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**Powering Growth:
The Non-Traditional Security (NTS) Perspective on
the Energy Security Policies in Singapore**

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Abstract

The Singapore government treats energy security as a means towards achieving sustainable economic growth. It is on that note that the Economic Strategies Committee (ESC) and National Energy Policy (NEP) reports recommended strategies which are meant to steer the nation towards economic competitiveness, energy security and environmental sustainability. To date, both reports provide the clearest indication of what the future energy security landscape will look like in Singapore. These reports also underline the belief that an efficient energy market would inevitably drive economic growth, and generate wealth and security for the nation. However, energy security should also be about human security as much as it is about economic growth, according to non-traditional security (NTS) literature. The NTS perspective argues that energy security should also account for the welfare and development of individuals, households and communities, among other things. Building upon the NTS discourse, this paper attempts to unpack Singapore's energy policies by tracing and analysing the rationale behind the role of oil in the nation's economic development, and explores its implication for human security.

Biography

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Policy Recommendations

- Place people at the centre of the national economic development and planning. In addition, national economic growth strategies should also include a development agenda that could result in greater freedom and choices for the people; and the people should be able to exercise this freedom of choice.
 - For instance, if the objective of a smart energy economy is to ultimately improve connectivity, service and efficiency, then household consumers in particular should be given the opportunity to actively participate in the liberalised energy market since the optimum price of electricity is matched in part, against their demands. The smart energy economy can benefit households not only through future accrued savings but can allow households to actually generate income through it.
- Assuming that the appropriate technology is in place, the government must enact legislations, which make it possible for retailers and households to engage in the trading of electricity.
 - In this model, households should be able to either sell their surplus electricity to the retailers or buy surplus electricity from other households. This model could effectively reduce power wastage, energy surplus and overcapacity by routing back unused electricity to the market. However, this improved model requires an adjustment to the traditional market-based model, which limits households as mere consumers in the national energy market.

The NTS Perspective on Energy Security

There is no single overarching definition of energy security. Energy security means differently to different people at different times and at different locations and is also dependent on the existing level of economic development. Nevertheless, it is still possible to identify certain core ideas and concerns ranging from traditional to non-traditional perspectives which denominate the different framing of energy security.

To begin with, traditional notions of energy security centre on the security of the supply chains. This includes extraction, processing, transportation and distribution, among other things. One of the energy security concerns in the early nineteenth century was how the availability of oil supplies would affect military preparedness since military machines had made the transition from coal to oil as fuel, as in the case of the British Royal Navy. With rising dependency on oil and the geopolitical uncertainty surrounding the major oil-producing countries, oil-importing countries subsequently realised how vulnerable their national security, and in particular their economies, were to oil imports. Such security thinking has led to the preference for stratagems such as strategic petroleum reserves, security of supply chains, diversification of oil sources and the nationalisation of natural resources.

Thus, a typical framing of energy security would be primarily concerned with three main issues: security of supply, security of distribution and security of accessibility i.e. the ability for the state to procure energy supplies at an affordable price for its domestic consumption at a rate that is not detrimental to the nation's security and economic growth.

However, oil consumption is no longer restricted to just military use as it was in the early twentieth century. Today, analysts estimate that oil is the largest source of energy and accounts for nearly 40 per cent of global energy production. This is because the demand for energy is a derived demand since it is required in the production of goods and services. In most nations now, oil is the largest source of energy and is commonly used in the transportation industry, petrochemical products and fuel for electricity-generating plants. The use of oil by-products is so prevalent in the public and private lives that an increase in the price of oil will result in rising energy costs and therefore lead to a rise in the price of commodities, which will then affect national economies and household expenditures. Even in advanced economies, hikes in oil price can reduce the people's living standards. As for the poor, according to the United Nations Development Programme (UNDP) report on Asia and the Pacific, in 2007:

On the whole, rising oil prices have left the poor with few choices other than to cut back on their consumption of oil products or make other cuts in their household budgets. The urban poor tend to be worse off since they do not have the alternative of collecting fuelwood or other biomass.¹

It is against such a vulnerability complex that the NTS perspective gradually evolved. Following the post-Cold War era, the NTS discourse gained traction and contested that the focus of security should be broadened beyond the state to include other referent objects such as human collectivities. This was in part due to the growing recognition that security threats to the state are increasingly non-military in nature and resulting more from internal

¹ United Nations Development Programme, *Overcoming vulnerability to rising oil prices: Options to Asia and the Pacific* (2007).

conflicts than wars.² Emmers and Caballero-Anthony explain that NTS is distinct in the sense that it focuses on non-military challenges to security and recognises that most challenges are transnational in terms of origins, conception, and effects, and finally it moves beyond the state and inculcates human collectivities as the primary referent object of security.³

Therefore, the NTS perspective broadens the energy security discourse and questions whether traditional strategies could ensure that all consumers have equal opportunities to access oil-related products such as petrochemical products, fuel and electricity even if these have been made readily available for public and private consumption. After all, it can be ascertained that access to energy-related goods and services at the individual, households and communities level are important but not necessarily sufficient for human development and welfare. There is still the issue of affordability, which can be understood as the freedom to consume those products at a price that is not detrimental to human development and welfare.

Hence, relevant to the concept of NTS is the notion of human security. At its barest form, human security is about human welfare and dignity. The most common reference to human security in contemporary discourse attributes the concept to Mahbub ul Haq who was credited with universalising the notion. According to Haq,

Human security is not a concern with weapons. It is a concern with human dignity. In the last analysis, it is a child who did not die, a disease that did not spread, an ethnic tension that did not explode, a dissident who was not silenced, and a human spirit that was not crushed.⁴

Human security was formally coined and adopted by the UNDP's *Human Development Report* in 1994. The report states that human security has two aspects: freedom from want and freedom from fear. Freedom from want refers to human safety from chronic threats such as hunger, disease and repression. Freedom from fear refers to protection from sudden and hurtful disruptions in the patterns of daily life at the individual, community and national level. The *Human Development Report* listed seven categories against which threats to human security could be measured. They are economic security, food security, health security, environmental security, personal security, community security and political security.

Unpacking Singapore's Approach to Energy Security: From Industrialisation to Economic Growth

Energy security policies in Singapore are premised on the belief that energy resources are the means towards achieving and sustaining economic growth. To date, the two most comprehensive documents that inform the state's approach towards ensuring energy security are the National Energy Policy Report (NEPR) and Economic Strategies Committee (ESC) reports. The NEPR, released in 2007, was prepared by the Ministry of Trade and Industry, Singapore. The ESC report was released in February 2010 and was prepared by a

² Emmers, R., and Caballero-Anthony, M. "Introduction", in Ralf Emmers, Mely Caballero-Anthony and Amitav Acharya, ed., *Studying Non-Traditional Security in Asia: Trends and Issues* (Singapore: Marshall Cavendish, 2006), xiv.

³ *ibid.*

⁴ Haq, *Reflections on Human Development* (New York: Oxford University Press, 1995), p. 116.

committee that was formed by the government in 2009. This committee and its eight subcommittees comprised members from both the public and private sectors.

Both the NEPR and ESC reports stressed that energy security recommendations and strategies should be aligned towards securing the larger national objectives, which are economic competitiveness, energy security and environmental sustainability. Although there are no direct references to human security and human development, it is plausible that the government's vision of developing the country as a 'global city through sustainable and inclusive growth' resonates with the core principles of human security, since human development cannot be achieved without economic growth and environmental sustainability, at least according to developmental economists and advocates of human security and development, Mahbub ul Haq and Amartya Sen.⁵ This then raises the question of whether the current economic security strategies can actually lead towards human development and human security. An informed analysis, however, has to first appreciate the rationale behind Singapore's energy policies and how it relates to the strategic role of oil in the nation's economic growth, against the past and present landscape.

The Present Landscape of Energy Consumption in Singapore

Singapore is an island city with limited energy resources. Currently, its energy market is entirely reliant on oil and natural gas imports. In 2007, Singapore's electricity was generated by natural gas (78.7 per cent), fuel oil (17.8 per cent) and others (3.5 per cent). Others consist of orimulsion fuel, synthetic gas, diesel, and refuse incineration.⁶

The Energy Information Administration (EIA) ranks Singapore as the eleventh largest importer of crude oil in the world in 2008.⁷ According to International Enterprise Singapore (IE Singapore), 75 per cent of Singapore's crude oil sources come from the Middle East where Saudi Arabia supplies almost 33 per cent of it.⁸ From within Southeast Asia, Vietnam is the largest supplier at about seven per cent.⁹ In addition to that, about 80 per cent of Singapore's electricity is generated by gas imported from Indonesia and Malaysia.¹⁰ Hence, in comparison to the Association of Southeast Asian Nations (ASEAN) energy mix, the Singapore energy mix, which is almost wholly reliant on oil and natural gas, is one of the least diversified in the region.

⁵ See Amartya Sen, *Development as Freedom* (Oxford: Oxford University Press, 1999) and Mahbub ul Haq, *Reflections on Human Development* (New York: Oxford University Press, 1995).

⁶ Energy Market Authority, *Fuel Mix for Electricity Generation* (Singapore, 2009).

⁷ Energy Information Administration (EIA), *Top World Oil Producers*, <http://tonto.eia.doe.gov/country/> (August 1, 2008).

⁸ Ministry for Trade and Industry, *Energy for Growth: Singapore's National Energy Policy Report* (Singapore, 2008).

⁹ *ibid.*, Singapore imports its energy sources from the following: Saudi Arabia, 32.8 per cent; Kuwait, 18 per cent; Qatar, 13.5 per cent; UAE, 10.5 per cent; Other Middle East countries, 7.1 per cent; Vietnam, 4.4 per cent; Australia, 4.5 per cent; Malaysia, 3.7 per cent; and others, 5.4 per cent.

¹⁰ Ministry of Trade and Industry, *Developing a Holistic Energy Policy: Press Release* (Singapore, 2006).

Table 1: ASEAN energy mix

Fuel Type	1990	1995	2000	2005	2010
Natural Gas	18.8	22.3	26.5	30.9	32.0
Coal	9.2	9.9	11.2	12.4	14.5
Oil	65.5	60.6	54.1	48.9	44.4
Hydro	5.6	6.1	7.0	6.9	8.3
Others	1.0	1.1	1.2	1.0	0.8
Total	100.0	100.0	100.0	100.0	100.0

Source: ASEAN Centre for Energy

To meet the future demand for energy, the government will be adding Liquefied Natural Gas (LNG) to the national fuel mix with the intention of diversifying its gas sources. An LNG terminal, which will enable it to import LNG from nations further away, is currently under construction.¹¹ Analysts estimate that the construction of the LNG terminal, which is expected to begin its operations in 2012, will cost approximately one billion dollars.¹² The government expects the terminal to meet initial demands of up to three million tonnes per annum. However, the plan to import LNG is just one of a series of new initiatives outlined in NEPR.¹³

Overview of Singapore's Oil Industry (1871–1961): Petroleum as the Driver for Industrialisation

Singapore is one of the largest refining centres in the world, second only to the refineries in Houston in the United States and Rotterdam, Netherlands. The history of oil refinery in Singapore began with the first installation of an oil storage facility by American oil traders in the 1870s.¹⁴ Due to its strategic location in the region, Singapore was well-placed to be a regional distribution centre. The first bulk carriage, which discharged oil at Pulau Bukom, occurred on 1 July 1892. The oil tanker *Murex* discharged 2,500 of the 4,000 tonnes and transported the rest to Bangkok.

By the First World War, oil exports had reached approximately 700,000 tonnes per year and domestic competition was mainly between the two American oil companies, Standard Oil of New York and Standard Oil of New Jersey.¹⁵ Around the same time, Singapore was also blending and distributing oil in addition to storage.

¹¹ *ibid.*

¹² Energy Market Authority, *Consultation Paper: Initial Findings and Views on LNG Importation into Singapore* (Singapore, 2005).

¹³ Ministry of Trade and Industry, *Energy for Growth: National Energy Policy Report* (Singapore, November 2007).

¹⁴ Horsnell, P, *Oil in Asia: Markets, Trading, Refining and Deregulation* (Oxford: Oxford University Press, 1997). p. 134.

¹⁵ *ibid.*

Singapore's oil trade regained its momentum after the war and continued to flourish. Singapore evolved to serve as a port for regional refineries such as those in Borneo and Southern Sumatra.¹⁶ By the end of the 1950s, the oil trade had grown to about three million tonnes per year. By the time Singapore gained Independence, its refinery industry had grown to both storage and distribution. What followed next was the emergence of a national refinery industry.

The Emergence of Singapore's Refining Industry

With self-governance, the Singapore government was keen to strengthen the country's economy through industrial development and thus offered 'pioneer' status to new commercial enterprises. Shell was the first company to be awarded 'pioneer' status and began operating out of Pulau Bukom in 1961.¹⁷ This was followed by Japanese firms Maruzen and Toyo Menka (1962), British Petroleum (1964), Mobil (1966), Exxon (1970) and the Singapore Petroleum Company (1973).¹⁸ Thus, by 1961, Singapore transformed itself into an important regional oil refinery hub, attracting the investments of major industrial players such as Shell, Exxon and Mobil.

Summing up the impact of the petroleum industry, Koh and Mariano opined that the petroleum industry led the country's industrialisation in its first two decades, from 1965 to 1984, and contributed towards approximately 50 per cent of the country's domestic exports.¹⁹ And during this period, the Singapore economy grew at an average rate of seven per cent. However, between 1985 and 2004, the electronics industry gradually replaced the oil sector as the country's economic leading export engine. In 1976, oil accounted for 50 per cent of the total domestic exports. By 1984, the proportion of oil as the nation's domestic exports fell to 47.6 per cent. At the turn of the century, oil accounted for 18.3 per cent and had been replaced by electronics which represented 48 per cent of the total domestic exports in 2001.²⁰

By 2008, refined petroleum products were still one of the top 10 exports at a percentage share of close to 24 per cent.²¹ As of 2007/2008, its petrol products contribute about US\$44 million and its chemical and pharmaceutical products earn approximately US\$31 million in a year.²²

¹⁶ *ibid.*, p. 139.

¹⁷ *ibid.*

¹⁸ SPC was incorporated in 1969 under the name Singapore Petroleum & Chemical Company (Private) Limited, and was later named Singapore Petroleum Company Private Limited. (see http://www.spc.com.sg/aboutspc/history_milestones.asp/).

¹⁹ Koh, Koh, M, *The Economic Prospects of Singapore* (Singapore: Addison-Wesley Pearson Education South Asia Pte Ltd, 2006). p. 124.

²⁰ Ministry of Trade and Industry, "Singapore's Changing Growth Engines Since 1965", *Economic Survey of Singapore*, Second quarter (Singapore, 2002). pp. 47–54.

²¹ Ministry of Trade and Industry, *Economic Survey of Singapore*, http://app.mti.gov.sg/data/pages/485/doc/AES_2008_ES.pdf/ (Singapore, 2008).

²² Gross Domestic Profit, <http://www.guidemesingapore.com/singapore-introduction/c618-singapore-economy.htm> (August 2008).

Paradigm Shift in Political Thinking: Sustaining Economic Growth

A sustained trend in the increase of the price of oil, particularly in the last decade, has led to a shift in thinking among the political elites in Singapore. Between January 2004 and August 2006, the price of oil increased by nearly 300 per cent – up to US\$75 per barrel.

The then Deputy Prime Minister (DPM) of Singapore remarked in 2006:

Even as our consumption of energy has risen steadily with our rapidly growing economies, we have concurrently taken for granted that the supply of energy will continue to be cheap and sustainable. Recently, however, this idyllic state of affairs has been disrupted.²³

Signifying a shift in the political paradigm towards energy security, the DPM also announced that the government would look at energy issues from the perspectives of economic competitiveness, energy security, environmental sustainability and energy industry development. These four categories later took on a more definite shape when it was packaged as the NEPR, which was released in the following year, 2007. The government thus continued to mark out energy security as a primary driver of the national economy although the strategy shifted its objectives from industrialisation to economic growth.

The global price of oil went on to reach a historic high of nearly US\$150 per barrel in August 2008. Although the price has gone down since, the current level remains higher than the first half of the last decade. At the time of writing, the price of oil per barrel was US\$85.50, according to the InterContinentalExchange Brent Crude Oil price index.²⁴ Energy economists and analysts attributed the upward pressure on the global price of oil in 2008 to several factors such as the strong demand from the expanding economies of China and India; inadequate spare capacities in oil production and refining, and global concerns over 'peak oil'; geo-political uncertainties and natural disasters.

Regardless of the dominant narrative among the experts, many countries were left reeling from the effect of the high oil price. Singapore, which is largely dependent on global trade and exports, was one of them. These countries suffered from slower economic growth, high inflation and high unemployment rate, which also occurred in the first and second oil shocks in the 1970s and 1980s. Inevitably, deterioration in the national economic condition will affect the socio-economic conditions of the national population whose quality of life will be severely affected by the increase of prices in goods and services. Naturally, the segment of the population that is most vulnerable will be the ones who are financially less well off.

²³ Institute of Southeast Asian Studies, *Singapore Energy Conference 2006: Summary Report* (Singapore, 2006).

²⁴ InterContinentalExchange (ICE), "Brent Crude Oil", <http://www.theice.com/> (August 2008).

Global oil prices (1978–2009)



Source: U.S. Energy Information Administration

NEPR: Energy for Growth

The Energy Policy Group (EPG) released the NEPR entitled Energy for Growth, in November 2007. Formed in March 2006, the EPG is an inter-ministerial group, which is led by MTI and comprises members from the Economic Development Board (EDB), Energy Market Authority (EMA), Ministry of Environment and Water Resources (MEWR), Ministry of Foreign Affairs (MFA) and Ministry of Finance (MOF).²⁵

The report represents the state's holistic approach towards energy security. It aims to carry out three main policy objectives, which are economic competitiveness, energy security and environmental sustainability.

These three policy objectives thus translate into six strategies that are to promote competitive markets, diversify energy supplies, improve energy efficiency, build the energy industry and invest in energy R&D, step up international cooperation and develop whole-of-government approach.

These objectives are to be achieved by developing and strengthening government, academic and research institutions, which will study energy-related issues in depth and regulate the industry and market. To that end, the government has institutionalised its plans by introducing several agencies within the bureaucracy that have specific functions with regard to the state's strategic objectives. These agencies in return regulate the industry and market according to the policies set by the state. These policies and regulations in turn ensure that the energy market remains competitive and efficient. The research institutions, on the other hand, were institutionalised with the objective to study energy-related issues.

The impact of these six strategies is perhaps better understood when studied against the backdrop of its implications for Singapore at the national, regional and international level.

²⁵ Chin, Loh Kim, "Inter-Ministry Group set up to Coordinate Energy Strategies," *ChannelNewsAsia*, September 7, 2006 (<http://www.wildsingapore.com/news/20060910/060907-3.htm/>).

The Institutional Framework – At the National Level



At the national level, the state recognises the complexity and strategic importance of a comprehensive energy policy and has thus created several agencies with specific functions. Government agencies and think tanks were created or those roles were expanded as part of the national drive towards the whole-of-government approach.

- The Energy Division (ED) within MTI:

ED develops and manages Singapore's overall energy policy with the aim of supporting economic growth and addressing energy security, economic competitiveness and environmental sustainability. ED also oversees the development of the energy industry and energy R&D, and performs energy economics analysis. In addition to collaborating with other agencies, it also sets the strategic direction and policies for energy security and the liberalisation of the electricity and gas markets, working closely with EMA.

- Energy Market Authority (EMA)

Formed on 1 April 2001, EMA is a statutory board under the Ministry of Trade and Industry that regulates the electricity and gas industry and district cooling services in designated areas.²⁶ At the early stages, EMA's role was to liberalise the market and promote competition in the electricity and piped gas industry and maintain the security and reliability of the power system. Under the NEPR, EMA's functions have been

²⁶ Energy Market Authority, "Our Profile", <http://www.ema.gov.sg/profile.php> (August 2008).

expanded to encompass strategic concerns on Singapore's overall energy needs. It has thus created the Energy Policy and Planning Division (EPPD), which, among other things, plans and reviews Singapore's energy policies and develops scenarios for formulation of strategic plans to secure Singapore's energy needs. It also conducts research and analysis into energy.

- Clean Energy Programme Office (CEPO)

Set up in April 2007, the CEPO is the key inter-agency workgroup responsible for planning and executing strategies to develop Singapore into a Global Clean Energy Hub where clean energy products and solutions are developed here and exported globally.

- Energy Efficient Programme Office (E2PO)

Led by NEA, the E2PO is a multi-agency taskforce whose mission is to draw up a long-term plan that integrates whole-of-government efforts to improve energy efficiency to be known as the 'Energy Efficient Singapore', or 'E2 Singapore'.²⁷

- Energy Studies Institute (ESI)

ESI seeks to advance the understanding of local, regional and global energy issues through independent research and analyses aimed at addressing, informing and influencing public opinions and policies.²⁸

Other than ESI, there are other think tanks that study energy security at the local and international level. For instance, the Centre for Non-Traditional Security (NTS) Studies at the S. Rajaratnam School of International Studies analyses the impact of energy security policies on human security.²⁹ Other think tanks include the Institute of Southeast Asian Studies (ISEAS), Institute of South Asian Studies (ISAS), Lee Kuan Yew School of Public Policy and the East Asian Institute.

Electricity Market, Policy and Regulation

The Electricity Act 2001 was introduced in a bid to develop a more cost-efficient electricity market through open competition and market liberalisation.

When the National Electricity Market of Singapore was opened for trading on 1 January 2003, it was Asia's first liberalised electricity market.³⁰ Prior to 2003, Singapore's electricity market, which started in 1995, underwent significant transformation. The national electricity and piped-gas industries had always been vertically integrated and state-owned and managed by the Public Utilities Board (PUB) until 1995. In 1963, the PUB was formed to manage the supply of water, electricity and piped gas. In October 1995, the electricity and piped-gas undertakings were corporatised with the long-term view of introducing open market competition. The rationale was to allow open market forces instead of central

²⁷ Energy Efficiency Programme Office (E2PO), <http://www.e2singapore.gov.sg/energy-efficiency-programme-office.html> (August 3, 2008).

²⁸ Energy Studies Institute, "About U.S.". National University Singapore, <http://www.esi.nus.edu.sg> (August 2008).

²⁹ For more information, please visit the website of the Centre for Non-Traditional Security Studies, <http://www.rsis.edu.sg/nts/home.html>.

³⁰ Energy Market Company, *Asia's First Liberalised Electricity Market*. <http://www.emcsg.com> (August 2008).

planning to decide market prices, investments and production decisions.³¹ In 1998, the Singapore Electricity Pool, which is a wholesale electricity market, came into operation. The market was further de-regularised in 2000 with the introduction of an independent system operator, liberalisation of the retail market and the separate ownership of the contestable and non-contestable parts of the electricity industry. At the same time, the government decided to restructure and liberalise the gas industry as well. A year later, in 2001, the EMA was formed and took over the PUB's responsibility of regulating the electricity and gas industries, and certain district cooling services. The Energy Market Company was formed to take over as the Pool Administrator of the Singapore Electricity Pool. By 2003, the new electricity wholesale market, the National Electricity Market of Singapore (NEMS) began its operation.³²

The NEMS consists of a wholesale and a retail market and is regulated by EMA. The wholesale market is a 'real-time' trading market for energy, regulation and reserve.³³ The retail market, however, was introduced in stages. From July 2001, consumers became competitors and were given the option to choose their preferred retailers. However, this was only applicable to consumers who had a maximum power requirement of two megawatts. This power requirement was eventually lowered to an average monthly consumption of 20,000 kilowatt-hours and was further revised to 10,000 kilowatt-hours by December 2003.³⁴ At present, the retail market for consumers who require less than 10,000 kilowatt-hours a month is still being studied by the EMA. It appears that eventually, all the industrial and domestic household consumers get to select their own electricity retailers when the market becomes fully liberalised.³⁵

Since 2003, 10,000 large consumers account for 75 per cent of the total electricity demand and this leaves the remaining 25 per cent, comprising small consumers such as households, which remain non-contestable and therefore continue to purchase electricity only from SP Services Ltd.³⁶ As of 2009, the EMA was studying the feasibility of a retail scheme called the Electricity Vending System (EVS), which would give small-sized consumers access to the different electricity packages offered by different retailers. According to the EMA, this scheme is the first of its kind in the world.

The liberalisation of market comes with consequences that may lead to market failure should big generator companies attempt to influence the market prices by unfair practices. As such, the EMA has introduced vesting contracts as a way of curbing the exercise of market power by big power generators. Senoko Power Ltd, PowerSeraya Ltd and Tuas Power Ltd supply about 90 per cent of Singapore's electricity demand and they are the three largest producers in the market.³⁷ Without vesting contracts, large power generator companies may distort market prices by simply withholding supply or via other unethical practices. Vesting contracts are thus contractual agreements made between the power generator companies and the

³¹ Energy Market Authority, *Milestones in Restructuring (Singapore Electricity and PNG Industries)* <http://www.ema.gov.sg> (August 2008).

³² Energy Market Authority, *Introduction to the National Electricity Market of Singapore* (July 2009).

³³ *ibid.*

³⁴ *ibid.*, 2-2-2-4.

³⁵ *ibid.*, 11-1.

³⁶ Energy Market Authority, *Implementation of Electricity Vending System (EVS) project by the Energy Market Authority: Press Release* (Singapore, October 18, 2007).

³⁷ Youngho, Chang, "The New Electricity Market of Singapore: Regulatory Framework, Market Power and Competition." vol. 35, Issue 1, *Energy Policy* (January 2007): p. 44.

Market Support Services Licensee (MSSL), who acts on behalf of consumers.³⁸ This contract stipulates that the power generator companies must sell a certain quantity of electricity at a certain amount. Smaller companies are only offered voluntary vesting contracts. The EMA determines the level of vesting contract every two years.³⁹

On the impact of vesting contracts on price stability, certain studies have shown that the restructuring of the electricity market in Singapore indeed has an economically and statistically significant impact on the market. Furthermore, vesting contracts are effective at maintaining a lower electricity price and can effectively lower the price and volatility during peak hours.⁴⁰

By the end of 2008, all three power generator companies, Senoko Power Ltd, PowerSeraya Ltd and Tuas Power Ltd, have been fully divested which means they are no longer wholly owned subsidiaries of Temasek Holdings (Private) Limited.⁴¹ Senoko Power Ltd was the last of the three wholly owned 'gencos' (generator companies) to be sold in a move that began in 2007. The divestment of the 'gencos' is part of the larger strategy by the Singapore government towards creating an open and competitive power generator market. However, it remains to be seen, whether the restructuring and liberalisation of the electricity market will actually and effectively lead to ensure energy security in Singapore in the long run and how effective vesting contracts are at curbing market power.

Research and Development (R&D)

In the NEPR, the EPG has identified R&D as the key factor towards achieving energy security and sustainable development. Among other projects, the government has identified the use of photovoltaic (PV) as a source of clean energy. The National Research Foundation (NRF) through its Clean Energy Programme has set aside \$170 million to focus on solar research.⁴² PV has also been identified as a way to diversify Singapore's energy mix. The NEPR too mentions that Singapore is well-placed to develop PV capabilities and serve as an exporter to the region.

³⁸ *ibid.*

³⁹ Market Support Services, *Vesting Contracts*, <http://www.mssl.com.sg> (August, 2008).

⁴⁰ Youngho, Chang and Cheolbeom, Park, "Electricity Market Structure, Electricity Price, and its Volatility, Economic Letters." vol. 95, Issue 2, *Economic Letters* (May 2007): p. 197.

⁴¹ Temasek Holdings, *Temasek Sells Senoko Power to Japanese Consortium: Press Release*, (Singapore, September 5, 2008).

⁴² Ministry of Trade and Industry, Singapore. *Energy for Growth: National Energy Policy Report* (Singapore, November 2007). p. 67.

Regional Cooperation/Integration

Singapore is actively involved in various energy-related initiatives, which among others include the ASEAN, the Asia-Pacific Economic Cooperation (APEC) and the East Asia Summit (EAS). Singapore is also represented at the EAS's Energy Task Force and APEC's Energy Task Force. In particular, and as part of the ASEAN Vision 2020, the ASEAN member states pledged to develop an interconnecting arrangement in the field of energy and utilities for electricity, natural gas and water through the ASEAN Power Grid, Trans-ASEAN Gas Pipeline and Water Pipeline.⁴³ Therefore, as a member of ASEAN, Singapore has signed the memorandum of understanding (MOU) on the following:

- Energy security
- ASEAN Power Grid (APG)
- Trans-ASEAN Gas Pipeline Project (TAGP)

International Participation

At the international level, Singapore participates actively in the United Nations Framework Convention on Climate Change (UNFCCC). Singapore was one of the 154 countries that signed the UNFCCC at the 1992 United Nations Conference on Environment and Development in Rio de Janeiro, Brazil. Singapore went on to ratify the UNFCCC on 29 May 1997, which was brought into force on 27 August 1997.⁴⁴ On 13 April 2006, Singapore acceded to the Kyoto Protocol of the UNFCCC.⁴⁵

Economic Strategies Committee Report: Towards a Smart Energy Economy

The ESC was formed in May 2009 by Singapore's Prime Minister, with the objective to recommend forward planning strategies for Singapore to further develop itself as a global city through sustainable and inclusive growth. Within the ESC, a subcommittee on Energy Reliance and Sustainable Growth was formed to recommend specific strategies in support of the larger national objectives, which are economic competitiveness, energy security and environmental sustainability. On that note, the ESC report shares the same primary objectives as the NEPR.

The report singles out energy security in particular as crucial to the nation's economic competitiveness and growth and thus calls for the national economy to evolve into a smart energy economy. Additionally, it also calls for a reduction in carbon emissions.

Although the ESC report did not clarify what a smart energy economy is, it can be inferred from the subcommittee's recommendations that it is one which employs Information Technology (IT) in the form of an Intelligent Energy Systems (IES), which will improve connectivity, service and efficiency between household and industrial consumers, and retailers.⁴⁶

⁴³ Association of Southeast Asia Nations (ASEAN), *ASEAN Vision 2020*, <http://www.aseansec.org/1814.htm/> (Singapore, August 10, 2008).

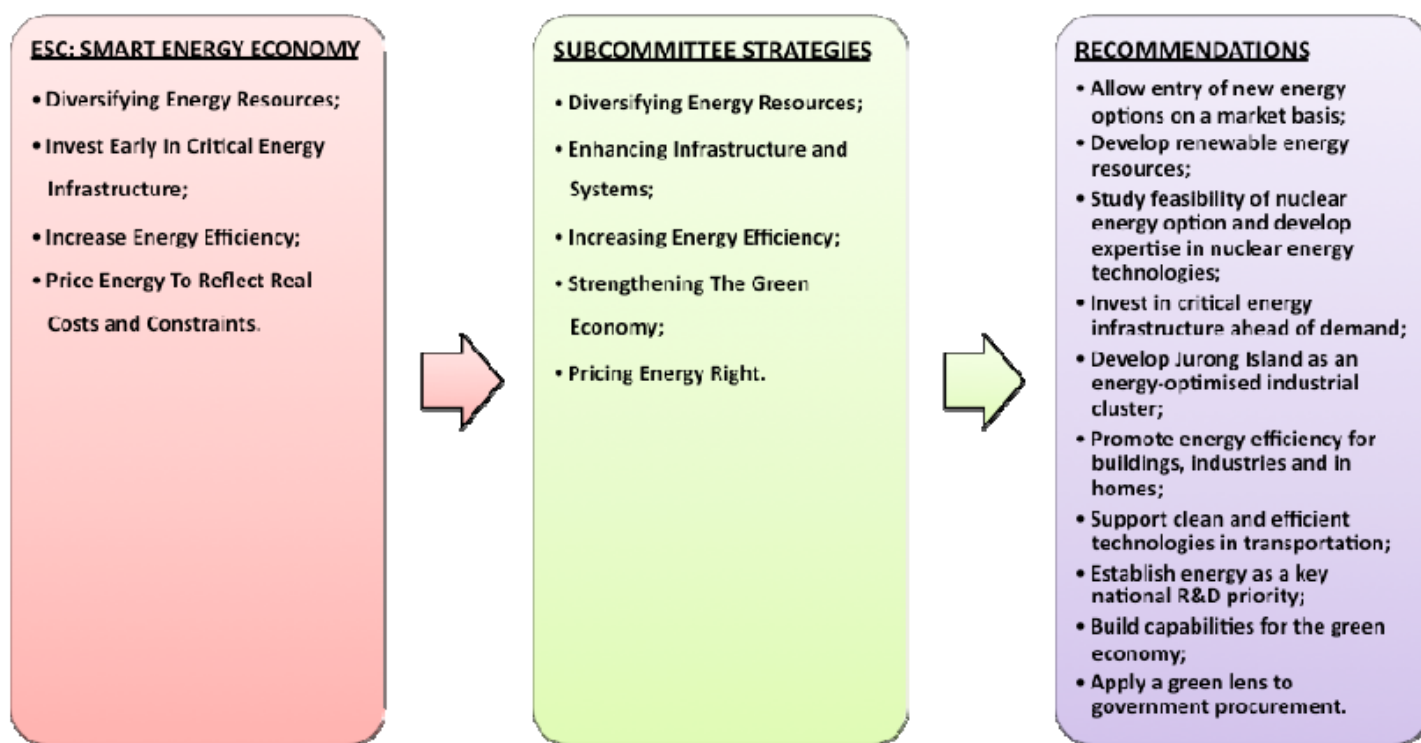
⁴⁴ Ministry of the Environment and Water Resources, *Singapore's Initial National Communication: Under the UNFCCC* (Singapore, August 2000).

⁴⁵ Ministry of Environment and Water Resources, *Singapore accedes to the Kyoto Protocol: Press Release*, MEWR Newsroom (Singapore, October 2006).

⁴⁶ Economic Strategies Committee Report, "Enhancing Infrastructures and Systems" (Singapore, February 2010).

The ESC also calls for the diversification of energy resources, investments in critical energy infrastructure, increase in energy efficiency and the use of carbon pricing schemes to protect the economy against future price hikes and also in anticipation of future carbon constraints as a result of international climate change agreements. To that end, the ESC subcommittee identified five strategies as a way forward. These strategies and the ensuing recommendations are outlined in the illustration below.

ESC's strategies and recommendations



Energy Security for Whom?

Singapore’s approach towards energy security, with the intention to drive economic growth and achieve sustainable development, appears comprehensive and balanced. However, it remains to be seen whether the liberalised market system and the smart energy economy will be sufficient to ensure that human security can be achieved as well. Haq and Sen argue that human security and development could only be achieved if it is the end rather than the means of economic growth. For instance, they point out that the distribution of wealth might not necessarily trickle to every household and this may lead to an income gap, which would affect one’s ability to consume basic necessities, such as electricity. Therefore, they call for putting people at the centre of any nation’s economic development and planning. Stretching this point further, Haq and Sen also point out that economic growth strategies should include a development agenda that could result in greater freedom and choices for the people and that they should be able to exercise this freedom of choice. Expanding on this idea further, Prahalad and Yunus call for the empowerment of the people by providing them with the

incentives to improve their socio-economic conditions by participating in the market.⁴⁷ They believe that the people's welfare can be improved if they were to participate in the market, and both begin on the premise that exclusion from the market will create and sustain socio-economic inequalities.

According to the NEPR, the objective of liberalising the national electricity market was to promote an open and competitive market, which would be able to price electricity competitively in the interests of both consumers and producers. However, will its benefits be felt by all if there is a wide income gap, and when the market equilibrium is determined by the demands of the middle or upper class? Lower-income groups can be left behind if a fixed tariff is applied across all households, regardless of their income levels. The efficient transmission of electricity does not necessarily mean that all consumers would be able to afford it. The argument here is that energy security from a human security perspective should encompass issues of affordability as well as accessibility. It should also be stressed that the notion of energy poverty in an urban society and developed economy is different from that of a rural and agrarian society, typically found in the less-developed and underdeveloped economies, which are perhaps more concerned with the deprivation of electricity and fuel for daily sustenance. Unlike these societies, there is almost no recourse for alternative fuels or energy resources for an urban society such as that in Singapore. The typical dwellers in Housing Development Board (HDB) flats cannot resort to the use of bio-fuels and solar energy, for instance. Thus, it should be argued that more attention should be paid to consumers who cannot resort to alternative electricity sources or suppliers.

Furthermore, unlike residents in landed properties who can opt for other energy sources, those HDB dwellers depend mainly on electricity provided by SP Services. Perhaps this is why the EMA and SP Services introduced the Pay-As-You-Use (PAYU) metering scheme and the EVS in 2005 and 2007 respectively. Under the PAYU scheme, consumers pay in advance for their electricity. This scheme is available to households who have defaulted on their payments or are in arrears. Though the scheme helps these households manage their electricity usage better, it does not address the issue of affordability. They still pay the same tariff as customers on the conventional scheme. The EVS, now being tested, allows households and small businesses to choose their own retailers and packages that suit their needs. Thus, energy security should not simply revolve around market equilibrium and diversifying sources. It should strive to make energy affordable for everyone as well.

Additionally, the move towards a smart energy economy, while appearing useful in ensuring a more effective allocation and distribution of resources, does not necessarily enhance the human security of the consumers. It simply provides a more efficient distribution of electricity via the smart grid. The model achieves this by ensuring that the consumers are able to make more informed decisions with regard to their consumption patterns and accords them the freedom to adjust their consumption patterns accordingly. Overall, the smart grid increases efficiency and reduces wastage but it still operates within the conceptual framework of the smart energy economy model, which treats households and industries as the ultimate consumers of energy.

Building upon Prahalad's and Yunus's theoretical framework, perhaps the smart energy economy model could be adjusted to empower the consumers as active rather than passive participants in the energy market. In this adjusted model, consumers, especially households,

⁴⁷ See C. K. Prahalad, *The Fortune at the Bottom of the Pyramid* (U.S: Wharton School Publishing, 2004) and Muhammad Yunus. *Banker to the Poor* (New York: Public Affairs, 2003).

would have the freedom to sell back surplus electricity to the market. In fact, households could either sell their surplus electricity to the retailers or buy surplus electricity from other households. Furthermore, this model could also effectively reduce power wastage, energy surplus and overcapacity by routing back unused electricity. However, this improved model requires an adjustment to the traditional market-based model where participants are not bound as either consumers or producers in the production and exchange of commodities.

At the same time, energy consumers will be encouraged to move away from mere passive consumption to active participation in the energy market, thereby exploiting opportunities to improve their socio-economic conditions. However, for this system to materialise, the government must first enact legislations which make it possible for retailers and households to engage in the buying and selling of electricity and the necessary technology must be in place. This idea, however, is not new and has been widely discussed by proponents of smart energy grids, such as Roberts.⁴⁸ However, if the objective of a smart energy economy is to ultimately improve connectivity, service and efficiency, then household consumers in particular should be given the opportunity to actively participate in the liberalised energy market since the optimum price of electricity is matched in part, against their demands. It is reasonable to argue that in addition to the stated benefits, the smart energy economy can also benefit households not only through future accrued savings but that they actually generate income through it.

Conclusion

Energy security had always been important to Singapore's economic growth and development but it has, in recent years, taken a more prominent and central role. This was clearly outlined in the government's NEP and ESC reports, which identified energy as the driver for future economic development and growth. Clearly, energy security is seen as one of the building blocks of the nation's security. This appears to be a rational strategy considering how effective the petroleum industry has been in driving the country's economy forward in the last century.

However, energy security should also be understood in relation to human security norms, which are human welfare and development. In particular, electricity tariffs, while determined by market forces, should at least be made affordable to all to the extent that the cost of consumption does not comprise a large portion of the household expenditure. Households must be able to afford the cost of electricity consumption at a price that is not detrimental to their welfare. This is a pressing issue considering that there are limited alternatives especially for dwellers in HDB flats. In addition to this, household consumers can be empowered to improve their own energy security, which can be achieved by participating in income generation activities in the smart energy economy.

In that regard, energy security should also exist for individuals, households and communities. The global oil price hike in 2007 and 2008 has shown how countries struggled to sustain their economies. Many households in developed and developing economies alike suffered from the ensuing price inflation, which has led to a deterioration of 'standards of living'. Many households fell below the poverty line simply because they could not cope with rising costs. All this happened despite the uninterrupted global supply of oil and electricity. The issue then, as it will continue to be in the future, is affordability rather than accessibility.

⁴⁸ See Roberts, *The End of Oil* (New York: Mariner Books, 2005).

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