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ASEAN Energy Cooperation
An Increasingly Daunting Challenge

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Introduction

East Asia has been the fastest growing region in the world since the early 1980s. Arguably, all countries in the region are set for a period of economic, to some extent demographic, and urban expansion. Since energy is a vital factor in driving economic growth, higher energy consumption can be expected in the coming decades in this part of the world. Although the strong growth is to a large extent due to China, Southeast Asian economies also record stellar economic performances and account for the dramatic rise in energy consumption. The Toyko-based Asia-Pacific Energy Research Centre (APERC) projects that energy demand in the region (excluding Cambodia, Laos, and Myanmar) will double from 252 million tons of oil equivalent (mtoe) to 525 mtoe between 1999 and 2020. How to best meet this demand poses a range of policy challenges for the region's governments not only at the individual but also at the regional level (Symon 2004).

In Southeast Asia (SEA), energy sector development has implications for inter-governmental relations for a number of reasons. First, the pursuit of domestic energy goals can affect neighboring countries, as exemplified for instance by the construction of dams for hydropower in shared river systems in the Greater Mekong Sub-region (GMS). Secondly, domestic gas and power systems are expected to be increasingly supported by pipelines and transmission links with other countries, thus opening the possibilities of system integration to meet demand at lower cost. Lastly, with fossil fuels as the primary source of energy supply, problems of environmental degradation as well as of availability (associated in particular with high oil dependency) are doomed to loom large in this part of the world and could be better met through intra-regional cooperation.

A major characteristic of the region is the presence of the Association of Southeast Asian Nations (ASEAN), which is the only formal grouping of economic cooperation in Asia. Prima facie energy appears to be an ideal area for cooperation: given the characteristics of these economies, and in particular their shared concerns with energy security, it seems logical for them to push for resource sharing and interconnecting so as to enhance security. Energy cooperation has indeed been on ASEAN's agenda for a long time and the recent

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rise in oil prices has no doubt rekindled interest in cooperative initiatives in the energy sector. However, an oft-heard criticism about ASEAN is that it tends to be often long on good intentions and relatively short on actions.

The objective of the present paper is two-fold, first to survey and assess critically ASEAN's achievements in the area of energy cooperation, and secondly to examine the future prospects, as well as the limitations of further cooperation. In this context, the appropriate scope for further cooperation, in particular its extension beyond the borders of ASEAN, needs to be examined. The paper is organized in two parts. The first part provides a brief overview of the energy situation in ASEAN. The second part assesses the various cooperative initiatives undertaken by ASEAN and examines the opportunities and challenges associated with the extension of energy cooperation beyond the borders of ASEAN.

ASEAN Energy Outlook

A (relatively) resource-rich region

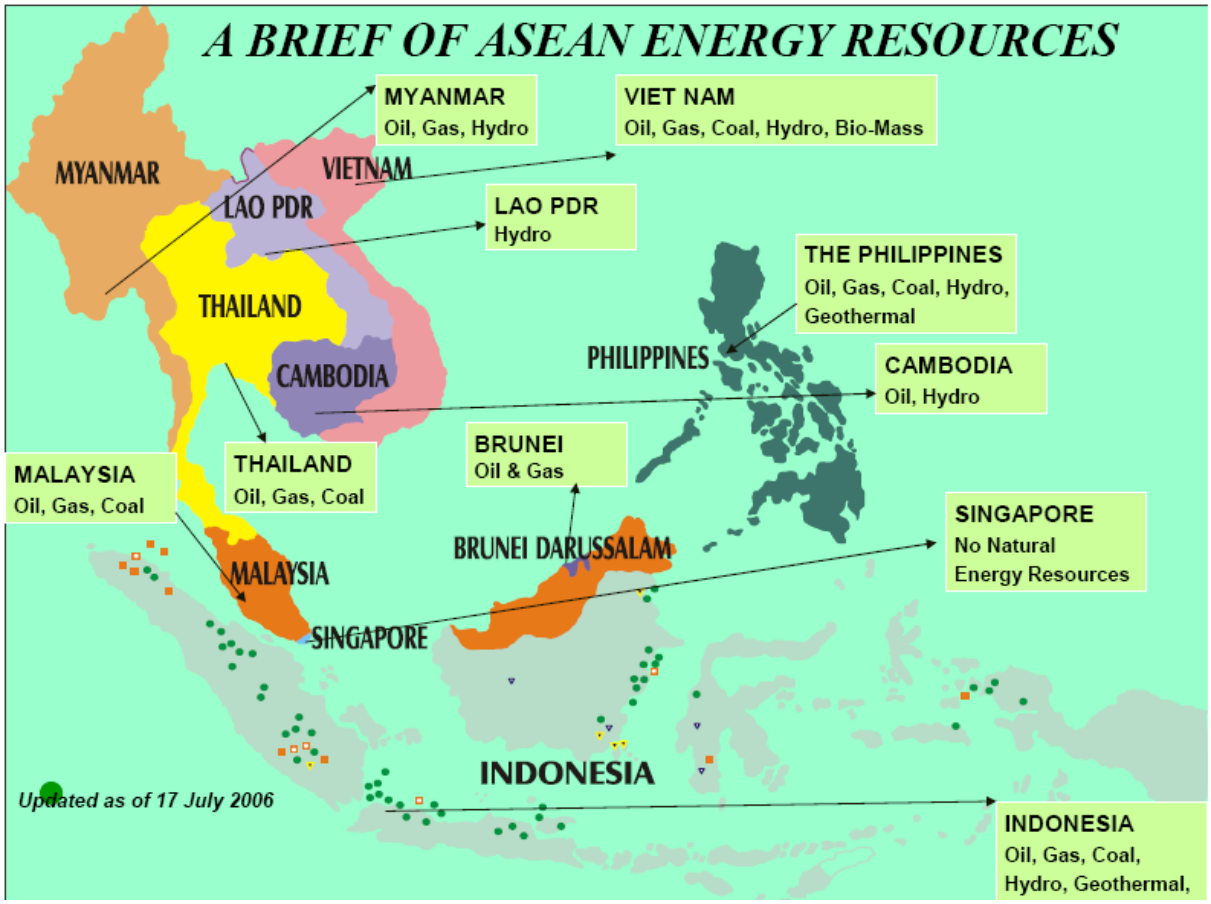
Next to Central Asia and the Middle East, SEA is one region in Asia with substantial energy resources. This is in sharp contrast to the situation in Japan and South Korea which have close to no energy resources. As for China, it is rich in coal resources but increasingly dependent on oil imports.[1]

As shown on the map, eight of the ASEAN member-states have proven oil and gas reserves, and five have substantial coal resources. Moreover, the Northern part of the ASEAN region is rich in enormously powerful stream power which can be harnessed to generate electricity.

Oil production in ASEAN is far from insignificant: Indonesia ranks among the top 20 oil-producing countries in the world, and Brunei, Malaysia, Thailand and Vietnam also produce significant amounts of oil. Over the past few years, intense hydrocarbon exploration activity has developed in the region. Thailand, which began producing oil in 1980, produced less than 60 000 b/d until the early 1990s. Since then production has more than tripled to more than 190 000 b/d in 2007 as a result of offshore exploitation (Wu et al. 2008). Recent discoveries were made in Myanmar and Cambodia and there may be more oil and gas to be found in the Gulf of Thailand. The exploration boom is due to the fact that the region remains relatively unexplored, particularly compared to more mature hydrocarbon regions. Another reason is the economic rise of China. Because of its rising energy needs China has embarked on a strategic approach to energy security involving active investments in overseas oil and gas resources through the Chinese national petroleum companies in the Middle East, Russia, Central Asia, Africa, Latin America as well as Southeast Asia.

[1] Despite its substantial oil resources (China's proven oil reserves amounted to about 16 billion barrels at the end of 2008, equal to 1.2% of world reserves) China became a net importer of oil in 1993, and just 7 years later in 2000, was turned into a major oil importer ranking as the world's 7th largest importer behind the US, Japan, Germany, Korean, France and Italy (see Godement et al. 2004 for further details).

Figure 1



Reproduced from: Matassan (2007)

Oil production in ASEAN is far from insignificant: Indonesia ranks among the top 20 oil-producing countries in the world, and Brunei, Malaysia, Thailand and Vietnam also produce significant amounts of oil. Over the past few years, intense hydrocarbon exploration activity has developed in the region. Thailand, which began producing oil in 1980, produced less than 60 000 b/d until the early 1990s. Since then production has more than tripled to more than 190 000 b/d in 2007 as a result of offshore exploitation (Wu et al. 2008). Recent discoveries were made in Myanmar and Cambodia and there may be more oil and gas to be found in the Gulf of Thailand. The exploration boom is due to the fact that the region remains relatively unexplored, particularly compared to more mature hydrocarbon regions. Another reason is the economic rise of China. Because of its rising energy needs China has embarked on a strategic approach to energy security involving active investments in overseas oil and gas resources through the Chinese national

petroleum companies in the Middle East, Russia, Central Asia, Africa, Latin America as well as Southeast Asia.

Compared to those in the Middle East, Africa and Latin America, however, oil resources in SEA are minimal and the recent discoveries have so far failed to deeply affect the regional energy outlook. In the case of Cambodia for instance, there is still uncertainty as to the magnitude of the reserves. While US energy giant Chevron discovered oil in 2005 off the Cambodian coast (in the so-called Block A), it is not yet clear how much oil can be actually extracted. If all goes according to plan, Chevron will begin extracting oil and gas from these wells by 2011. According to some estimations, Block A is thought to contain some 400 to 500 million barrels, but this is not confirmed and this is not much compared to Indonesia's or Malaysia's reserves (see Table 1). Moreover, in a recently issued public statement, Chevron explained that the undersea reservoir has a complex design and contains "small dispersed fields, rather than one core field." Next to Block A, five other blocks licensed for exploration are so far unexplored. A further round of exploratory drilling is planned for 2008 and 2009. In addition, part of these oil and gas reserves are in some cases located in disputed territories, making their exploitation somewhat problematic. For instance in an area disputed by Cambodia and Thailand there are huge unexplored oil fields that cover an area as much as all six existing blocks combined.

Similar exploration efforts are underway in Myanmar and Laos. China's state-owned CNOOC has recently teamed up with Thailand's PTT Exploration and Production to cooperate on Burmese exploration, while in the latter case, state-owned Vietnam Oil and Gas started exploration in two southern provinces of Laos. Due to the limited reserves, however, there is relatively little scope for further rise in the region's oil production.

The region as a whole holds close to 4% of total world proven natural gas reserves,[2] with Indonesia and Malaysia having the most significant reserves. As a result ASEAN has become the fourth largest liquid natural gas (LNG) producer.[3] A major difficulty is that these reserves tend to be located far away from the major centers of economic activity, thus requiring substantial investment in transport infrastructure.

Lastly, some ASEAN countries also hold coal, although their reserves are negligible compared to neighboring China. Those with the largest coal reserves are Indonesia, Thailand and Vietnam (in that order).

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[2] This is larger than US gas reserves and comparable to all South and Central America's reserves (BP Statistical Review of World Energy 2009).

[3] Brunei, for instance, became the first Asian LNG exporter in 1972. Today it is the 4th largest natural gas producer in the world and the 3rd in Southeast Asia.

Table 1. Coal, oil and gas in ASEAN countries (reserves and production), at end 2008

	Coal reserves (mio tonnes)	**Coal production** (MTOE)	**Oil reserves** (1,000 mio barrels)	**Oil production** (1,000 b/d)	**Gas reserves** (trillion cubic metres)	**Gas production** (MTOE)
Brunei	--	--	1.1	175	0.50	12.1
Indonesia	4,328	141.1	3.7	1,004	3.18	69.7
Malaysia	--	--	5.5	754	2.39	62.5
Myanmar	--	--	--	--	0.49	12.4
Thailand	1,354	5.1	0.5	325	0.30	28.9
Vietnam	150	23.6	4.7	317	0.56	7.9
Memo items						
China	114,500	1,414.5	15.5	3,795	2.46	76.1
World Total	826,001	3,324.9	1,258.0	81,820	185.02	3,056.6

Source: *BP Statistical Review of World Energy 2009*.

Among other energy resources, hydropower looms large in Southeast Asia for a number of reasons. First, countries of mainland SEA have high hydropower potential because they are drained by five major river systems: the Irrawady, Salween, Chao Phraya, Mekong, and Red River. Secondly, although separated by seas and not having common major river systems, the countries of insular SEA—Indonesia, Malaysia and Philippines—also have high potential for hydropower.

As a result, overall energy resource availability is not a major issue in ASEAN (with the notable exception of Singapore which is deprived of any energy natural resources and is as a result heavily dependent on its immediate neighbors (Indonesia and Malaysia) for its energy supply). However these resources are not evenly distributed across the region and consequently some countries are resource-rich while others are resource-poor. This mismatch provides opportunities for energy trade within the region and calls for substantial efforts in the development of appropriate infrastructure, such as oil and gas pipelines. Moreover, as explained above, part of these reserves are in disputed territories, making their exploration potentially problematic. As a result, energy accessibility is more a matter of concern than availability. It remains that these resources are relatively limited compared to the scale of energy needs in the region, as will be seen below.

An energy-thirsty region

High consumption…

Energy demand in the Asia Pacific as a whole is growing faster than in any other region on the planet. According to BP's 2008 Statistical Review of World Energy, total energy demand in the Asia Pacific grew by 5% in 2007. While those numbers are skewed somewhat by China's torrid growth, other countries are showing big demand increases, including Singapore (6.8% growth in primary energy use in 2007), the Philippines (5.4%) Thailand (3.5%) and Indonesia (2.5%).

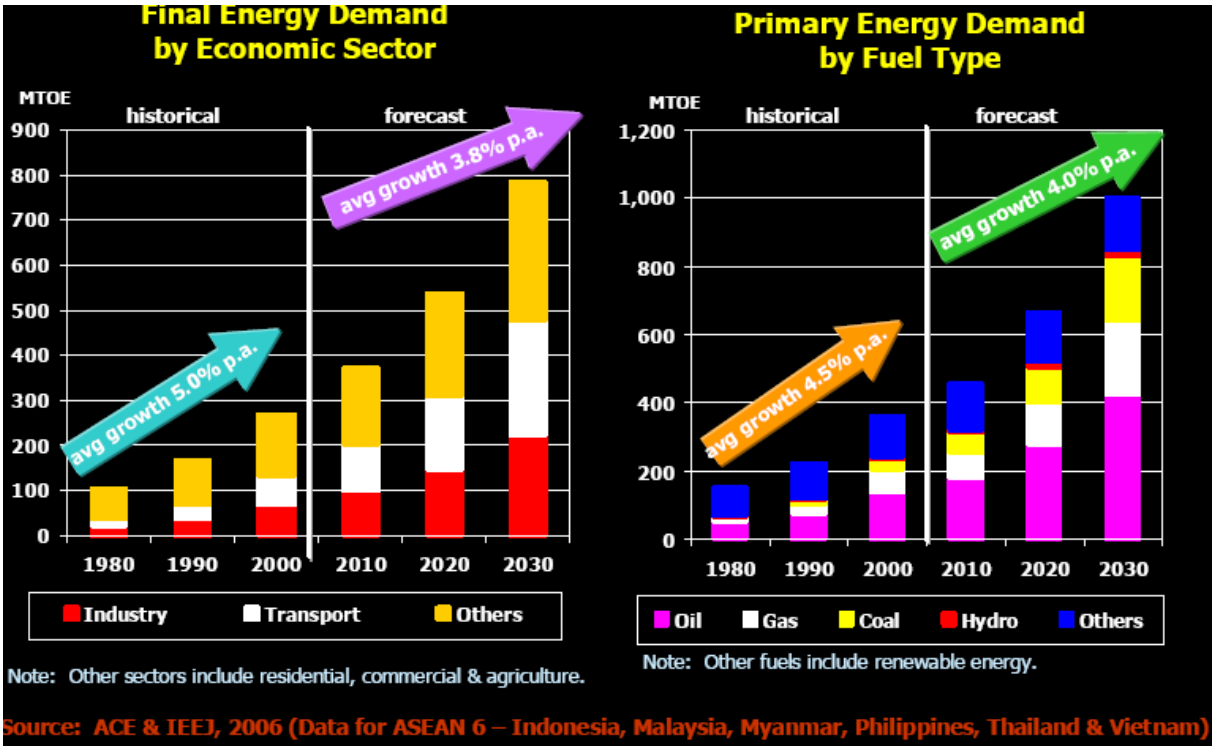
In line with economic growth and economic progress, energy consumption per capita has been generally on the rise in ASEAN. In the least advanced economies in the region the low energy consumption per capita is partially a reflection of the lack of access to basic energy services. In 2002, access to modern energy was at 5% in Myanmar, against 100% in Singapore. Despite these changes, SEA countries still consume much less energy per capita than the citizens of industrial countries. This low level of energy consumption points to enormous potential for future consumption growth. With more than 570 million people and comprising some of the world's fastest growing economies, SEA is expected soon to have electricity demand comparable on a per capita basis to North America or Europe and it is projected to expand quickly for many decades (Andrew Symon "Coal clouds over climate change talks", *Asia Times*, December 5, 2007).

Moreover, the characteristics of ASEAN's growth (greater industrialization, increased urban migration, expanding middle-class, increasing motorization) fuel sustained demand for energy. The potential is recognized in a predicted 60% growth in demand for energy within ASEAN for the period 2005-2010.

The annual average growth rate of primary energy demand in developing Asia (excluding China and India) is projected by the IEA at 2.3% over the next two decades (WEO 2007) and at about 4% for the major ASEAN member countries. It is worth stressing that the share of ASEAN in world primary energy consumption is larger than what its economic weight would suggest (3.2% against 2.1%). Similarly oil consumption has been rising at a rapid pace: the five major Southeast Asian economies accounted for 4% of global oil consumption in 2007, compared to 1.3% in 1970.

Demand for gas can be expected to be particularly high because of increasing cost-competitiveness and consistency with ecological concerns, increasing emphasis on regional petrochemical production, and the ongoing development of essential gas transportation infrastructure.

Figure 2



… low efficiency

An important characteristic of the ASEAN energy market is the relatively high level of energy intensity,[4] which is higher than in Europe by 30% and close to the world average. While all groups of countries within Asia and the Pacific reduced energy intensity, ASEAN is an exception, together with small island developing States (ESCAP, *Statistical Yearbook for Asia and the Pacific 2007*). Although this can be accounted for by deep changes in the structure of the economies, it suggests that ASEAN countries may also have difficulties in enhancing energy efficiency.

Singapore's high energy intensity stems largely from the use of energy in the manufacturing sector, which is more energy intensive than other sectors due to the extensive use of heat and electricity in manufacturing processes, especially in the petroleum refining, petrochemicals and semiconductors industries. In addition, the petrochemicals industry consumes petroleum products as feedstock for their processes, which alone is estimated to contribute to about 20% of the City-state's energy use.

[4] Energy intensity is calculated as units of energy per unit of GDP. High energy intensities indicate a high price or cost of converting energy into GDP.

Table 2. Energy use in ASEAN

	Energy consumption per capita						Energy supply, apparent consumption per unit of GDP					
	Kilograms of oil equivalent				Average annual growth rate (%)		Kilograms of oil equivalent per 1000 PPP dollars				Average annual growth rate (%)	
	1990	1995	2000	2004	90-04	00-04	1990	1995	2000	2004	90-04	00-04
Brunei	1351	1989	2156	2292	3.8	1.5						
Cambodia	3	3	17	165	31.8	77.7						
Indonesia	299	426	498	461	3.2	-1.9	246	218	244	244	-0.1	0.0
Lao PDR	10	19	28	28	7.4	-0.2						
Malaysia	462	1044	1259	1456	8.5	3.7	228	245	248	243	0.5	-0.5
Myanmar	110	120	401	430	10.3	1.8						
Philippines	300	342	487	404	2.1	-4.6	116	135	139	122	0.4	-3.2
Singapore	1953	2764	1495	1543	-1.7	0.8	293	308	235	237	-1.5	0.2
Thailand	521	775	793	993	4.7	5.8	175	170	192	204	1.1	1.5
Vietnam	15	202	435	547	29.5	5.9	319	266	236	240	-2.0	0.4
ASEAN	276	424	539	567	5.3	1.3	208	203	213	213	0.2	0.0
Memorandum items												
China	167	573	540	653	10.2	4.9	470	320	226	226	-5.1	0.0
Japan	2157	2529	2394	2383	0.7	-0.1	152	159	160	154	0.1	-1.0
Europe	1491	1997	2182	2286	3.1	1.2	190	195	173	168	-0.9	-0.6

Source: UNESCAP, *Statistical Yearbook for Asia and the Pacific 2007.*

Contrasted patterns of electricity generation

Despite recent efforts to increase regional oil production,[5] Southeast Asia has limited capacities. As a result, oil remains a relatively modest source of electricity generation in the region, with less than 20% in most cases, with the exception of Singapore (until recently) and Cambodia.

In contrast, with Brunei, Malaysia and Indonesia now ranking among the world's top six LNG producers (Matassan 2007), natural gas has grown to become a very important source of energy in the ASEAN region, especially for power generation, petrochemicals and industrial applications. The share of gas in electricity generation is particularly high in Malaysia and Thailand. In 2002, the Singapore Government set a target of 60% of the country's electricity to be generated from natural gas by 2002. By 2003, this goal had already been met.

[5] In Malaysia, the country's national oil company Petronas reported that there were 53 wells drilled in 2006, double those in 2003. A similar boom is occurring in Thailand.

Coal-generated electricity is still substantial in Indonesia and the Philippines, and to a lesser extent in Vietnam and Thailand. In Indonesia, one-fifth of total installed capacity, or 7,460 MW, is currently coal-fired. Moreover, the share of coal is likely to remain substantial in the coming decade and even to rise substantially. According to the ASEAN Center for Energy, the share of coal can be expected to exceed 40% by 2020, with the Philippines, Indonesia, Malaysia and Vietnam as the most coal-dependent countries in the region. By way of illustration in Vietnam, which is one of the region's fastest-growing economies, of the 48,700 megawatts of new generation capacity that is set to come on line between 2006 and 2015 under the current power master plan, 53% (or 25,890 MW) is slated to be coal-fueled, 29% from hydropower and 13% only from natural gas. In parallel to the rise of coal, the share of gas is expected to drop in all countries, with the exception of Singapore and Vietnam.

Of course, the situation may vary widely across countries, according to their natural endowments. As can be seen in Table 3, Malaysia and Thailand currently depend on gas and Indonesia and the Philippines on coal, while Laos and Myanmar are heavily dependent on hydro power for electricity generation. Hydropower dams have sprouted across the region, most notably along the Mekong river, and in Laos at the Nam Theun 1 and 2 dams. By 2020, however, Vietnam, Thailand, Malaysia and the Philippines (in that order) plan to produce a rising share of electricity through hydro, from 56 000 to 1 011 000 GWh (Balce 2005). The share of hydroelectricity is also set to rise in the least developed ASEAN member-countries (Table 3). As exemplified by the case of Vietnam, however, heavy reliance on hydropower may turn out to be problematic because of the risk of disruption associated with unusually low monsoon rainfall.

Table 3. Electricity Generation Mix in 2000 and 2020

(by country and type of fuel, in percentage, with values for 2020 in brackets)

Country	Type of Fuel					
	Gas	Coal	Oil	Geo	Hydro	Others
Brunei	100 (89)	0.0 (0)	0.0 (0)	0.0 (0)	0.0 (0)	0.0 (11)
Cambodia	0.0 (19)	0.0 (0)	100 (12)	0.0 (0)	0.0 (30)	0.0 (39)
Indonesia	28.1 (25)	42.1 (60)	24.3 (4)	1.2 (3)	4.2 (4)	0.0 (3)
Laos	0.0 (0)	0.0 (0)	0.0 (0)	0.0 (0)	100(100)	0.0 (0)
Malaysia	74.8 (44)	9.7 (46)	5.1 (0)	0.0 (0)	10.4 (9)	0.0 (1)
Myanmar	44.9 (4)	0.0 (2)	11.4 (0)	0.0 (0)	43.6 (93)	0.0 (0)
Philippines	0.0 (8)	44.8 (82)	19.3 (1)	11.1 (3)	7.5 (5)	17.2 (0)
Singapore	12.6 (78)	0.0 (18)	87.4 (2)	0.0 (0)	0.0 (0)	0.0 (1)
Thailand	74.1 (69)	16.0 (17)	8.1 (0)	0.0 (0)	1.8 (12)	0.0 (0)
Vietnam	20.9 (30)	28.8 (40)	20.2 (0)	0.0 (0)	30.1 (28)	0.0 (2)
Total	47.7 (39)	22.0 (45)	19.7 (1)	1.4 (1)	7.4 (3)	1.8 (1)

Source: ACE

As of today, other renewable energies remain marginal as sources of power generation, but some countries (Malaysia, the

Philippines, Singapore and Thailand) have set national targets for renewable energy so as to raise its share (Worldwatch Institute 2005). These policy targets are for share of electricity production (set at 5% in the case of Malaysia) or for share of total primary energy supply (set at 8% – excluding traditional rural biomass - by 2011 in Thailand). Lastly, they may set specific installed capacity figures from renewables: the Philippines target to double existing capacity by 2011, to 4.7GW, while Singapore targets 35 MWth of solar thermal systems by 2012. For the time being, however, all these countries remain below the set targets.

A vulnerable region

An oil-dependent primary energy mix

As of today, oil is the first pillar of ASEAN's energy system, accounting for between 40 and 60% of the region's primary energy consumption, against 36% worldwide, and 20% for China. Of course, the energy mix varies considerably from one country to the other, according to resource availability. Singapore is in a unique position with an almost exclusive reliance on oil.

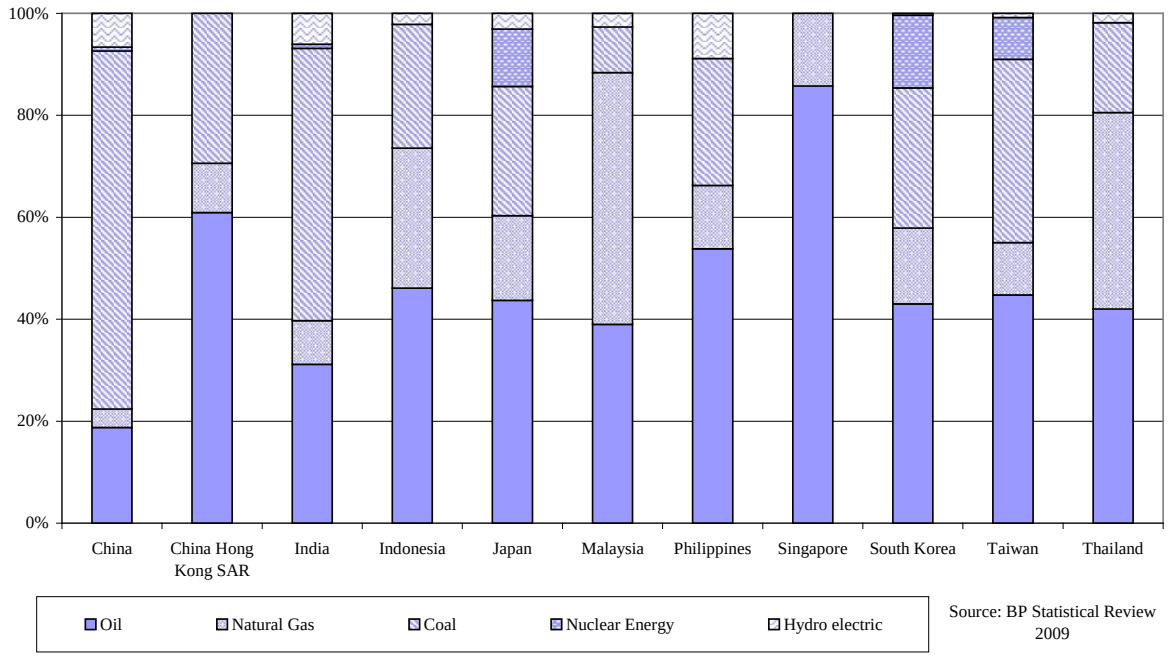
Natural gas comes second. According to the recently published *2009 BP Statistical Review of World Energy*, major energy consuming countries in ASEAN accounted for around 350 million tonnes of oil equivalent (mtoe) in 2008, of which 106.9 mtoe was accounted for by natural gas. The share of gas in primary energy for major ASEAN energy consuming countries was around 31% in 2008, confirming the relative importance of natural gas as an energy source in this region. In comparison natural gas' share of primary energy demand worldwide stands at around 24%, somewhat lower than in this region. This is also in sharp contrast with China's situation where natural gas merely accounts for 2.4% of total primary energy demand.

Coal comes third, accounting for less than 20% in ASEAN, compared to 28% worldwide and 70% for China. However, the share of coal in the primary energy mix is expected to rise dramatically to 20-27% by 2030, according to ACE.

Nuclear energy is so far absent from the primary energy mix in all ASEAN countries. This is in contrast to what is observed in China as well as in more advanced countries in the region (Japan and South Korea). However, a major change can be expected over the next decades. The use of nuclear energy is increasingly discussed, as exemplified in the November 2007 ASEAN Summit, when a declaration on safeguarding the environment and the use of nuclear energy for peaceful purposes was agreed by the ASEAN member-states. The leaders also agreed on the establishment of a nuclear safety regime with a regional monitoring laboratory whose mission is

Figure 3

East Asia: Primary energy consumption by fuel (at end 2008)



Source: BP Statistical Review 2009

to help scientists in the region to study the safety of their respective nuclear power plants (see below). Individually, Vietnam, Indonesiaand Thailand[6] are contemplating the construction of nuclear power plants, while the Philippines is considering to resume power generation from the Batan plant which had been closed since 1998.

Hydroelectric power also accounts for a non negligible share of the primary energy mix in the Philippines, while it remains modest in Indonesia, Malaysia and Thailand. However, as explained earlier, it is no doubt set to increase over time in absolute as well as in relative terms, be it only for environmental reasons.

A deteriorating energy balance

Southeast Asia relies upon a range of different energy sources but few countries are genuinely self-sufficient in energy terms. In contrast to Northeast Asia, which is a net importer (with 721 Mtoe in 2005), Southeast Asia is still a net energy exporter but its surplus has been

[6] The Electricity Generating Agency of Thailand (EGAT) is contemplating commissioning a 4-Giga Watt nuclear power plant by 2015 (Jha 2007). The Indonesian Government has indicated that Gorontalo in Sulawesi would likely become the country's first province to have a 4-giga Watt nuclear power plant, while Vietnam plans to build its first nuclear energy plant by 2020.

declining steadily over the past two decades, dropping from 52 Mtoe in 1990 to 27 Mtoe in 2004, and less than 20 Mtoe in 2006. Indonesia became a net energy importer in 2004 and countries such as Malaysia and Vietnam are expected to shift from a net energy export to a net energy import position in the next decades (see Table 4).

The situation is expected to deteriorate further with a sharp rise in net oil import dependence. Southeast Asia will import 70% of its oil by 2030 while it merely imported 9% in 2002 and less than 20% in 2006. The dependence will be particularly pronounced vis-à-vis the Middle East. Already the reliance on Middle East oil is over 50% for countries such as the Philippines and Singapore,[7] but also for Malaysia and Thailand (APERC 2007a). Even Indonesia, for long a member of the Organization of Petroleum Exporting Countries (OPEC), had recently to withdraw from that body because it now imports at least as much oil as it exports.[8] The decision, made in May 2008, will be effective by the end of the year.

Table 4. Net energy import dependency of the ASEAN economies, 1982-2030

	1980	2002	2030
Brunei	-630	-668	-688
Indonesia	-120	-55	Negligible
Malaysia	-44	-57	32
Philippines	54	51	68
Singapore	100	97	99
Thailand	52	53	81
Vietnam	8	-26	15
Memo items			
China	-3	Negligible	18
Japan	88	82	78
Korea	77	84	77

Source: APERC (2007b)

Note: Negative values mean net export to domestic consumption rate.

Summary: Energy security a shared concern and a strong rationale for energy cooperation

On the supply side, SEA is not deprived from energy resources in the way Japan or Korea are. However, energy resources are unevenly distributed across the region, with some countries being energy-rich and others energy-poor, and with different countries being endowed

[7] The situation of Singapore is unique with high energy demand and non existent supply.

[8] Oil comes in many grades and countries which produce oil are most likely both to import some types while exporting other types.

with different energy resources. For instance, Singapore relies increasingly on natural gas piped from Indonesia and Malaysia, while Laos is exporting energy to neighboring Cambodia, Thailand and Vietnam. This uneven distribution provides ample opportunities for regional cooperation and accounts for the intensity of intra-regional energy trade. The need for intra-regional energy transportation implies further that regional cooperation on infrastructure planning is warranted together with cooperation on financing infrastructure and transportation networks. Financing constraints are indeed often problematic, while development of natural gas is often held up because of the need to coordinate investments in pipelines and other supply infrastructure with the development of power plants.

Another reason for regional cooperation results from the complementarity prevailing within the region as a result of economic development gaps. For instance, although a significant oil producer, Vietnam is heavily reliant on imports of petroleum products from Singapore (or Japan) due to a lack of refining capacity.

Of course, the contrasted situations prevailing within the region may lead to problems of accessibility and the potential for competition and rivalry is also substantial. Here again, however, the cooperative approach may be a way of defusing potential tensions.

In a longer-term perspective, the rationale for regional cooperation can be expected to shift gradually away from exploiting complementarities to addressing increasingly shared concerns. Given the rate of economic growth in the region over the past decades, demand can be expected to outstrip domestic supply capabilities very soon. Substantial imports of energy are unavoidable, primarily from the Middle East, making the region particularly vulnerable to supply and transport disruptions, and thus particularly sensitive to energy security concerns.[9]

Moreover, given the region's limited oil reserves, tight supplies and the resulting high energy prices are likely to constrain economic growth in the future. As a result, the need to slow oil consumption growth through improved efficiency and to substitute other forms of energy for oil is a priority goal for all countries in the region, providing them with excellent opportunities for regional cooperation.

Lastly, a further reason for intra-regional cooperation relates to the need to encourage "clean" energy options. Assuming no major departure from existing energy production and consumption patterns, the Tokyo-based Asia-Pacific Energy Research Center (APERC) projects a fourfold increase in total carbon-dioxide emissions - the major greenhouse gas –from 2002 to 2030 produced by energy production and consumption in SEA. The total will be twice that of

[9] It is worth stressing at this stage that the region has a deficit in crude oil but a surplus in petroleum products.

Japan in 2030, nearly a third of the US total, and a quarter that of China (Symon 2007). Because of the persistent role of coal as a pillar of power generation in ASEAN, environmental consequences inherent in burning coal need to be addressed and again this may be more easily done at the regional than at the domestic level. Similarly, enhancing acceptability of some energy resources may be more easily addressed at the regional than at the national level.

In a nutshell, energy security (including availability, accessibility, affordability and acceptability issues) is a widely shared concern in the region which may be addressed at the regional level. Energy security may be ensured through better control of demand for energy, securing transport lanes, diversifying sources of energy supply and changing the energy mix. The following section examines how regional cooperation has been put in place to date in all these areas.

Cooperation in the Energy Sector: ASEAN and Beyond

A brief reminder on ASEAN

Originally founded in 1967 by Indonesia, Malaysia, the Philippines, Singapore and Thailand, the Association of Southeast Asian Nations (ASEAN) is now a ten-state[10] cooperative framework intended to promote greater regional development through mutual assistance. Although the initial objective was primarily political, the scope of co-operation has gradually expanded to encompass economic interests. During the first two decades of its existence, ASEAN did not achieve much in terms of economic co-operation and efforts remained limited to specific industrial co-operation projects. A major step was made in 1992 when the ASEAN Free Trade Agreement (AFTA) was launched with a view to creating a full free trade area by 2008. The deadline for bringing the tariffs down to a maximum of 5% was eventually moved forward to 2003, while full free trade is set for 2010 for the six original signatories and 2015 for the least advanced member countries (the so-called CMLV -Cambodia, Myanmar, Laos and Vietnam).

In October 2003, the ASEAN leaders In October 2003, the ASEAN leaders signed the Declaration of ASEAN Concord II (Bali Concord II) that aims at establishing an ASEAN Community by 2020. This Community is made up of three pillars, namely the “ASEAN Security Community”, “ASEAN Economic Community” (AEC), and “ASEAN Socio-cultural Community.” The AEC is envisaged as a single market and production base with free flow of goods, services, investment, skilled labor and freer flow of capital. To that end the member-countries decided to accelerate the integration of 11 priority sectors[11] including electronics, automotive, rubber-based products, textiles and apparels, as well as agro-based products. For these products full tariff elimination was set for 2006 for the most advanced member-countries and 2012 for the remaining four.

[10] Brunei joined ASEAN in 1984, Vietnam in 1995, Myanmar and Laos in 1997 and Cambodia in 1999.
[11] These sectors account for more than 50% of intra-ASEAN trade.

Over time, the initial program of tariff reductions was broadened and accelerated and other "AFTA Plus" activities were initiated, including efforts to eliminate non-tariff barriers, harmonization of customs nomenclature, valuation, and procedures and development of common product certification standards among others.

An integral part of ASEAN's regional economic co-operation focuses on the energy sector where the declared objective is to ensure greater security and sustainability of regional energy supplies through diversification, development and conservation of resources, the efficient use of energy and the wider application of environmentally sound technologies.[12] Energy cooperation is officially seen as a complement to regional economic integration.

Intra-ASEAN cooperation on energy

Broadly speaking, regional co-operation on energy-related issues may have two possible purposes, namely guaranteeing security of energy supply and minimizing the environmental impact of energy consumption. A number of measures can be taken to reach these objectives, including infrastructure development, financial mechanisms, regulatory frameworks, R&D, information-sharing, education and capacity-building (APERC 2007b). In ASEAN there has been a shift over time from an exclusive focus on security of energy supply to the minimization of environmental impact.

Mid-1970s to mid-1980s: focus on oil and power grid connection

As a result of the importance of oil imports for a large number of ASEAN countries, oil dependence has tended to dominate the energy security debate in these countries very early on. In 1975, Indonesia's national oil company circulated a proposal to the other ASEAN member-states "to form co-operation within the field of oil industry." The objective was thus clearly to help harness existing complementarities within ASEAN. The proposal generated positive reactions and gave rise to the establishment of the ASEAN Council on Petroleum (*ASCOPE*) in 1976[13]. The aims and purpose of ASCOPE are strictly in line with the objectives of ASEAN as follows:

- Promotion of active collaboration and mutual assistance in the development of petroleum resources

[12] From « Building the Trans-ASEAN gas pipeline », *Asia Pacific Review*, July 2003.
[13] Brunei joined ASCOPE in 1985, Vietnam in 1996, Cambodia and Myanmar in 2001. At the time of writing Laos was still not a member.

in the region through joint endeavors in the spirit of equality and partnership;

- Collaboration in the efficient utilization of petroleum;

- Providing mutual assistance in personnel training and the use of research facilities and services in all phases of the petroleum industry;

- Facilitating exchange of information;

- Holding of Conferences and Seminars;

- Maintenance of close cooperation with existing international and regional organizations with similar aims and purposes.

Later on, another important cooperative initiative took the form of the ASEAN Petroleum Security Agreement (*APSA*). APSA is a binding treaty enforced in 1986, which obliged all six ASEAN economies to provide oil mutually in the case of sudden shortfalls in oil supplies in the ASEAN region. The agreement specifically established an ASEAN Emergency Petroleum Sharing Scheme for petroleum products in times of both shortage and oversupply. In cases of shortage, the oil exporting members of ASEAN were expected to assist the affected members.[14] ASEAN members were also expected to increase their oil imports from a member country if that country happened to be in a state of oversupply.

Next to cooperation in the oil industry, ASEAN countries also sought very early on to cooperate on energy infrastructure with an emphasis on power grid interconnections. The beginnings of a Southeast Asian power grid date back to 1966, when Laos and Thailand concluded a power-exchange agreement. Similar agreements were signed in 1978 between Malaysia and Thailand and between Malaysia and Singapore. In an attempt to coordinate the cooperation at the overall regional level, in 1981 ASEAN established a task force involving the Heads of ASEAN Public Utilities Authorities (HAPUA) with the objective of establishing regular cooperation on power grid connections. As with APSA, the objective was to enhance energy security by setting up specific mechanisms so as to avoid supply disruptions.

[14] The Emergency Petroleum Sharing Scheme stipulates that the oil producing ASEAN Member Countries shall commit to supply crude oils and/or petroleum products to the ASEAN Member Country in distress in meeting at least 80% of its normal domestic requirement. In the event of failure to do this, the ASEAN Governments will endeavor to release a supply pool of an additional 10% of their entitlement.

The 1990s and the ASEAN plans of action on energy co-operation

General objectives

Over time, as the region's energy outlook gradually shifted towards higher dependence on external sources (in particular for oil) and towards a rising need for diversification, intra-ASEAN cooperation on energy issues became more comprehensive and the areas of cooperation became more diverse to include enhancing energy availability, accessibility, affordability, and acceptability. Energy security stricto sensu is no longer the only objective, energy efficiency and limiting the environmental impact of energy consumption are increasingly important goals. According to ASEAN data, greenhouse-gas emissions are estimated to possibly triple in SEA by 2030, with demand for energy doubling in the same period, hence the need to shift the emphasis of intra-regional energy cooperation to diversification options, energy efficiency and environmental considerations.

With the ASEAN Energy Co-operation Agreement signed in 1986, the ASEAN member countries agreed to cooperate on a wider range of energy-related issues, with a view to fostering efficient development and use of all forms of energy. Cooperative activities include planning, energy development, conservation, training, security of energy supply and exchange of information.

ASEAN Member Countries have engaged in cooperation programs in the field of energy through a series of plans of action in the 1990s. In particular the *Plan of Action on Energy Cooperation* (PAEC 1995-1999) was developed following the review of the Program of Action for Enhancement of Cooperation in Energy (PAECE) endorsed in 1991. This medium term program, adopted in October 1995, took into consideration a focused approach to ASEAN cooperation in the following areas: Electricity, Oil and Gas, Coal, New and Renewable Sources of Energy, and Energy Efficiency and Conservation, among others, through the established ASEAN coordinating bodies in each of these five cooperation areas, and in further pursuance of the Agreement of ASEAN Energy Cooperation of 1986.

The importance of ASEAN energy cooperation was reinforced in the *ASEAN Vision 2020*, arising from the ASEAN Second Informal Summit in December 1997 in Kuala Lumpur. The ASEAN Vision 2020 called for cooperation activities to "establish interconnecting arrangements for electricity, natural gas and water within ASEAN through the ASEAN Power Grid and a Trans-ASEAN Gas Pipeline, and promote cooperation in energy efficiency and conservation, as well as the development of new and renewable energy resources". The Hanoi Plan of Action of 1998 provided the direction towards this vision during the period 1999-2004. Following the ASEAN PAEC 1999-2004, a new Plan has been defined for the period 2004 – 09 (as part of the Vientiane Action Plan).

The Plan includes 6 program areas

- Trans-ASEAN Gas Pipeline
- Trans-ASEAN Power Grid
- Coal (including clean-coal technologies)
- Energy Efficiency and Conservation
- New and renewable Source of Energy
- Regional Energy Outlook, energy policy and environmental analysis.[15]

The coordination of the various initiatives is under the responsibility of the ASEAN Center for Energy (*ACE*) which was set up in 1999 as the central intergovernmental organization in charge of collective activities on energy. One of ACE's goals is "to strengthen the region's capability in addressing global and regional issues in energy by enhancing the coordination of energy strategies of the ASEAN member economies." To that end, the ACE facilitates and coordinates the work of a number of specialist organizations, including the Forum of Heads of ASEAN Power Utilities/Authorities (HAPUA), the ASEAN Council on Petroleum (ASCOPE), the ASEAN Forum on Coal (AFOC), the Energy Efficiency and Conservation Sub-sector Network (EE&C-SSN) and the New and Renewable Sources of Energy Sub-sector Network (NRSE-SSN).

The Trans-ASEAN Gas Pipeline

Pipeline infrastructure represents an essential link between gas supply and markets in the ASEAN region, with major efforts directed over recent years to promote the development of the Trans-ASEAN Gas Pipeline (TAGP) which aims to integrate ASEAN's gas fields and consumption centers with a large and complex regional natural gas supply system. The objectives are to (i) ensure the reliability of gas supply for ASEAN member countries; (ii) encourage the use of environment-friendly fuel; (iii) attract multinational companies; and (iv) invest in gas exploration and reduce the region's reliance on crude oil.

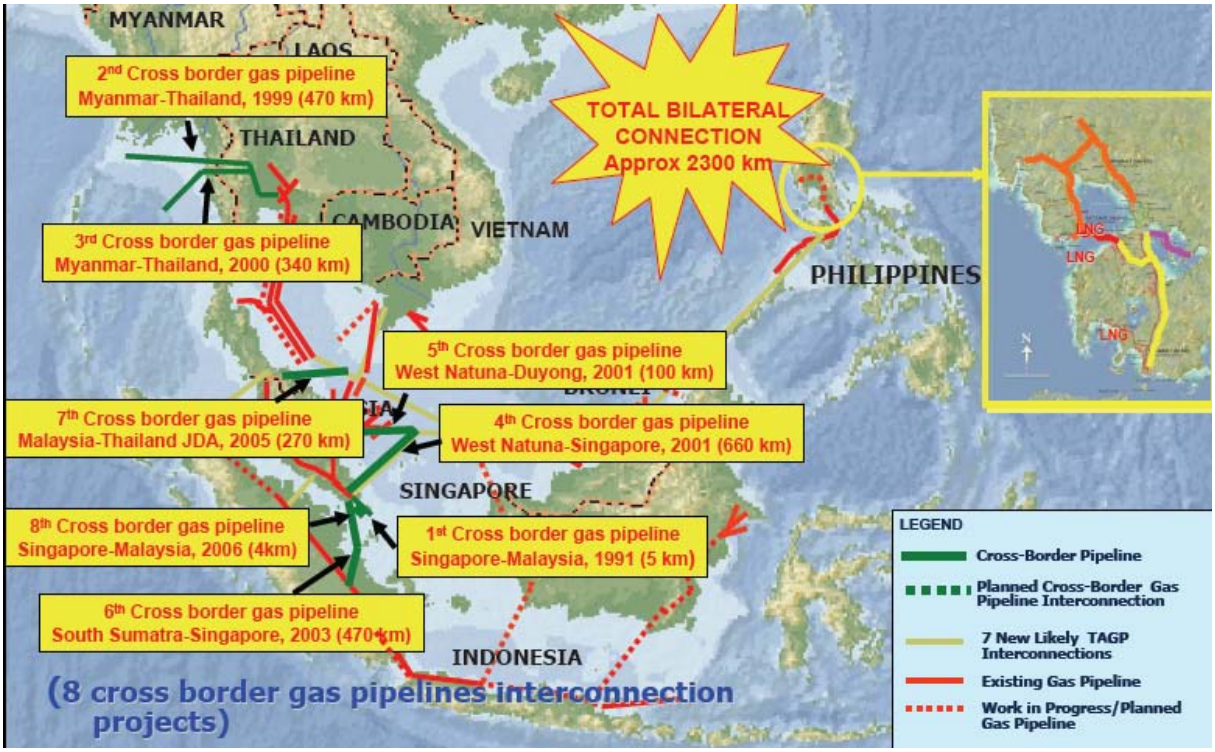
Gas pipelines are favored because of the high capital expenditure requirement associated with the construction of gas liquefaction and regasification terminals. The TAGP project was first discussed in 1990, and the Trans-ASEAN Gas Task Force was launched in 1999 by the ASEAN Council on Petroleum (ASCOPE). However, the first cross-border gas pipeline from Malaysia to

[15] A new Plan for the period 2009 – 2014 includes a seventh program area on nuclear energy safety.

Singapore was commissioned as early as 1991. Since then seven other cross-border pipelines have been completed for a total cost of US$ 14.2 billion: two pipelines linking Myanmar and Thailand; West Natuna – Duyong; West Natuna – Singapore; South Sumatra – Singapore; Malaysia – Thailand; Singapore – Malaysia. Altogether the cross-border pipelines are close to three thousand kilometers long, supplying natural gas from one country to another, with a total capacity of some 19 b cubic meters per year (Figure 4).

Several more projects are in the process of design and construction or are under consideration. If completed, the project would involve over five thousand kilometers of new interconnected pipelines for an additional cost of construction estimated at more than US$ 17 billion, including pipeline infrastructure, gas extraction facilities and compression equipment.

Figure 4. Map of gas pipelines in ASEAN



Source: Pruecksamars (2009).

Gas pipeline development over the period until 2015 - both offshore and onshore – is expected to have a major bearing on long term energy security and reliability in the ASEAN region. At the same time, however, alternatives to pipeline delivered natural gas –

including coal and imported LNG – have begun to feature more strongly in the minds of both government[16] and industry. As a result, although the prospects for pipeline delivered natural gas are good on economic and environmental grounds, they cannot be taken for granted by the industry (Beasley 2007).

In addition, the realization of the TAGP can be expected to encounter substantial technical as well as legal difficulties. The challenges to further success of interconnection under this project are increasing investment costs, synchronization of national technical and security regulation requirements, reaching consensus on adapting contractual arrangements and/or principles for the supply, distribution and transportation of natural gas, as well as gas pipeline network management procedures and cost sharing. (APERC 2007a, Carroll and Sovacool 2008).

The ASEAN Power Grid

As recalled earlier, the possibility of an integrated ASEAN Power Grid first began to be considered by a forum of the Heads of ASEAN Power Utilities/Authorities (HAPUA). The "ASEAN Vision 2020", endorsed at the ASEAN Summit in 1998 goes further and seeks to establish interconnecting arrangements for electricity through the so-called ASEAN Power Grid. In addition, the hydro potential of Myanmar and Lao PDR under the independent Greater Mekong Sub-region (GMS) interconnection initiative will be developed to provide cheap and clean energy to the unified ASEAN power grid; however, full integration of the ASEAN grid could take some decades to develop.

HAPUA completed the ASEAN Interconnection Master Plan study (AIMS) in March 2003 and identified 14 interconnection projects (Figure 5) for potential implementation through 2020. All of them have been found to be cost-effective, however the economic viability of each needs to be clearly established and accepted by the participating economies. Additionally, there is a need to introduce an effective regulatory framework, and concerns remain on how to raise capital for participating low-income economies, and unforeseen technical difficulties for a few of the interconnections (APERC 2007).

For the time being four power grid interconnections already exist in Southeast Asia (Peninsular Malaysia – Singapore; Thailand – Peninsular Malaysia; Vietnam – Cambodia; Thailand – Cambodia), and seven others can potentially be implemented by 2020. Future interconnections would include Sarawak-Peninsular Malaysia, Batam-Bintan-Singapore-Johor, Philippines-Sabah, Sarawak-Sabah-Brunei

[16] For instance, with a view to reducing its dependence vis-à-vis Indonesian gas, Singapore is contemplating the development of LNG facilities so as to avoid power outages that were the result of natural gas supply disruptions such as those it faced in November 2003 and June 2004.

Darussalam, Lao PDR-Viet Nam,Thailand-Myanmar and Lao PDR-Cambodia.

Existing interconnections are reported to have improved political relations between economies and provided opportunities to develop closer regional energy cooperation.

Figure 5. Interconnecting ASEAN power grids

1)	P.Malaysia - Singapore	Existing
2)	Thailand - P.Malaysia	Existing
3)	Sarawak - P. Malaysia	2015
4)	P.Malaysia - Sumatra	2012
5)	Batam - Singapore	2015
6)	Sarawak - West Kalimantan	2012
7)	Philippines - Sabah	2015
8)	Sarawak - Sabah - Brunei	2015
9)	Thailand – Lao PDR	
	• Roi Et - Nam Theun 2	2009
	• Udon - Nabong	2010
	• Mae Moh - Hong Sa	2013
10)	Lao PDR - Vietnam	2010
11)	Thailand-Myanmar	2014
12)	Vietnam - Cambodia	2008
13)	Lao PDR-Cambodia	2010
14)	Thailand-Cambodia	2007

Source: ACE (2008)

The ASEAN Forum on Coal (AFOC)

In pursuance of the goals set in the ASEAN Vision 2020, the ASEAN Senior Officials Meeting on Energy (SOME) suggested that an entity be formed to carry out activities for the development and promotion of environmentally sound utilization of coal. The ASEAN Forum on Coal (AFOC) was established in 2000 so as to replace the Coal Sub-Sector Network previously established under the ASEAN Energy Cooperation Program.

The objectives of the AFOC are to enhance cooperation in the coals sector, to promote intra-ASEAN business opportunities on coal, and to facilitate dialogue among coal players in the region. The encouragement of environmentally-sustainable coal mining and utilization, as well as of transfer of clean coal technology rank high among the Forum's tasks.

Energy Efficiency and Conservation

Energy Efficiency & Conservation (EE&C) activities cover institutional capacity building programs, and greater private sector involvement in

Member Countries. Recognizing the importance of EE&C in meeting the growing energy needs with a lower environmental impact, ASEAN governments agreed to further intensify cooperation in this area to, among others, mitigate greenhouse gas emissions. Financial initiatives are also focused on promoting trade and investment in RE, EE and clean energy technologies, and services. The basic mechanisms for promoting investments from the private sector are workshops, seminars and feasibility studies.

New and renewable sources of energy

As part of the PAEC 2004 - 2009, efforts are undertaken by Member Countries to promote the production and utilization of renewable energy, with a view to increasing the share of renewable energy in power generation in the region to 10% by 2010. In particular, recognizing the gradual emergence of bio-fuels as one of the alternatives to reduce ASEAN's fossil fuel consumption, ASEAN governments are pushing closer cooperation in promoting bio-fuels produced in a sustainable manner. They also agreed to forge further regional cooperative partnership to promote solar, wind, geothermal, hydro, and bio-mass energy.

More recently, nuclear energy use was discussed at length among ASEAN member states during the 25th ASEAN Summit of November 2007. Regional cooperation on this issue seems particularly well-adapted given the high costs involved. ASEAN ministers of energy agreed to the establishment of an ASEAN Nuclear Energy Safety Sub-Sector Network to explore nuclear safety issues. The Ministers tasked the senior energy officials to determine the Terms of Reference and composition of this network, and to report the status by the next AMEM in 2008.

The sensitive nature of nuclear technology would require regional cooperation to cover its security, technological, economic and environmental aspects. Embracing nuclear technology in ASEAN may no doubt be instrumental in fostering closer ties among ASEAN member states and in tying the entire region's future together. There has been no objection to nuclear power among ASEAN governments and support for nuclear power was re-iterated in the Cebu Declaration on East Asian Energy Security (January 2007) and the Singapore Declaration on Climate Change, Energy and the Environment (November 2007).

Renewed cooperation on oil security

In contrast to what is observed in Northeast Asia,[17] few ASEAN countries are stockpiling oil. Because of its unique position as a

[17] As members of the International Energy Agency (IEA) both Japan and Korea have established strategic oil reserves. Japan holds approximately 90 days worth of oil consumption in national strategic reserves managed by Japan National Oil Corporation and it also requires private companies to hold crude and petroleum

regional refining center and oil trading hub, Singapore holds large commercial stocks and it requires three state power companies to each have 90 days of oil consumption in storage (Godement et al. 2004). Other countries have contemplated the establishment of national stockpiles but none of them has made the decision yet. Thailand has a limited stockpile, mandated by its Fuel Act of 1978, required to be maintained by the Thai private sector (Giragosian 2004). However, for the time being, there is an inadequate government role in developing a state-owned stockpile. Thailand and the Philippines have at some point contemplated the idea of coordinating stockpiling, but the idea did not go very far. As for Malaysia, it has not subscribed to the idea of a national oil stockpile since production can still be easily increased to meet demand.

Rather than national stockpiles, ASEAN countries tend to favor the establishment of a regional stockpile. Joint stockpiling by ASEAN economies has been raised in various forums within the region as an initiative on energy security. Concrete steps in this direction were recently made with the discussion of the new ASEAN Petroleum Security Agreement (APSA). The 1986 APSA mentioned earlier was never activated: when problems arose, they were solved bilaterally and with non-ASEAN producers and international traders. Moreover, with production almost flat and domestic consumption still rising, oil-producing ASEAN countries have less and less crude oil available for export to their partners so that the chance that the agreement may be successfully invoked is getting thinner. As a result, ASCOPE was asked by the ASEAN Meeting of Energy Ministers (AMEM) in 1997 to review the provisions of the 1986 APSA. The new APSA was approved by ASEAN Energy Ministers in August 2008 and the agreement was signed in March 2009.

According to the new APSA, in case of a shortage, net oil exporters in Southeast Asia are expected to supply petroleum products to the countries in need[18] at discounted prices. In case of an oversupply, net importing countries would purchase the products from those exporting countries. The agreement also includes short-term measures to ensure that production is not disrupted. It also covers medium- to long-term measures to collaborate on renewable energy, energy conservation, and in building oil stockpiles. The major issue of oil stockpiling was included into the New APSA as well as an annex on Coordinated Emergency Response Measures (CERM) on a voluntary and commercial basis.

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product stocks. Altogether it held almost 150 days of net oil import equivalent by the end of 2007 (IEA 2008). South Korea also maintains reserves equal to about 90 days of consumption. Although not a member of the IEA, China decided in 2003 to build an emergency petroleum reserve. It is also contemplating imposing an obligation on industry to create emergency stocks.

[18] If they face a 10% shortfall in their needs. The former APSA set the limit at 20%.

Capacity-building

One of ACE's proclaimed goals is to "strengthen the region's capability in addressing global and regional issues in energy by enhancing the coordination of energy strategies of the ASEAN member economies." To achieve this goal ACE employs strategies including the facilitation of regular high-level policy dialogues and the establishment of nodal networking. Examples of initiatives that have been undertaken in the ASEAN region to achieve the above goals and also actively promote capacity building include the ASEAN-EC Energy Management Training and Research Center, the ASEAN Energy Business Forum and the Regional Energy Policy and Planning Sub-Sector Network.

A critical assessment

To date, the regional approach to energy security in Southeast Asia has been focused on petroleum security, conservation and the search for alternative fuels. Specific examples of regional cooperation include the APSA, requiring ASEAN member states to provide crude oil and/or petroleum products for countries in short supply. Among the most outstanding projects, studies for a Trans-ASEAN Gas Transmission System and an ASEAN Power Grid aim at ensuring a reliable supply of energy to the region, with some notable progress to date related to cooperation in natural gas use and energy management.

Recently, interest in energy cooperation has been gaining renewed momentum as a means of hastening the establishment of the ASEAN Economic Community by 2015. An efficient, secure and integrated energy system is indeed deemed to be key for the realization of the project. However, due (in part) to technical difficulties, the cooperation has been progressing very slowly and the results of the cooperative efforts are relatively disappointing. In particular plans for the Trans-ASEAN natural gas grid have been pushed back by up to a decade due to delays in developing the Indonesian East Natuna field, the biggest in the region.[19] Similarly, the new APSA cannot be expected to contribute much in terms of regional energy security because the widening gap between oil production capacities and oil consumption potential in the region clearly constrains the efficiency of the scheme.

Moreover, in other areas such as energy efficiency enhancement, consumption reduction and renewable energies development, achievements have been mixed at best. As stressed by Symon "Despite Kyoto and the climate-change debate elsewhere, energy production and consumption in Southeast Asia remain business as usual. Individual governments and the ASEAN often

[19] The East Natuna field is not expected to come into production before 2016.

make assertions about the desirability of greater energy efficiency, cleaner energy technologies and greater reliance on renewables. But at the moment there is no major departure from the region's 1990s trends in energy use."[20] Actually, Southeast Asia's increasing reliance on coal to fuel large electricity generation expansion plans points to the limited achievements of the current efforts.

Also, even relatively simple proposals — such as the common stockpiling of oil — face a host of complications, such as disputes over where supplies would be located, which nations would take responsibility for securing them and what would be the exact purpose of the supplies. On the latter point, there seems to be disagreement as to whether to address emergency supply disruptions or cushion the fluctuations in the price of oil in the world market, or to hold commodities in anticipation of higher prices, or to provide subsidies. Likewise, stockpiling whether "strategic" or "commercial" needs further study. Further difficulties include program management and organization, stockpile composition, storage method, stockpile ownership, and cost of storage facility. This does not bode well for cooperation on other energy issues. In particular, although nuclear energy seems particularly well-adapted for regional co-operation given the high costs involved (Symon 2008), the high level of trust required may turn out to be wanting.

Lastly, a number of signs tend to suggest that some countries in the region are not ready to go beyond paying lip service to regional cooperation because national interests still prevail over regional objectives. Such is for instance the case for refining activities, where three countries compete to become a regional hub. While Singapore dominates this sector,[21] the Malaka refining complex in Malaysia has become a competitor and Thailand plans to do the same with its Sri Racha oil center. Moreover, the flipside of the shared vulnerability highlighted earlier is the emergence of intra-regional competition and rivalry. In an attempt to reduce their energy dependence, the temptation may be strong for some countries to choose to go it alone or to privilege forging links with energy suppliers outside the region rather than with their partners in the region. While a potential area of cooperation is collective bargaining to obtain better terms on oil imports from the Middle East for instance, the persistence of diverging views and interests in the region has prevented the formulation of such a collective-bargaining arrangement.

[20] "Southeast Asia's climate-change challenge", *Asia Times*, May 26, 2007.
[21] It is reported to have a total crude oil refining capacity of approximately 1.3 millions barrels a day as of January 2006 (Oil and gas website).

Beyond ASEAN: assessing the opportunities

The energy-related concerns highlighted earlier are also shared to a large extent by Northeast Asian countries. A number of factors also point to the need to take a broader perspective and to address energy issues in the context of the wider East Asian region.

ASEAN, a key partner for Northeast Asia

Southeast Asia is of utmost strategic importance for Northeast Asia because it controls the different routes for transporting energy from the Middle East, Africa and Latin America. ASEAN is a gateway to Northeast Asia, with 12 million barrels a day of oil (or 14.3% of world oil demand) going through the Malacca Strait[22] in 2006 (Lyons 2008). This accounts for more than 80% of the crude oil supplies for China, Japan, South Korea and Taiwan. Oil flows through the Strait are reported to be three times greater than through the Suez Canal and 15 times greater than through the Panama Canal. In addition, oil traffic through the Malacca Strait is expected to rise to 21 million barrels a day in 2030 (Tsutomu 2008).

LNG and coal are also transported by sea so that altogether about two thirds of South Korea's energy supplies and almost 60% of Japan's and Taiwan's flow through the Strait. As a result, because of Northeast Asia's dependency on the Strait of Malacca the fates of the two regions are necessarily linked and the pressure to adopt a cooperative stance is strong. In particular, all three Northeast Asian countries (as well as Taiwan) have a keen interest in cooperating with ASEAN to enhance their energy security by securing sea-lanes.

China is particularly interested in near-by energy resources which would help it bypass the choked Malacca Straits. From China's perspective, security concerns put a high premium on Cambodia's nearby newfound resources.[23] Similarly, China is interested in new oil discoveries in Myanmar. Such reserves would become all the more attractive if a shortcut (such as the construction of a canal) could be found through the Kra Isthmus in Southern Thailand, or alternatively with the construction of a pipeline from Myanmar to China.

Additional factors provide a further rationale for cooperation between Northeast and Southeast Asia. Geographic proximity necessarily influences the scope and aims of regional cooperation on

[22] It is the shortest route for energy transportation from the Middle East and Africa: it is approximately 2000 km shorter than the second shortest route through the Sunda Strait.

[23] See "Cambodia's coming energy bonanza", by Shawn Crispin, Asia Times, Jan. 26, 2007.

energy issues: the so-called Greater Mekong Sub-region (GMS), which links together the six Mekong countries (Laos, Cambodia, Vietnam, Thailand, Myanmar and China), is particularly well-suited for deeper regional cooperation. In 2002 the Energy Ministers of GMS economies signed the Inter-Governmental Agreement (IGA) on Regional Power Trade in the Greater Mekong Sub-Region, allowing members to cooperate in the planning and operation of their power systems.

Moreover, because of their shared dependence with regards to Middle East oil, both Southeast and Northeast Asian countries have an interest in taking joint initiatives to mitigate this dependence. This may take a number of directions, but a major one is to address collectively the so-called Asian premium issue.

Lastly, the complementarity between the two regions in terms of energy resources may also provide opportunities for bilateral cooperation. Although on the oil front, ASEAN can do very little in terms of supply to East Asia, the substantial LNG production in SEA may offer China an important opportunity to increase natural gas in its energy mix. As stressed by Zhang Xuegang (2007), "China's declaration to shift from heavily polluting, oil-based energy consumption to cleaner gas-based alternatives is expressed in their 2004 Energy and Economic Transformation Strategy, and this long-term goal places energy cooperation between Southeast Asia and China at the heart of the relationship."

However, given the pace of economic growth in ASEAN highlighted earlier, the scope for complementarity with Northeast Asia is gradually declining. As explained by Thomson (2006) for instance, "Indonesia has already announced it is reducing its energy exports to Japan because it wants to use the fuel domestically. Without doubt, the other ASEAN energy exporting countries will also soon be reconsidering their energy export contracts with Northeast Asia." More tensions may be expected in the future as the countries in the region compete for scarce resources.

On the other hand, while proximity with fast-rising China may fuel rising tensions between the two regions it also makes cooperation both more necessary and more valuable. In particular because the intensified competition involving acquisition of energy supply sources may negatively influence the environment of surrounding countries through an increase in energy demand, but also in air pollution and water pollution, the resulting potential conflicts will definitely need to be addressed collectively.

Existing cooperation schemes and further opportunities

A number of bilateral as well as multilateral initiatives have been launched over the past few years between ASEAN and its Northeast Asian partners. The asymmetry in the countries' interests provides

ample opportunities for trade-offs: in particular ASEAN may be instrumental in securing sea-lanes while Japan and Korea may help their Southeast Asian partners through their experience in energy conservation and oil stockpiling.

ASEAN+3 and beyond

In the wake of the 1997-98 financial crisis, ASEAN countries started meeting regularly with Northeast Asian countries in the so-called ASEAN+3 grouping. Energy is part of the cooperation areas and meetings are now regularly held among the ASEAN+3 energy ministers (AMEM).

The ASEAN+3 cooperation on energy security, which takes place through individual or multilateral efforts, aims to promote greater emergency preparedness, wider use of energy efficiency and conservation measures, diversification of types and sources of energy, and development of indigenous petroleum. It also addresses the need for effective dialogue and cooperation between ASEAN+3 and major energy producing countries both within and outside of the region.

In addition, the ASEAN has organized the Energy Security Forum in cooperation with China, Japan and Korea to work in formalizing a mechanism for regional consultation and coordination during periods of petroleum shortages and emergencies within the region. The Philippines is among the designated coordinating countries along with Myanmar and Japan. The forum is expected to promote information sharing through network and implement effective energy response measures/plans.

Japan has often taken the lead in cooperative efforts on energy issues in the region.[24] This is the case with the Hiranuma Initiative (named after the then Japanese Minister of Economy, Trade and Industry) launched at the occasion of the 8th International Energy Forum held in Osaka in September 2002 for promoting cooperative dialogue between energy producing and consuming countries. As a result of a meeting held among ministerial level senior energy officials representing the ASEAN countries plus Japan, Korea, and China, five priority areas for Asian energy cooperation have been set out, encompassing: (i) energy security network; (ii) oil stockpiling; (iii) studies on the oil market (the “Asian Premium” issue); (iv) promotion of natural gas usage; and (v) renewable energy. Subsequently, forums related to the five areas above have been formed with meaningful discussions taking place in each of them. In addition, the Energy Policy Governing Group (SOME+3 EPGG) meetings were organized to monitor the progress in respective forums and also to discuss the way forward for them.

[24] Japan has much to offer in terms of energy efficiency. It is one of the world’s most efficient energy users, thanks in particular to strict energy conservation policies (development of fuel-saving technologies for the transportation sector, etc).

More recently, the Cebu Declaration on East Asian Energy Security was established at the beginning of 2007 during the East Asian Summit which includes India, Australia and New Zealand in addition to the 13 countries of the ASEAN+3. The Cebu Declaration spells out specific measures for promotion of energy efficiency and conservation, agreeing that each one of the participating countries should voluntarily formulate energy efficiency goals and action plans. One of it mechanisms is to facilitate the improvement of energy efficiency along the whole energy supply chain in East Asian economies by accelerating the introduction of advanced technologies by technological transfer and project funding. As a follow-up to the Cebu Declaration, Japan proposed concrete measures (under the Abe Initiative, see Box) to help promote energy conservation, the use of biomass energy as well as the development of clean coal technology.

Abe Initiative

Promotion of Energy Conservation

(1) Receive 1,000 trainees from countries in the region and send 500 experts in the next five years.

(2) Set up the Asian Energy Conservation Cooperation Center.

(3) Positively use yen loans and the JBIC' s investment financing.

Promotion of Biomass Energy

(1) Establish the Asian Biomass Energy Research Core to carry out joint research into biofuel.

(2) Receive 500 trainees in the next five years.

(3) Hold a seminar on the best practices in policy and technology.

(4) Set up the Asian Biomass Energy Cooperation Promotion Office.

Clean Use of Coal

(1) Construct the Coal Liquefaction Support Center and implement projects for the spread of coal liquefaction and training of experts.

(2) Implement cooperation in clean coal technology.

Energy for Poverty Eradication

Extend 2 billion dollar-scale energy-related ODA to improve energy access and carry out energy efficiency and measures in the next three years.

Further initiatives have an even broader geographic scope. The Asia Cooperation Dialogue encompasses the whole of Asia, including Northeast Asia, West and Central Asia, South Asia and

ASEAN. In this context, 22 member-states decided in May 2004 to begin to build a regional oil stockpile (in response to rising oil prices). The idea was taken up again by ASEAN+3 energy ministers in June of the same year. Concrete steps have yet to be made.

Energy security is also discussed within the ASEAN Regional Forum (ARF) which brings together the 10 ASEAN member states and 17 other countries, including Russia, China, India, the United States and the European Union. In this group, the emphasis is placed on securing the sea lanes.

Lastly, at the bilateral level, the cooperation does not necessarily take place at the government level but it may also involve the private sector. This is the case for instance with two-way investments in energy-related projects with Chinese companies investing in ASEAN and ASEAN companies investing in China (Zhang 2007, p. 24). The resulting rising interdependence lays the ground for deeper formal government-level cooperation.

Shortcomings and challenges

While complementarities within the region provide a propitious environment for intra-regional cooperation, the problem often lies in the countries' willingness to pool their assets and interests. By way of illustration, the persistence of territorial disputes makes joint oil exploration for instance particularly delicate. However territorial disputes were set aside in some cases (South China Sea), allowing for joint exploration projects for instance.

In addition to the potential intra-regional frictions highlighted earlier, major intra-regional imbalances (in terms of economic weights) impose obvious limits to the potential for cooperation. According to energy analyst Tomoko Hosoe of Facts, Inc. and the East-West Center, "although the ASEAN grouping is a dynamic, populous region, its total economy and oil consumption are more on the scale of Korea's than that of Japan or China," as seen by the fact that "Japan's current oil stockholdings are large enough to supply all of ASEAN's net oil imports for more than two years." Hosoe further recognizes that the "ASEAN can be important in enhancing Japanese energy security, but on the oil front, ASEAN can do very little in terms of supply to East Asia in general or Japan in particular."

A major challenge is to determine what may be the optimal geographical scope for energy co-operation or to make the various existing initiatives consistent with one another. While some relatively technical energy-related issues (nuclear issue) may be better addressed within an enlarged forum, such is probably not the case for issues such as oil-stockpiling where a relatively limited number of participating countries may be a better option. Overall, cooperation at the ASEAN level is probably particularly relevant for the development of energy infrastructure, while capacity building or information sharing schemes are likely to be more effective at the broader East Asian level.

Concluding Remarks

Energy cooperation appears today more necessary than ever because of the recent world oil price hikes and the challenges associated with the climate change issue. Moreover, with ASEAN member countries now seeking to create a full-fledged economic community, energy cooperation could definitely be instrumental in giving substance to economic cooperation among ASEAN member-states.

As explained earlier, there is already a wide array of energy-related topics on which cooperation exists and could be further developed, with cooperation on functional aspects as the most promising area (emergency preparedness, and oil-stockpiling in particular, technological assistance, energy efficiency, etc). Regarding energy efficiency and conservation; cooperation at the level of the ASEAN+3 region is probably more promising, because the more developed and energy efficient countries in the region can share their useful energy conservation experiences and technology with less developed countries. In addition, most advanced countries could also be instrumental in helping phase in China and other emerging SEA economies into the Kyoto protocol.

However, results have been relatively disappointing so far, even within ASEAN, despite high level of ambitions. Although cooperation is certainly easier and chances of success more substantial within ASEAN where the most important obstacles no longer prevail (or at least to a much lesser extent), the sheer scale of diversity and scope of diverging national interests have significantly impeded most efforts at coordination. In particular, the absence of a recognized common goal still persists, making the pledges for joint strategic reserves and region-wide gas pipelines unfulfilled promises. As recalled by Len (2007), “in the case of Asia, intra-regional rivalry, unresolved territorial disputes and the lack of trust among Asian states as a result of historical animosity is restricting Asia’s ability to address its energy challenges collectively”. It remains to be seen whether recent pressures resulting from the tensions currently prevailing in the energy market, as well as from environmental challenges will finally tip the odds in favor of a more active regional cooperation.

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