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RENEWABLE ENERGY: A SURVEY OF POLICIES IN EAST ASIA

This NTS Alert conducts a brief survey of renewable energy (RE) policy frameworks among five selected East Asian countries – China, Indonesia, the Philippines, Thailand and Vietnam. There appears to be agreement among East Asian countries on the importance of alternative energy as a solution in addressing the energy-economics-environment nexus. National efforts have been undertaken in recent times to tap these underutilised resources, in part due to the possible recognition that other alternative sources, nuclear power especially, are politically and economically riskier. While earlier energy policies in these five nations were plagued by technical and financial barriers, concerted efforts have been undertaken by these governments to overcome them. However, the effectiveness of these policy revisions remains to be seen. Moreover, notwithstanding better policy frameworks, certain RE technologies might be better suited to some countries than others, thus careful national planning is necessary to evaluate the feasibility of every available RE source, prior to exploitation.

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Overview

In the previous issue of the NTS Alert, recent progress in the development of alternative energy sources in East Asia was outlined. It was argued that a 'nuclear renaissance' does not best describe the state of energy development in the region, given the many socio-political and economic hurdles encountered by some of the nuclear aspirants. In conclusion, a 'renewables renaissance' was deemed more fitting for energy development in East Asia, as is evident from the significant progress observed to date in RE programmes in the region.

Despite the great RE potential East Asia possesses, sustainable growth of the sector requires sustainable policy frameworks to ensure that these resources are developed according to the needs and limitations of national contexts. Different RE technologies have varying levels of efficiency, cost, and 'density' – a concept highlighted by Michael Quah from Singapore's Energy Studies Institute. Some RE sources require larger material inputs (land space, etc) in order to match comparable hydrocarbon sources to satisfy energy demands. National energy policies should therefore recognise the inherent limitations of certain RE sources, and deploy these technologies in the most suitable and cost-effective applications.

As such, this Alert shall examine the policies adopted by select nations in East Asia, to see how policymakers are attempting to harness the renewable energy technologies and resources at their disposal. By doing so, the Alert hopes to identify the direction each country is taking to address its energy security goals.

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Renewable Energy Policy Frameworks in East Asia

Five East Asian countries – China, Indonesia, The Philippines, Thailand and Vietnam – are selected as case studies. Their selection is based on the following criteria: 1) each of these countries has outstanding electrical power needs (see Table 1 below); 2) they all have plans to either expand or consider the use of nuclear energy; and lastly 3) they each possess a vast RE potential (see Table 2 below).

Table 1: Electricity Access in Selected East Asian Countries in 2008

Country	Electrification Rate (%)			Population without electricity (millions)
	Total	*Urban*	*Rural*	
China	99.4	100	99	8
Indonesia	64.5	94	32	81.1
The Philippines	86	97	65	12.5
Thailand	99.3	100	99	0.4
Vietnam	89	99.6	85	9.5

Source: Data compiled from *World Energy Outlook 2009 New Electricity Access Database*, International Energy Agency (http://www.worldenergyoutlook.org/database_electricity/electricity_access_database.htm)

Table 2: Renewable Energy Potential in Selected East Asian Countries

Country	Renewable Energy

	Wind	Solar	Hydropower	Biomass	Geo-thermal	Marine
China [a]	1000GW	3-7.5kWh per square-metre per day	694GW (theoretically exploitable); 542GW (technically exploitable); 402GW (economically exploitable)	500 million tce; some estimates put it at 1 billion tce	6GW	110GW (theoretical tidal reserve); 21.8GW (developable)
Indonesia [b]	10GW	4.8kWh per square-metre per day	75.67GW (plus 0.5GW small-hydro)	49.81GW	13.44GW	0.01-0.035GW per km coastline
The Philippines [c]	76.6GW	5-5.1kWh per square-metre per day	13.097GW (plus 1.784GW small-hydro)	277 MMBFOE	2.6GW	170GW
Thailand [d]	1.6GW	4.7-5.1kWh per square-metre per day	0.7GW (small hydro only)	3.3GW	0.01-0.02GW	Under evaluation
Vietnam [e]	513GW (theoretical); 120.5GW (economically exploitable)	2.4-5.9kWh per square-metre per day	18-20GW (large) and 2-4GW (small hydro)	1-1.6GW	1.4GW	Under evaluation

Legend: GW = gigawatt; kWh = kilowatt hour; MMBFOE = million barrels of fuel oil equivalent; tce = ton of coal equivalent

Sources:

[a] Data for China compiled from *Recommendations for Improving the Effectiveness of Renewable Energy Policies in China*, Renewable Energy Policy Network for the 21st Century, October 2009 and *Medium and Long-Term Development Plan for Renewable Energy in China*, National Development and Reform Commission, People's Republic of China, September 2007.

[b] Data for Indonesia compiled from *Indonesia's Renewable Energy Potential*, Ministry of Energy and Mineral Resources, Republic of Indonesia, 25 August 2008; and Public State Electricity Corporation, Republic of Indonesia, 'Renewable Energy Development Program in Indonesia,' presented at the Global Workshop on Grid-Connected Renewable Energy, Washington D.C., United States of America, 28 August – 5 September 2009.

[c] Data for the Philippines compiled from the *DOE Portal*, Department of Energy, Republic of the Philippines, (http://www.doe.gov.ph/ER/Renenergy.htm); accessed on 5 March 2010; and from the Philippine Energy Plan: 2009-2030. Retrieved March 11, 2010 from DOE Portal (http://www.doe.gov.ph/PEP/PEP%202009-2030.pdf)

[d] Data for Thailand compiled from Thailand Board of Investment, *Thailand's Energy Policy and Development Plan*, National Energy Policy Council, approved 6 and 21 November 2006; and Dr. Pallapa Ruangrong, Energy Regulatory Commission of Thailand, 'Thailand's Approach to Promoting Clean Energy in the Electricity Sector', presented at the Forum on Clean Energy, Good Governance and Regulation, Singapore, 16-18 March 2008.

[e] Data for Vietnam compiled from Nhan T. Nguyen and Minh Ha-Duong, 'Economic potential of renewable energy in Vietnam's power sector' *Energy Policy* 37 (2009), pp. 1601-1613.

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China

Poised to experience a steady increase in electricity demands (from 2009, a total of 3,588 terawatt hour (TWh) to a projected 5067TWh by 2014), China has devoted tremendous efforts to ensure energy security, while simultaneously attempting to reduce carbon emissions. Alternative energy sources are sought, yet at present China's power generation is based mainly on coal (77%), with the remainder mostly fulfilled by nuclear and hydropower (which China has relied upon as a traditional and important source of energy).

Figure 2: An evening shot of a coal burning power station that co-fires biomass to reduce Co2 emissions. Such an example might soon be found in East Asia. Singapore is one of the latest examples with plans for a clean coal-biomass cogeneration plant, to be built by Japanese firm Marubeni Corp., due to be operational by 2012.

According to a three-step strategic RE development roadmap outlined by China's National Development and Reform Commission, by 2050 over a third of China's total primary energy consumption will be satisfied by RE sources. At present however, RE sources have yet to make meaningful contribution to the country's overall energy mix, though Beijing has been taking steps to tap its vast solar and wind resources.

The Renewable Energy Law (REL) was introduced in 2005, and since then, the use of RE sources has increased steadily, from 7 per cent of the total power generation capacity in 2005 to 9 per cent by 2008 (10 per cent has been projected in 2010). However, policy inconsistencies, weak fiscal incentive systems and inadequate RE investments were some of the problems identified in the REL as preventing RE sources from being able to compete with fossil fuels. In addition, Zhou and

Source: Ian Hamilton, 2007, Available at: (http://www.istockphoto.com/stock-photo-3954218-power-station.php)

Thomson have pointed out that the biofuels industry in China faces problems with regard to domestic sources of feedstocks. According to a study by Zhou and Thomson, published in 2009, traditional sources such as inedible corn are running low, necessitating the use of edible corn and thus leading to an increase in food prices. To supply biofuels demand, efficient alternatives such as cassava would have to be imported from countries such as Thailand and Vietnam, though this has consequences for food prices for cassava as well.

Some of these problems have been addressed by a major revamp of the REL, passed by China's legislature in December 2009. Under this new amendment, power operators are obliged to purchase all the power produced by non-hydrocarbon energy sources, envisaged under the plan to supply up to 15 per cent of China's total power consumption by 2020. The REL Amendments were designed to address the following systemic policy, technological and fiscal barriers, including the chronic lack of assured interconnection of RE projects to the national grid. By mid-February 2010, Beijing is expected to unveil a new RE policy to lift government RE development targets.

In addition, a Renewable Energy Development Fund will be established to encourage grid interconnection and to support other RE development projects. A study published by McElroy et al in 2009 suggested that wind power alone could potentially satisfy all of China's power demands by 2030. Recognising this, China has invested US$2.9 billion to build six 100GW wind farms in Inner Mongolia, and is expected to invest US$4.4 billion in grid infrastructure connecting the farms and the coastal provinces of China. However, Li also points out that progress in the wind energy industry has been hampered by limited indigenous research and development, opaque bidding processes for power purchasing agreements that often underestimate costs and favour domestic wind power companies, the variability of wind power output in certain areas, and the engineering challenges of linking wind farms to areas with high electricity demand given the vast distances and poor grid infrastructure. Thus, wastages may occur unless bidding processes and checks and balances are refined.

Even with these limitations, RE continues to grow at a brisk pace in China. While RE sources are projected to constitute an ever-increasing share of the power generation mix, the technical uncertainties of RE development appear to nudge China towards a two-pronged, hedging strategy, which is, to continue investing in nuclear energy and devoting more effort to RE sources. However, whether the latest RE policy developments could allow China to reduce its dependence on hydrocarbons remain to be seen.

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Indonesia

Previously a member of the Organisation of Petroleum Exporting Countries, Indonesia became a net oil importer in 2006. This has necessitated a diversification of its energy mix away from fossil fuels. Also, even though approximately 65 per cent of the population has electricity access, over 80 million rural residents remain unconnected to the national power grid. Fortunately, like China, Indonesia is endowed with a significant, yet untapped, RE potential – primarily geothermal and biomass.

In Indonesia, RE development is regulated by the Presidential Decree No.5/2006 which states that nuclear and RE sources should comprise 17 per cent of the total power generation mix by 2025. Although Jakarta's energy policy champions energy diversification, barriers against RE development exist, such as inadequate policies, incentives, as well as legal and institutional frameworks. With an aim of improving the RE investment climate, the Energy Law No. 30, passed in July 2007, has met with little success. According to statistics published by the Ministry of Energy and Mineral Resources, RE sources account for merely 3.4 per cent of the total power generation mix. Despite the fact that the prices of cooking fuels are rising, the government has not promoted biomass sources as a primary alternative due to the risk that inefficient production of biomass could increase the country's net carbon emissions, especially from deforestation.

The generally small scale of RE development as compared to hydrocarbon-based energy projects means higher relative transaction costs for RE sources. This deters small-scale investors from opting for RE and also discourages Jakarta from supporting such projects. Halting of the construction of seven geothermal plants in the 1990s during the Asian Financial Crisis demonstrated the aversion investors have towards 'high-risk' projects. Also, traditional approaches to stimulate greater RE investments, such as feed-in tariffs and capital subsidies, are deemed ineffective since production costs far exceed the tariffs that could be collected in the biofuels sector for instance. RE growth in Indonesia will be limited unless serious governmental support and investment are forthcoming for RE development.

Small efforts have recently been undertaken by Jakarta to encourage RE development. A notable instance has been the introduction of a ministerial decree which stipulates the benchmarking of prices of geothermal-generated electricity sold to Perseroan Terbatas Perusahaan Listrik Negara (PT PLN), the state-owned electricity firm. In September 2009 the Indonesian legislature passed a new electricity law that revoked PLN's monopoly over transmission, distribution and retail operations, thus allowing central and regional governments to issue power permits.

This move facilitates the opening up of the Indonesian electricity market to competition and thus might encourage some of the country's more prosperous, resource-rich provinces to embark on new power projects, including RE sources, for local utilisation. In February 2010, Indonesian Finance Minister Sri Mulyani Indrawati remarked that the country was lagging behind other nations in power and RE developments. As such, Jakarta has announced plans to offer fiscal incentives, including tax exemption, to bolster the development of geothermal and biomass sources especially. The country has also encouraged micro-hydro schemes to electrify remote villages, as this form of technology is cleaner and cheaper than using diesel generators.

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The Philippines

For the archipelagic Philippines, which is experiencing a power shortage due to a combination of a drought and routine power plant maintenance, RE development could play a pivotal role in raising energy self-sufficiency from 55.5 per cent in 2004 to 58.2 per cent by 2013, according to the Philippine Department of Energy (DOE). Grand plans are envisaged by Manila in the field of RE development, such as doubling hydropower capacity, and the installation of 130-250MW of biomass, solar and tidal capacities by 2013.

Figure 1: Offshore wind farms such as this one at Scroby Sands, Great Yarmouth, Norfolk in the United Kingdom (below), may be utilised in future by countries that have great wind potential in East Asia. China has invested massively in wind farms, and the Philippines possesses the largest wind farm in Southeast Asia at present.

Source: Ian Britton, 2007, FreeFoto.com (http://www.freefoto.com)

The country pioneered the use of renewable energy in the region after the 1973 oil crisis. As it was dependent on 95 per cent of its energy needs on oil, the Marcos administration embarked on an energy diversification programme instituted by the executive branch of government that involved the installation of geothermal, hydroelectric, and nuclear facilities. While the nuclear programme did not come to fruition, geothermal and hydroelectric facilities contributed significantly to national energy capacity, and have successfully reduced dependence on foreign oil. At present, 34 per cent of the country's energy is sourced from renewable energy, according to DOE Assistant Secretary Mario Marasigan. The Philippines also declared its aim of becoming the world's largest geothermal power producer, a leading Southeast Asian wind energy producer and a solar power manufacturing export hub.

In September 2009, the Philippine Government established the National Renewable Energy Board (NREB), composed of representatives from the Department of Energy and other executive departments, as well as representatives from NGOs and the private sector. This act catalyses the implementation of mechanisms and incentives essential for putting the December 2008 Renewable Energy Act (REA) of the Philippine Congress (which mandated income and value-added tax holidays, tax credits, and cash incentives for the RE industry) into motion. The NREB helped develop feed-in tariffs that could make planned RE development projects economically more viable.

In January 2010, the Philippine DOE was reported to have contracted 87 RE projects, and is 'working to immediately provide fiscal perks to the investors' according to DOE undersecretary Roy Kyamko. On 1 February 2010 alone, it was reported that DOE had signed around 100 RE contracts, spurring huge optimism that approximately US$9-10 billion of RE investments could be generated in the next decade. This development might also see the doubling of RE-generated power capacity from the current 4500 to 9000MW.

Even though the Philippine Government has made substantial progress in exploiting its colossal RE potential, some hurdles need to be overcome in order to increase investment in the RE sector. These include restrictions on foreign ownership of RE projects, and the comparative cost disadvantage that RE-generated electricity has vis-à-vis traditional sources due to the existing system of power purchase agreements. In addition, the government will need to take into account various external factors, such as droughts in the case of hydropower, which may limit minimum baseloads for the generation of renewable energy. For the current 'RE frenzy' in the Philippines to maintain its momentum, the above-mentioned problems faced by the Philippine RE development process will need to be addressed.

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Thailand

In a bid to reduce carbon emissions and its reliance on fossil fuels, the present Abhisit administration has showed its commitment to RE development through the establishment of alternative energy policies as part of its national agenda. The Alternative Energy Development Plan (AEDP) 2008-2022 aims to increase the share of RE sources to 20 per cent of the total power generation mix by 2022. Envisaging 'proper and fair incentive', it strives to promote RE development through supporting R&D for all RE types. Detailed planning for demand growth for electricity is managed by the Energy Policy Planning Office.

Community-based RE projects, revolving around the use of biomass, are perceived as an essential component of Thailand's present and future RE developments, and as part of the concerted effort to bolster rural electrification. RE development in Thailand carries a broader strategic goal, too. Some Thai policymakers have called for Thailand to develop itself as the export hub, learning centre and successful role model for other countries in the field of RE development, if the country is to stand at the forefront as a leading nation in RE usage.

Various incentives and promotional schemes have been applied under the AEDP; most importantly the provision of pricing subsidies/feed-in tariffs through the Small and Very Small Power Producer (SPP & VSPP) programmes using RE, co-generation and micro-hydropower projects for instance. The Board of Investment offers an extensive package of tax and non-tax incentives in a bid to promote RE development.

The Pros and Cons of Nuclear

While nuclear energy carries certain appeal, it is not without its drawbacks. The following benefits and costs of nuclear energy could be briefly summarised to highlight the contemporary debates over its use worldwide, East Asia in particular.

Advantages of nuclear energy: compared to most other alternative energy sources, nuclear power is a proven, arguably mature, technology. It emits minimal carbon emissions compared to the use of hydrocarbons, while the world's existing uranium reserves could, in the view of some analysts, last the world for millions of years in providing relatively clean source of power. Compared to highly-polluting coal as a source of energy, said an Australian opposition politician, nuclear is 'the lesser of the two evils'. The key point of attraction is that nuclear power contributes greatly to slashing electricity costs, taking France for example, where nuclear power accounts for more than 70 per cent of its national energy.

Despite having a strategic plan in the form of AEDP for RE development, a lack of collaboration between agencies and companies involved has been identified as delaying the implementation of many RE projects. Widespread RE deployment has also been hampered by their cost competitiveness against other energy types, as well as high initial capital costs and environmental costs, as is the case with expanding oil palm plantations for biofuels. Siriwardhana et al. in a study published in 2009 have also noted that oil palms are vulnerable to climate variations, such as droughts, and require heavy investments in irrigation and fertilizers. The growth of oil palm plantations has resulted in the deforestation of virgin forests to clear land for plantations. Prices of palm oil, widely used as cooking oil in Thailand, have also increased as a result of increasing biofuels demand, thus increasing food prices.

Bangkok appears satisfied with the results of the AEDP, at least for now. According to Mr Krairit Nilkuha, Director-General of the Thai Energy Ministry's Department of Alternative Energy Development and Efficiency in December 2009, the plan achieved better than expected results, by raising the RE mix by 8 per cent in the last two years. At present, greater interest has been shown among Thai investors in solar and wind energy instead.

Disadvantages of nuclear energy: while modern nuclear technology is deemed by proponents as considerably safer these days, attendant risks still revolve around the potential hazards of radioactive leakage and environmental contamination. A guarantee against the proliferation of nuclear materials among unstable, sometimes hostile, governments, and by terrorists remains far from assured. In addition, a long-term storage solution for radioactive waste has yet to be devised. Modern nuclear projects are marred by cost overruns and have been the source of public controversies among some countries, taking East Asia for instance. Lastly, some other alternative energy sources are cleaner, and hence more sustainable, compared to nuclear.

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Given the progress made to date by the Thai Government in promoting RE investments, it appears that nuclear development, subject to a policy review due in 2011, will take much longer to gestate than RE energy. This is notwithstanding some barriers, which still need to be overcome before the full realisation of Thailand's ambitious RE goals.

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Vietnam

According to one study published in 2009, the use of RE sources could reduce the use of coal in Vietnam's power generation mix, from 44 per cent to 39 per cent, and at the same time negate the necessity for the installation of 4.4GW fossil fuel capacity, decrease hydrocarbon imports, conserve domestic coal supplies and improve energy self-sufficiency. Even as Vietnam pushes onwards with a nuclear power programme, the country possesses great RE potential, which is beginning to be recognised.

One of the earliest attempts by Vietnam to explore RE sources was the Vietnam Renewable Energy Action Plan (REAP), conceived in 1999. It envisaged hydropower and biomass as the foremost potential RE sources which could bolster rural electrification. REAP provided the basis for further creation of more coherent RE-related policies. Under Decision No.110/2007.QD-TTg passed in July 2007 by the Vietnamese Government, installed RE-generated electricity is envisaged to total 4051MW within the 2006-2025 timeframe. The Master Plan on Renewable Energy Development in Vietnam up to the year 2015, with an outlook for 2025, was completed at the end of 2008.

However, Vietnam still lacks a broad target-oriented sustainable energy strategy. For instance, as Uddin et al had identified, there is no timeframe for the expansion of the use of RE sources, especially in areas where grid extension is too costly and where the use for such technologies are economically warranted. Practical limitations to RE development in Vietnam include limited financing due to regulation, as well as inadequate information, analysis and assessment of Vietnam's RE potential. These hurdles would have to be removed in order to allow RE investments to proceed smoothly.

Hydropower, in which Vietnam possesses vast potential, does not appear to be the focus of the country's RE development. Authorities in the central province of Quang Nam had recently decided to cancel eight hydropower projects, in addition to the five cancelled much earlier. This is due to concerns of the impact caused by construction of hydropower dams on the surrounding ecosystems, which could affect the quality of water supply essential to the livelihood of the residents in the affected zones. The socio-economic consequences of resettling affected communities from the hydropower project zones could be considerable. Nonetheless, Vietnam continues to explore other viable sources, so as to reach the target of 5 per cent for RE sources in the power generation mix by 2020.

There is still potential for the growth of certain RE sources, taking wind power especially, given recent interest expressed by Hanoi in this aspect. Sadly, even though Vietnam does have considerable wind energy potential, investments have been stymied by the lack of a national policy framework, inadequate infrastructure, very low price of power, as well as costs involved in wind turbines. Nonetheless, Hanoi appears determined to tap wind power. A February 2010 report stated that the Vietnam National Renewable Energy Centre is devising incentives for wind power development projects.

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Conclusion

This brief survey of renewable energy policy frameworks in the five East Asian countries derives some observations. Before summarising these observations, it is important to note that the five East Asian nations are chosen along the following lines: 1) projected increase in electricity demand; 2) vast indigenous RE potential; and 3) plans for either expanding or instituting nuclear energy, among all alternative energy sources.

Firstly, there appears to be a widespread, tacit agreement among East Asian countries that alternative energy is the way to go to address the energy-economics-environment nexus. RE potential in the region is underutilised and national efforts have been undertaken in recent times to tap these abundant and more environmentally friendly sources. Part of the reason for this recently intensified focus on RE sources in Southeast Asia in particular could be attributed to the possible recognition that other alternative sources, especially nuclear power, are both politically and economically risky.

Secondly, while earlier energy policies in these nations were plagued by technical and financial barriers, a concerted effort has been undertaken by these governments to overcome them. However, the effectiveness of these policy revisions, such as the rationalisation of

incentive structures and legislative amendments, remains to be seen. Even with better policy frameworks, certain RE technologies are better suited to some countries than others, and policymakers must identify which technologies should be given priority. Governments must take technical, financial, and environmental limitations into account to ensure that money is not wasted on projects with limited potential. For instance, due to environmental and socio-economic concerns, the huge hydropower potential in countries like Thailand and Vietnam cannot be fully exploited.

A final observation may be made about the 'renewables craze' in East Asia. While several countries envision themselves becoming leaders in promoting certain RE sources, careful planning is necessary to evaluate the feasibility of every available RE source, prior to exploitation. It may be one thing to have the 'inherent potential' but quite another to effectively tap this potential. Without manpower, technical capabilities, support from the private sector, and effective government support, RE will only remain a 'potential' resource.

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