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Strengthening ASEAN+3 Renewable Energy Strategies

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Abstract – *ASEAN+3 countries have committed to promote renewable energy through regional cooperation (for example, the June 2004 Ministerial Statement "Forging Closer ASEAN+3 Energy Partnership" and the January 2007 Cebu Declaration on East Asian Energy Security), and many have also established national renewable energy promotion policies. Despite these good intentions, renewable energy utilization in the region remains very low, and the region's enormous physical potential is largely unused. In many cases policies are weaker than they appear or suffer from inadequate funding or implementation.*

This is surprising since East Asian countries have very strong incentives to prioritize and invest in renewable energy, as well as vast untapped physical potential. Renewable energy would be enormously helpful in helping East Asian countries achieve urgent policy goals such as enhancing energy security, economic growth, poverty reduction, rural electrification, not to mention reducing GHG emissions. This study will examine why various national policies are less effective than expected, focusing on the ASEAN+3 countries, and why regional cooperation, which was already agreed on, has not been fully implemented. Based on this analysis, this study will make policy recommendations for how national and regional renewable energy policies in East Asia can be made more effective. This study argues increased globalization and regional integration pose several structural obstacles in additional to other well recognized economic, financial, legal, regulatory, and institutional barriers. This study recommends enhanced regional cooperation measures to address these structural obstacles, especially coordinated renewable energy targets and expanded cross-national grid interconnection, in conjunction with other complementary regional and national measures.

Keywords – Regional cooperation, renewable energy policy.

1. INTRODUCTION

With the volatile price of fossil fuel in the world market and the pressing problem of climate change, renewable energy (RE) is seen as a sustainable option to enhance energy security, reduce environmental problems due to GHG emissions and to provide electricity to people with no electricity access.

Many East Asian countries have instituted national RE policies to promote utilization of renewable energy. On the regional level, the working plan of the ASEAN Plan of Action for Energy Cooperation (APAEC) 2004-2009 has already identified strategies to promote sustainable development through the use of RE and its technologies. However, despite these good intentions, RE utilization in the region remains low, and the region's enormous physical potential is largely unused. Most if not all countries in the region are dependent on imported fossil fuel.

Considering the region's vast untapped physical potential and the seeming enthusiasm of countries to promote renewable energy, this study will examine why various national policies, focusing on the ASEAN+3 countries, are less effective than expected and why regional cooperation, which was already agreed on, has not been fully implemented. Based on this analysis, this study will make policy recommendations for how national and regional renewable energy policies in Asia can be made more effective.

The rest of this paper is organized as follows. Section 2 will establish the region's untapped RE physical potential and the possibility of increasing its utilization. The barriers to RE technology and utilization will be discussed in Section 3. This will be followed in Section 4 by the policy implications of current renewable energy policies and the role of government in mainstreaming renewable energy. Section 5 concludes the paper with proposed policy recommendations to effectively synergize national and regional efforts in promoting RE.

2. HOW LARGE IS THE POTENTIAL?

ASEAN+3 countries have abundant renewable energy resources which could potentially be used on a large scale. Table 1 shows the total physical potential, although it is not clear how much of this would be economically feasible.

The country data in Table 1 were consolidated from numerous published sources. The total potential electricity generation was estimated using the capacity factors from NREL, 2006 [1] such as:

- *Operating hours:* 4320 / annum
- *Capacity factor:* Biomass: 80%, Wind: 36%, Solar PV: 22.5%, Solar Thermal; 24.4%, Mini Hydro: 44.2%, Geothermal: 90%, Waste to Energy: 80%.

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Table 1: Regional renewable energy generation potential (Gwh / annum).

	Biomass	Wind	Solar PV	Solar Thermal	Mini/Small Hydro	Geothermal	Waste to Energy	Total New and Renewable Energy Generation Potential	2005 Total Electricity Generation
Brunei	*na	na	1.35	na	152.76	na	na	154.11	271.00
Indonesia	172,800.00	699.84	na	na	143,208.00	104,976.00	na	421,683.84	11,273.00
Malaysia	3,674.50	na	na	na	154,419.04	na	na	58,093.54	8,925.00
Philippines	187,195.20	119,128.32	na	na	3,398.80	18,273.60	na	327,995.92	6,317.00
Singapore	na	na	na	na	na	na	na	na	3,843.00
Thailand	9,676.80	4,665.60	97.20	na	19,094.40	777.60	na	34,311.60	13,184.00
Viet Nam	1,382.40	158,630.40	na	na	5,155.49	777.60	na	165,945.89	5,380.00
China	51,840.00	155,520.00	na	na	295,963.20	26,049.60	na	529,372.80	184,686.00
Japan	86,915.20	89,552.80	278,078.40	203,597.60	65,302.85	268,272.00	140,546.40	1,132,265.25	105,460.00
Korea	13,432.50	3,319.50	896.50	na	1,069.50	na	na	18,718.00	36,802.00
Total	526,916.60	531,516.46	279,073.45	203,597.60	587,764.03	419,126.40	140,546.40	2,688,540.94	376,137.00

Note: *na* means no data available
Source: Author estimated using data from EIA, 2005, DOE, 1997; Country level ministries and bureaus of statistics

Surprisingly, Table 1 shows that the total electricity generation is much smaller than the total RE physical potential. Therefore, even if just a fraction of the RE physical potential could be harnessed, renewable energy could have a bright future in the energy mix. Waste is also becoming a significant source of energy.

However, there are several serious constraints which make much of the potential unusable. Availability of solar and geothermal potential depends heavily on physical location, so these resources are concentrated in certain countries.

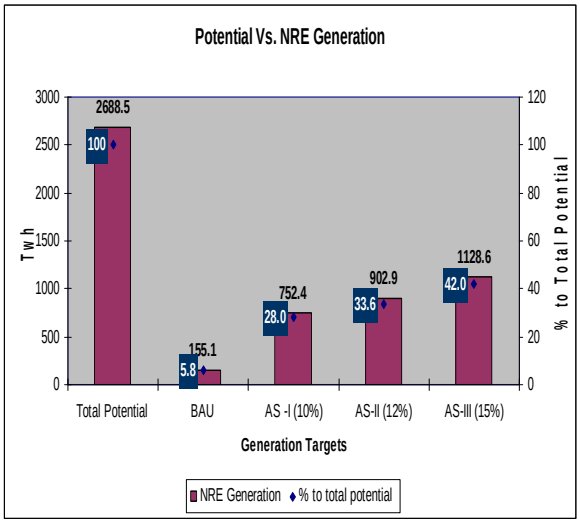

Fig. 1. Potential for increasing RE utilisation targets in the (ASEAN+3) region.

Currently, the Asian region is using only 5.8 percent of its renewable energy potential. Figure 1 simulates what would happen to the utilisation of total renewable energy potential if renewable energy utilisation targets were increased. This paper assumes that a 10% target for the share of RE in electricity generation is reasonable in the ASEAN context [2].

Figure 1 shows three alternative scenarios for increasing the renewable energy requirements (10 percent, 12 percent, and 15 percent by 2020). Thus, in scenario AS-I, if the ASEAN+3 would increase the renewable energy share of total energy demand to 10 percent, it would use 28 percent of the physical potential. Moreover, the AS-III scenario shows that raising the renewable energy share of total energy demand to an ambitious 15 percent would still only use 42 percent of the physical potential. Of course, in practice there may be a variety of barriers to large increases in renewable energy usage. Nevertheless, there is clearly a substantial amount of unused renewable energy potential, and it still seems reasonable to increase renewable energy utilisation targets in order to address environmental and energy security issues.

3. MAJOR BARRIERS TO RENEWABLE ENERGY

The primary problems cited for the difficulty in promoting renewable energy in the region are technological barriers and high costs. The situation for developing countries is even more complicated because of poor infrastructure, lack of trained personnel and low literacy rates in remote areas suitable for possible deployment of renewable energy [3]. Moreover, the potential resources are asymmetrically distributed among the countries in the region, which encourage countries with few renewable energy resources to opt for other alternatives like more fossil fuel exploration or energy conservation.

In developing countries, the high initial cost of renewable energy is the main deterrent to RE investments. Paying the high costs may require higher electricity prices, which are typically met with strong political resistance, due to fears of higher costs for basic needs and adverse effects on industrial competitiveness.

The high cost of renewable technologies can be partly attributed to a number of market barriers which prevent investments in the scaling up of RE projects. The Regional Energy Database [4] gives a clear picture of the opportunities and challenges in promoting renewable energy in few selected countries in Asia. However, instead of going into the specific details of the barriers in the different countries in the region, what will be shown here is the summary encompassing all RE barriers from the World Bank RE Toolkit which organized the barriers documented by Beck and Martinot to three general categories: economic, legal and regulatory, and financial and institutional.

Uncertainties about political stability increase perceived risks of investing in RE in many developing countries [5]. In addition, a significant percentage of the population in developing Asia does not have access to electricity. In remote areas in developing countries where off-grid RE technology could be best implemented, incentives to invest in RE alternatives are undercut by unrealistic plans or political promises for grid extension which cause people to believe they will be connected to the grid soon [6].

4. ANALYSIS OF CURRENT RENEWABLE ENERGY POLICIES

National policies in most ASEAN+3 countries are trying to address the list of barriers in Table 2 to encourage an enabling environment for enhanced renewable energy promotion and utilisation to meet their target in Table 3.

However, the current policies so far have not succeeded in generating enough investment to make significant progress towards these targets. This study has identified four structural factors, to a significant extent related to trade or globalization that undermine or inhibit the effectiveness of national efforts, and could explain why the current policies are progressing more slowly than expected.

Prisoner's dilemma inhibiting RE promotion

Given the inherent high initial cost of RE, it leads to a prisoner's dilemma problem which creates incentives for countries to under-invest in renewable energy. Countries which increase renewable energy utilisation essentially pay a price premium to obtain its environmental benefits. Countries perceive that increasing renewable energy use will mean a loss of economic

competitiveness in energy using industries. Unfortunately, in most developing countries, economic development gains are prioritized over environmental benefits.

An international or regional approach in which countries jointly agreed to increase their RE targets would help to avoid these effects on relative economic competitiveness. The targets could be differentiated as is the case with the Kyoto Protocol so relative changes in economic competitiveness can be minimised.

Table 2. Barriers to renewable energy.

Category	Barriers
Economic	Conventional fuels receive large subsidies while renewables may not. RE has high initial costs but lower operating costs, making it more dependent on financing and the cost of capital. It is difficult to quantify future fuel-risks for fossil fuels and incorporate monetary values for those risks into economic decision-making. Transaction costs are often higher for small, decentralized RE facilities than for large centralized facilities. The real economic costs of environmental damages from fossil fuels (health impacts, etc) are rarely priced into fuel costs.
Legal and regulatory	Independent power producers (IPPs) may be unable to sell into common power grids in the absence of adequate legal frameworks. Transmission access and pricing rules may penalize smaller and/or intermittent RE sources. Permitting requirements and siting restrictions may be excessive. Utilities may set burdensome interconnection requirements that are inappropriate or unnecessary for small power producers. Requirements for liability insurance may be excessive.
Financial and institutional	Consumers or investors may lack access to the credit required for capital-intensive RE investments. Financiers, developers, and consumers may unfairly judge technology performance risks. Market participants may lack sufficient technical, geographical, and/or commercial information to make otherwise sound economic decisions.

Table 3. East Asian RE targets.

Country	Target(s)
China	10% of electric power capacity by 2010 (expected 60 GW); 5% of primary energy by 2010 and 10% or primary energy by 2020
Japan	1.35% of electricity by 2010, excluding geothermal and large hydro (RPS)
Korea	7% of electricity by 2010, including large hydro, and 1.3 GW of grid-connected solar PV by 2011, including 100,000 homes (0.3GW)
Malaysia	5% of electricity by 2005
Philippines	4.7 GW total existing capacity by 2013
Singapore	50,000 sq.m. (~35 MWth) of solar thermal systems by 2012
Thailand	8% of total primary energy by 2011 (excluding traditional rural biomass)

Globalization increases the importance of cost, which favors fossil fuels over RE

Renewable energy policies must take into account the current and future trade liberalization initiatives which make the cost of production increasingly important for trade and business. Under these circumstances, renewable energy, which is costlier than conventional power, is less attractive. Thus, trade liberalization will increase the importance of cost in the process of choosing fuel types for electricity generation, making it more difficult to promote higher cost renewable energy, unless supported by additional policy measures.

This trend is magnified by governments' priority focus on energy security, which is usually a higher priority than environmental problems.

Therefore, in part because of this enhanced emphasis on cost, the majority of governments' efforts are focused on fossil fuel supply security, storage and indigenous exploration while efforts to promote use of renewable energy are limited.

Intermittent nature of RE

Problems caused by the intermittent nature of renewable energy, at least for solar and wind technologies, could be

greatly reduced by increasing the scale of the grid through expanded international grid interconnection and increased electricity trade. A stable back-up is necessary to pursue increased renewable energy utilization as shown from the EU experience. There has been limited scope of trading electricity in physical terms in Asia, mainly because of geographical constraints on grid interconnection. In contrast, in many other parts of the world, electricity has become a tradable commodity now, by using cross country grid interconnection.

In East Asia, four power grid interconnections already exist with 11 to 14 new projects which are under consideration. These interconnections have improved political relations between economies and provided opportunities to develop closer regional energy cooperation [7]. However, this grid interconnection covers only a limited part of the Asian region, so there is considerable scope for expansion, and in the meantime, the current potential for electricity trading is limited. Grid interconnection should be advanced in the region not just to promote electricity trading but also to promote renewable energy. It will also enhance overall energy efficiency. Therefore, there is a clear need for regional cooperation to coordinate policies to promote the electricity trading and grid interconnection to promote renewable energy and enhance overall energy efficiency. This could be facilitated by trends towards increased regional economic integration.

Technology transfer or RE development capacity

It is not easy to develop capacity to implement renewable energy policy, which requires significant financial and technical resources, and most developing countries need assistance. Therefore, some kind of mechanism for transferring financial and technical resources for RE promotion to developing countries is desirable. However, it is important to recognize that each country has a unique set of RE resources, so assistance needs to be tailored to each specific case.

In spite of these barriers, there are also success stories for promoting renewable energy in some developing countries in Asia that could be replicated in other areas. China implemented an ambitious rural electrification program – 1,000 townships within 20 months, through mini-grids. Institutional development and training were built to the program, and 30 percent of the total project funds were allocated to trainer's training on a local basis [8]. The Grameen Bank of Bangladesh administers loans for photo-voltaic solar home systems to serve those without access to electricity [9]. The Philippines and Bangladesh have networks of consumer-owned and managed cooperatives that receive financial incentives in exchange for meeting annual performance targets and providing electricity to members and the local community [10]. However, they have not been sufficient to achieve a large increase in RE utilization, so further efforts are necessary.

5. SUMMARY AND RECOMMENDATIONS

A synergy of national and regional policies is needed to promote renewable energy and ensure sustainable use of renewable energy. The analysis in this paper has shown that strong national policies are essential, but not enough by themselves, and greater international or regional cooperation is needed to make them more effective.

Strengthening national efforts

While national efforts are insufficient to significantly increase RE utilization, they are still very important. National governments are in the pivotal position with their ability to influence markets, technology, and behaviour through policies and regulations. Inappropriate energy policies and short-sighted subsidies can be very costly, at a rate of more than US $200 billion per year globally [11].

Every country that has succeeded so far in developing renewable energy on a substantial scale has been committed over the long-term to this goal, with consistent policies that include an integrated package of promotion measures [12]. The policy options for the government to facilitate RE promotion should include solutions to address both the supply and demand sides of the energy problem. Government procurement of renewable energy is especially important to help achieve a sustainable market and industry, while increasing public awareness and reducing perceived risk.

Strengthening regional cooperation

Some regional cooperation is already occurring, but further efforts are needed. Regular policy dialogues similar to the ASEAN+3 Energy Ministers meeting should be encouraged as a venue to adopt long-term agreements among member countries in promoting renewable energy.

Even if countries pursue different renewable energy policies, it is likely that the benefits will be enhanced by increased regional cooperation echoing the conclusion of the Policy Report at the World Summit on Sustainable Development, 'The scale and magnitude of tasks involved in progressing towards the objective and goals of energy for sustainable development are so enormous that, in addition to national efforts, international, regional, and sub-regional cooperation are of critical importance' [13].

This study proposes three sets of policy measures which show how increased regional cooperation can be effectively combined with stronger national efforts. It is expected that these measures will significantly enhance the level of RE utilization in the region by responding to the challenges posed by the identified barriers to renewable energy. The first is to set coordinated regional RE targets. The second is increased physical integration of the regional electric power grid. The third set of policy measures is composed of complementary supporting policies that can be implemented at the national and regional levels.

Coordinated RE targets

Coordinated increases in RE targets among countries in the Asian region could help avoid the prisoner's dilemma induced by increasing the share of renewable energy use. Stronger regional efforts can aid governments in reaching a domestic consensus to

strengthen RE promotion following Putnam's "two-level games" approach [14, 15]. For example, on one hand, since RE is expensive and developing countries are still behind in technology, it may be difficult to increase its implementation in the domestic level, so governments could invoke international commitments such as binding regional coordinated targets and financial assistance to convince domestic skeptics. On the other hand, it may also invoke domestic constraints to solicit cooperation from other countries in the region.

RE is still an expensive energy source relative to the conventional sources and, and coordinated increases in RE targets would help countries to gain the benefits of RE while minimizing adverse relative effects on relative economic competitiveness of energy using industries. Targets would not have to be increased in the same proportion, but could be differentiated, like the Kyoto Protocol, with developing countries having somewhat lower targets, for example. Moreover, coordinated RE targets could facilitate regional trading in renewable energy certificates, which would further promote RE adoption.

Physical integration measures

Significantly expanded grid interconnection will greatly enhance electricity trading in the region. This would benefit all countries both in harnessing its untapped RE potential and in offsetting the high RE costs, as well as increase energy efficiency. Currently, although regional economic integration increases the mobility of capital, goods and services, electricity trading is not yet predominant in the region due to lack of grid interconnection. Another important benefit is the ability to share baseload power to compensate for the intermittent nature of RE. Setting up cross border power grid interconnection facilities within East Asia with a target date should be included in the regional infrastructure plan. In addition, it is necessary to set up a regional legal framework to facilitate the connection and promote compliance with the RE target and grid interconnection. National efforts to upgrade the domestic grid will also be needed.

Complementary policy measures

The measures above would create a better regional enabling environment for promoting renewable energy, but these are not sufficient, since many developing countries lack the financial and technical resources to increase their use of RE. Potential RE resources are asymmetrically distributed, and so are the financial and technical resources needed to utilize them. The following are supporting policies that would address these issues and complement further the proposed physical integration and coordinated increased RE targets.

National policy measures

Public-private partnerships:

The private sector should be encouraged to invest in renewable energy projects. It is also beneficial to remove barriers to joint-ventures with foreign companies to attract RE investment.

Full cost accounting:

Removing subsidies to conventional energy sources or ensuring that energy prices reflect external costs (on human health, infrastructure, and ecosystems) and benefits can also improve results by shifting market incentives more in favour of RE technologies.

Subsidy-switching:

Subsidies for fossil fuel could be diverted to subsidize renewable energy-based electricity generation to stimulate the market to achieve lower production and technology costs.

Regional policy measures

Financial assistance:

The high cost of harnessing the untapped RE physical potential is the major obstacle to its realization. On the regional level, setting up a regional renewable energy development fund for exclusive use for developing renewable energy could address the financial problem in case of lack of private investment. Streamlined approval procedures, low interest loans with a long term repayment schedule with embedded risk coverage insurance etc. could be key features of such a fund.

Technology transfer:

Technology transfer from developed countries like Japan and Korea should be encouraged. On the other hand, developing countries must assume responsibility for effective technology transfer and not just depend on donor countries, to escape the endless cycle of RE demonstration projects that cannot be scaled up. In addition, IPR related issues should be reduced. A technology support fund could be linked to the RE Development fund.

It is also interesting to learn from the experiences in other sectors. Technological innovation in telecommunications sector is encouraging – remote places now have cellular phone access without having to lay telephone cables – in the same way that stand alone grids or mini-grids of renewable energy can be set up to provide basic electricity needs to rural areas in developing countries without waiting for grid interconnection.

Capacity building:

Capacity development and knowledge dissemination activities should be continuously encouraged in this region until a certain target of RE generation is reached. Support should focus on institutions rather than individual projects, as project-specific funding tends to create boom-bust cycles and does not generally build institutional capacity [16]. A concrete policy for designing such activities has to be formulated at a regional level to support national initiatives.

Carbon trading potential:

Taking greater advantage of carbon trading potential could further contribute to RE financing. One

way is to promote CDM projects in the developing countries within this region. CDM can also assist in technology transfer and capacity building. Voluntary trading, for example through Verified Emission Reduction (VER) schemes, is another way. In addition, greater promotion of carbon offset projects among private sector companies could be linked to carbon trading schemes to further assist RE promotion.

Optimizing the most promising technologies in renewable energy can deliver solutions simultaneously addressing the security of energy supplies, the threat of climate change, rural development needs, and providing access to electricity in remote areas.

Considering the asymmetrical economic standing of countries in Asia, the policy measures should be differentiated between developing and developed countries. The best mix of strategies for promoting renewable energy will vary depending on a given country's priorities. For developing economies, the primary objective of renewable energy policy is to link it with poverty reduction. There are millions of people who are not connected to the grid and rely on various inefficient fuels with very high emission factors like firewood, kerosene, etc., to meet their daily energy requirements. On the other hand, for the developed economies like Japan and Korea, the primary objective of renewable energy policy is to increase energy security and reduce greenhouse gas emissions.

On a collective regional level, the analysis of this study indicates that if a proper policy framework can be developed to solve technical and coordination issues, then the ASEAN+3 countries can significantly increase their utilization of renewable energy sources.

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