistical Yearbook 2005*, p. 142.

Regional integration in North America, Europe and other areas "forces" East Asian countries to follow suit if they do not wish to be left behind by the forces of globalisation. China-ASEAN economic cooperation is a must rather than a necessity.

Energy cooperation between China and ASEAN member states may be divided into two parts: bilateral cooperation and multi-lateral cooperation. Bilateral energy cooperation refers to energy cooperation between China and one ASEAN member state, including mutual investment and joint investment in third countries outside the region. There is no big obstacle to bilateral energy cooperation and the current positive trend will continue. What China should realise is that other than those profitable investments, more ODA programmes should be set up. Both energy investment and ODA in poor fossil energy countries like the Philippines, Laos and Cambodia lag far behind that in Indonesia and Myanmar. ASEAN countries should also look beyond economic profit when cooperating with China. A good example of this would be Malaysia's PETRONAS which offered a special price of US$5-6 per

British thermal unit (Btu) for the Shanghai LNG project, the first LNG development in China's coastal area. The market price was US$9-11 per Btu.[91] Malaysia is striving to be Southeast Asia's natural gas hub. The country is willing to work towards compromise for the sake of its long-term national interests, as it needs to build a stable long-term relationship with China in order to develop strong economic ties with the country.

Multi-lateral energy cooperation refers to energy cooperation between China and ASEAN as a whole, or between China and two to nine ASEAN countries. Global climate change, piracy in the Straits of Malacca and the South China Sea disputes are part of several problems in the region. As an emerging great power and a participant of the Cebu Declaration on East Asian Energy Security, China has a special responsibility to promote regional development. Besides profitable energy investments, China should initiate more energy ODA programmes in ASEAN countries that lack fossil energy resources, especially in Laos and Cambodia. The TAGP and TAGP also serve as platforms for multi-lateral energy cooperation.

The Asia-Pacific area, consisting of Southeast Asia, Northeast Asia, South Asia and Oceania, is relatively poor in fossil energy resources compared to other regions in the world. The proven oil and natural gas reserves in the area account for only 3.7 and 8.1 per cent of the world's reserves, respectively. Hence, all countries situated in the South China Sea are inclined to pay close attention to available energy resources under the sea, allowing for the South China Sea dispute to grow into potentially

[91] "CNOOC Holds LNG From Malaysia to Offset 'Asia Premium'". Custeel.com, 19 September 2006. Available at http://www.custeel.com/Scripts/viewArticle.jsp?articleID=850340.

critical territorial disputes between China and some ASEAN countries. The disputes manifest the inherent flaws in the nation-state system and consequently cannot be resolved within the framework of state sovereignty. Although ASEAN countries and China are latecomers to the nation-state system, there has been a long historical tradition of friendly co-existence and a spirit of neighbourliness between them. It is certainly possible for them to think of new ways to resolve problems. The idea is to make a mental shift from viewing energy resources as 'MY' energy to regarding it as 'OUR' energy, and contribute efforts to making the South China Sea a zone of regional cooperation. The successful outcome of the Early Harvest Package reminds us of the possibility of cooperation in sensitive issues as long as both sides are keen to move forward. It is time to move on with respect to the South China Sea issue. In general, China has practised self-restraint in the past two decades and has made no unilateral attempts to explore energy resources in the Spratly Islands. Therefore, it is hard to believe that China has any intentions of being the 'gorilla' in its neighbour's living room.[92] Other countries also need to practise restraint and not attempt to further develop E&P activities of hydrocarbon resources there alone.

As part of the resolution of the South China Sea dispute, we propose the establishment of a South China Sea Energy Development Organisation (SEDO). As a first step, this institution can organise a comprehensive geological survey of deep-sea energy resources. Following which, certain small areas can be flagged as potentially cooperative zones for E&P projects. This exercise will give all

[92] Bai Shenghui, "The Gorilla in the Living Room". *The Strait Times*, 28 March 2009. Quoted from *Can Kao Xiao Xi* (Reference News), 2 April 2009.

participating countries the opportunity to accumulate experience for improving cooperation, build confidence, and profit from the projects at the same time. The cooperative zones may be extended when all participants agree to further the extent of energy E&P cooperation. In doing so, China and ASEAN will be able to convert South China Sea energy resources from being sources of dispute to becoming a binder and accelerator of East Asian integration.