

Research on Innovative & Strategic Policy Options Second Phase (RISPO-II)

**Promotion of sustainable development in the context of
regional economic integration: Strategies for
environmental sustainability and poverty reduction**

**- A Case Study on the Energy Sector
in the ASEAN+3 Region -**

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Structure of the presentation

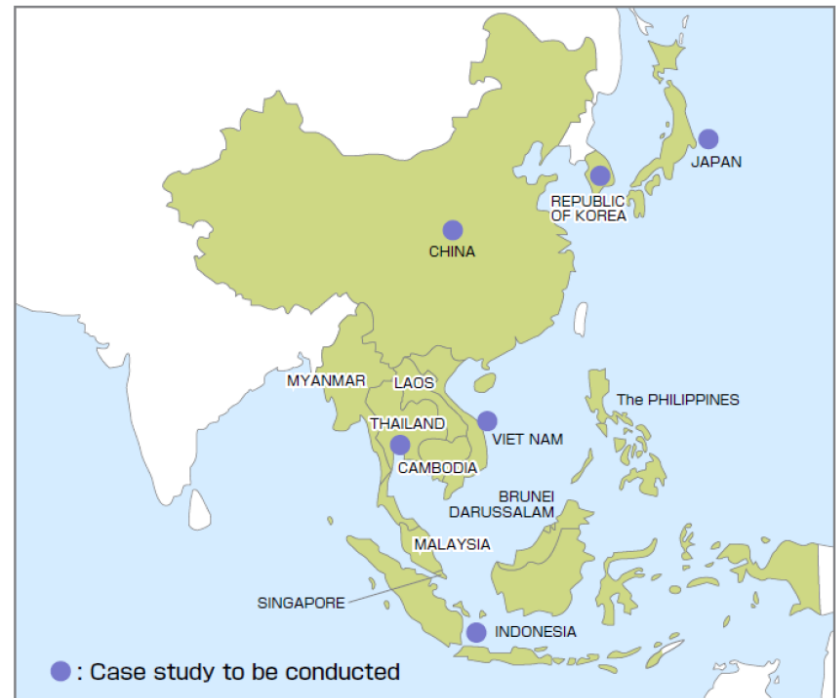
1. A brief introduction to the RISPO-II project
2. Overall structure of the energy case study research
3. Overview of the regional study – Analysis and Recommendations
4. Overview of National Studies
5. Country specific energy sector study
 - Japan
 - Vietnam
6. Strategic policy recommendations
7. Way forward

About RISPO-II project

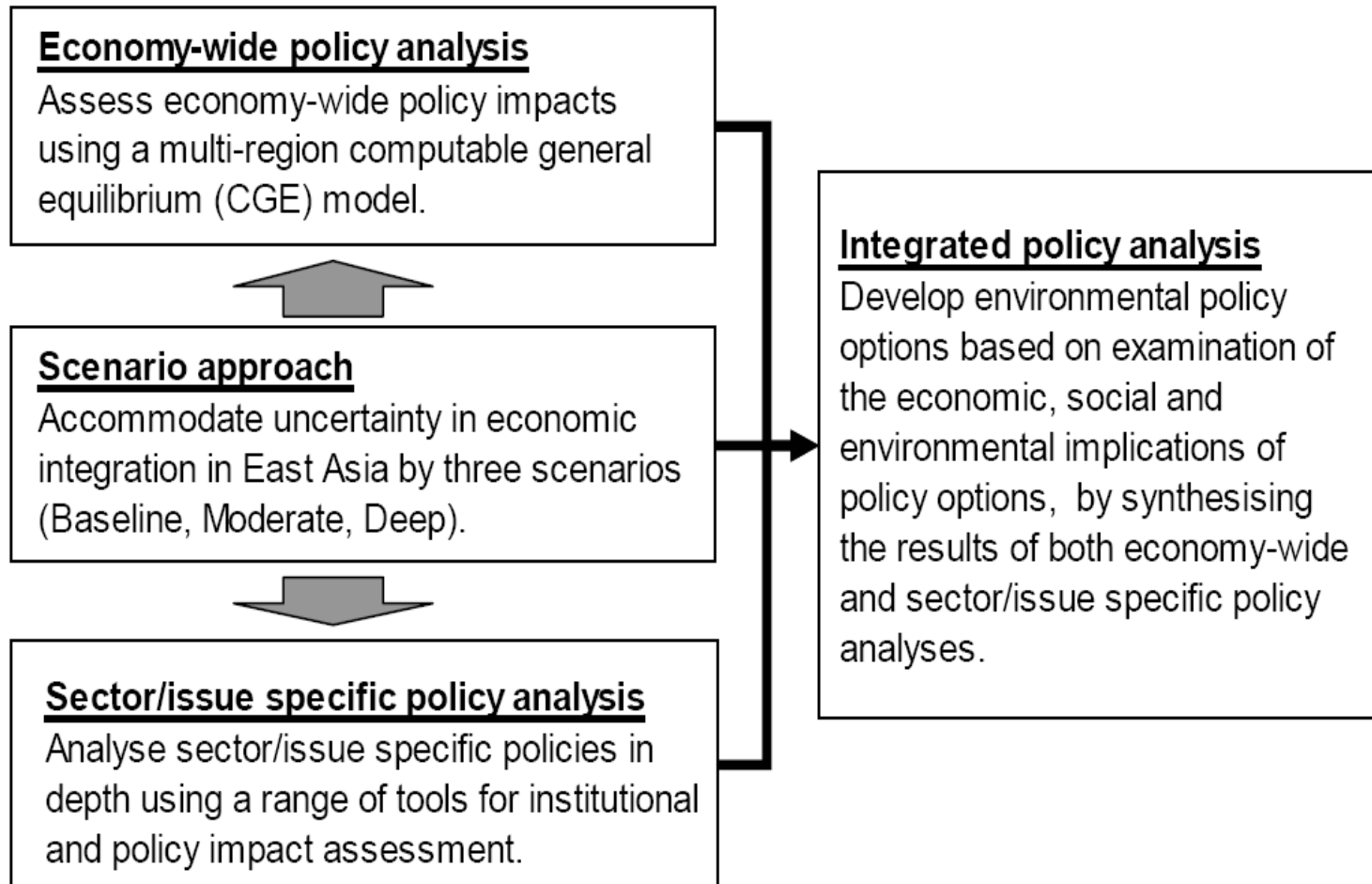
Background

- The goal of APEIS/RISPO-II is to provide policymakers with strategic environmental policy options for promoting sustainable development in the context of regional economic integration and identifying strategies for environmental sustainability and poverty reduction.
- This project comes under the umbrella of two organizations: APEIS and the United Nations Environment Program - Network of Institutions for Sustainable Development (UNEP-NISD). More precisely, APEIS/RISPO-II is funded through APEIS and at the same time designated as a partnership project of UNEP-NISD.

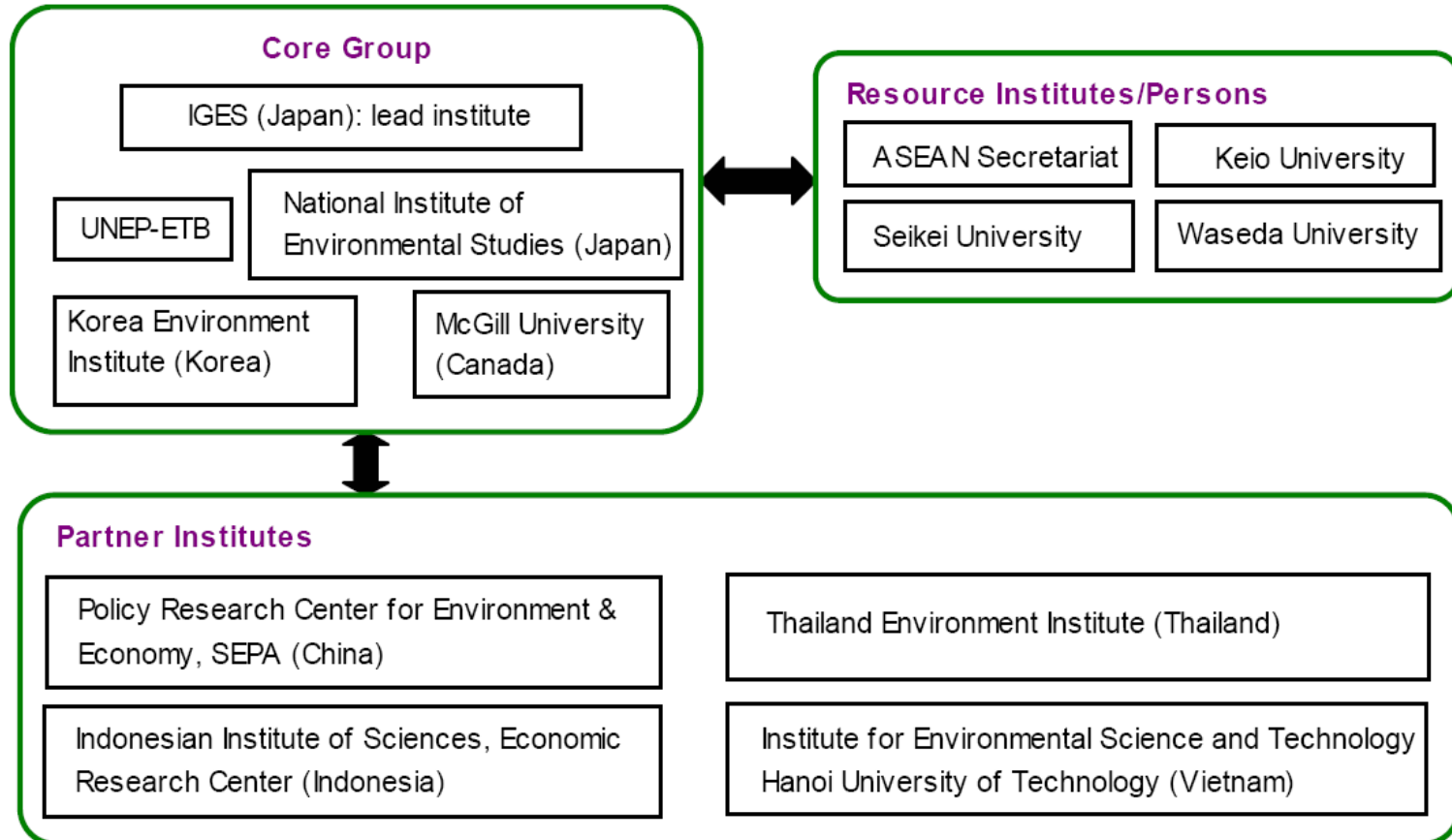
Geographical coverage of the project



Basic Methodology of the Research



Organizational structure of the Project



Part-II : Structure of the energy case study

First Step: Effects of EI on Environment Relating to Energy

Negative effects:

(EI => more economic growth, structural change => increased energy use)

- Increased environmental pollution (e.g. GHG emissions & air pollution) due to increased use of energy
 - Especially while shifting energy intensive industries to countries using comparatively inefficient technology.
 - And enhanced use of cheaper and dirtier energy sources
- Increase imbalance between demand and supply of energy: worsening the problem of energy security

Positive effects:

- Facilitate more trade and technology transfer of renewable energy equipment and technical knowledge

Rationale of using RE as a solution to the problem created due to EI

Multipurpose benefits of RE:

- RE can contribute to GHG reduction.
- RE can promote rural electrification. Many people in the region are still without access to electricity. RE can address this problem without using fossil fuels.
- RE has more job creation potential than conservation or efficient FF generation.
- Renewable energy can have cross sectoral effects on the economy – Other economic sectors can use RE to mitigate some of the effects of FF use.

RE is feasible

- The Asian region has vast reserves of untapped potential of renewable energy.
- Due to continuous R&D activities and increasing fossil fuel prices, RE will become more price competitive with conventional power.

RE is linked to EI

- EI facilitates financial and technological support for RE for developing countries.
- EI can facilitate the promotion of the RE industry through RE equipment trade
- EI affects operation of RE policies (discussed in regional study).

RE is necessary part of energy policy

- Efficient generation and demand side management are important, but not enough by themselves to address energy related issues.

Structure of the study:

- Regional study
 - Overall regional analysis
 - Aggregated country studies
- National level studies
 - 2 developed countries
 - 2 developing countries

Relation between national and regional studies:

Regional study identifies:

- Structural obstacles and opportunities for RE promotion presented by EI
- Regional policies to overcome these obstacles and take advantage of these opportunities
- Overall, regional policies strive to achieve a win-win situation. Collectively how this region as a whole could reach a reasonable target of RE production without much economic loss or concerns about relative gains.

National studies identify:

1. National level strengths and weaknesses for promoting RE under the influence of EI
2. National comprehensive RE promotion policies based on different national conditions (e.g. RE potential, energy market structure, political institutions and decision-making processes, etc.)
3. Specific need for international cooperation to promote RE in the country and potential for contributing to cooperation

Part-III : Regional Energy Case Study- Analysis and Recommendations

Overview of energy sector in ASEAN+3

- increasing energy demand in the region
 - marginal growth for Japan but for China and other developing countries, 2015 demand is almost twice the 2004 demand and will continue to double again in 2030
- the share of RE will be significant in future energy mix

	Electricity generation (TWh)			Growth (% p.a.)	
	2004	2015	2030	2004-2015	2004-2030
Japan:					
Total generation	1071	1208	1280	1.1	0.7
Coal	294	303	226	0.3	-1.0
Oil	133	103	49	-2.3	-3.8
Gas	244	281	330	1.3	1.2
Nuclear	282	389	510	2.9	2.3
Hydro	94	92	94	-0.2	0.0
Renewables (excluding Hydro)	23	40	71	5.1	4.4
China:					
Total generation	2237	4942	7624	7.5	4.8
Coal	1739	3966	5980	7.8	4.9
Oil	72	64	54	-1.1	-1.1
Gas	19	83	169	14.0	8.7
Nuclear	50	124	256	8.5	6.4
Hydro	354	650	937	5.7	3.8
Renewables (excluding Hydro)	2	56	228	32.7	19.0
Developing Asia:					
Total generation	3758	7663	12165	6.7	4.6
Coal	2442	5273	8423	7.2	4.9
Oil	222	258	211	1.4	-0.2
Gas	406	747	1113	5.7	4.0
Nuclear	110	263	467	8.3	5.7
Hydro	545	972	1467	5.4	3.9
Renewables (excluding Hydro)	33	150	484	14.7	10.9

Source: World Energy Outlook 2006

Why renewable energy in ASEAN+3

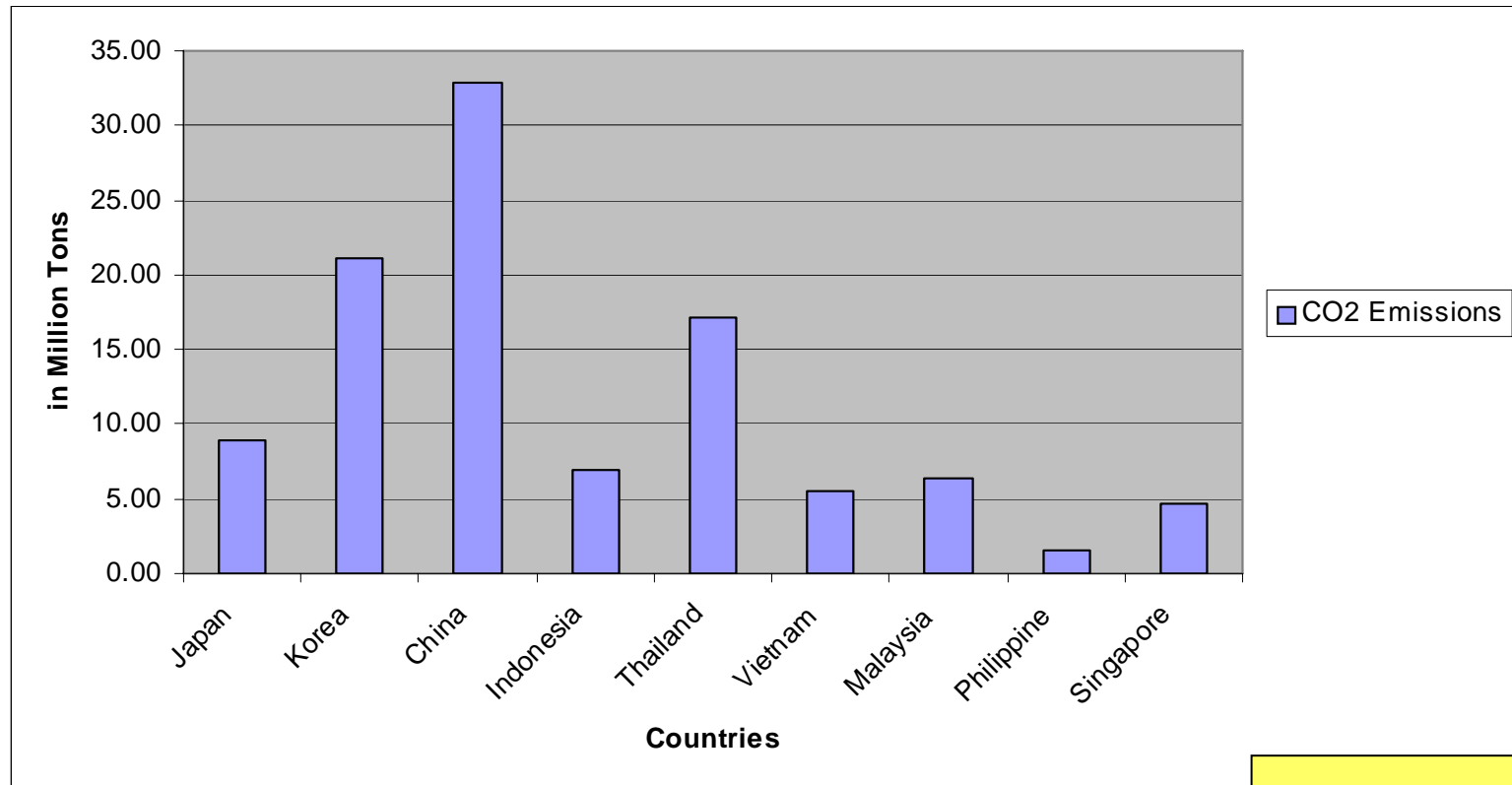
- Enhance energy security
- Reduce environmental problems (GHGs and air pollution)
- Provide electricity to people with no electricity access

Electricity access in developing ASEAN+3

Source: World Energy Outlook 2006

	Electrification rate %	Population without electricity million	Population with electricity million
China	99.4	8.5	1302.1
Indonesia	54.0	101.2	118.8
Malaysia	97.8	0.6	24.7
Philippines	80.5	16.2	66.8
Thailand	99.0	0.6	64.1
Vietnam	84.2	13.2	70.3
TOTAL		140.3	1646.8

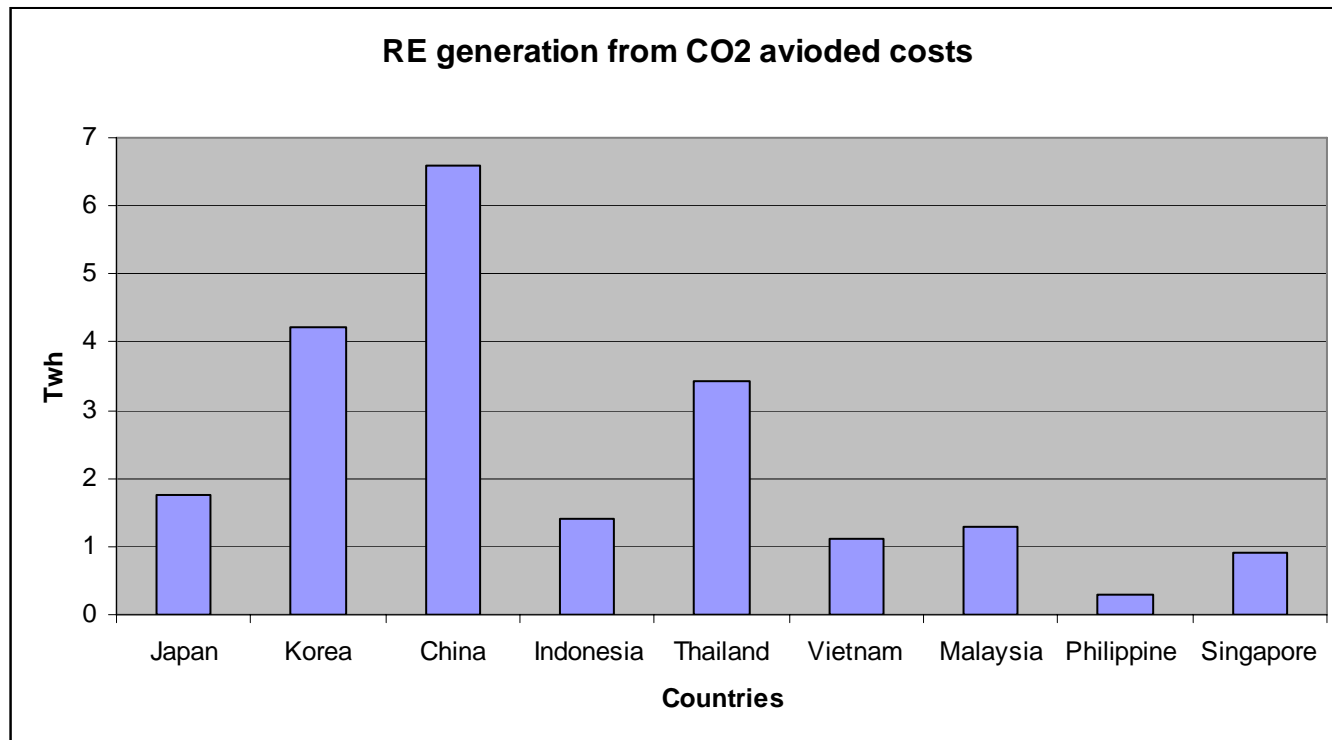
Increase in CO2 due to EI



-105.11 Mt CO2
-17.51 mil-ha
forest area

RE generation from CO2 avoided costs considering EI in 2020 (DEI-BL)

- assuming \$20 cost of CO2 per ton
- assuming 0.1 \$/kwh generation of RE (not incl. PV)



21 Twh

Overview of existing national policies

Indonesia

- Reduce oil dependency by 15% by 2025
- existing policies focus on market based mechanisms to reduce oil imports
- low RE target, must promote other forms of RE in addition to biofuels

Japan

- RE initiatives focused on solar PV and solar thermal power
- low RE target, RPS targets only 1.35% of total electricity supply by 2010
- most of the policies are voluntary in nature

Vietnam

- RE initiatives focused on mini-hydro
- lack of policy and regulation framework for RE to be tapped for rural electrification
- financing needed; technology needed for other RE forms; no large scale business for RE equip't/services

Korea

- low RE target; already achieved
- currently working on plan to increase RE target
- focus is more on energy security thru joint oil and gas explorations with other countries; energy conservation and efficiency improvement

Current level of initiatives in East Asia to promote RE

- LOW PRIORITY

• Despite the collective pronouncements of the East Asian energy ministers on addressing the energy challenges in the region RE has not received as much priority as it should have.

(From the analysis of the Forging Closer ASEAN+3 Energy Partnership, 2004)

- SIGNIFICANT UNUTILISED POTENTIAL

• East Asia is under utilizing its RE potential. Region has vast reserves of untapped RE potential but using only a fraction of it- reasons could be various but it is a fact that the resources are heavily under utilized.

Countries	Total RE potential (Gwh)	Total Electricity Generation, 2005 (Gwh)
Brunei	154.11	271.00
Indonesia	421,683.84	11,273.00
Malaysia	58,093.54	8,925.00
Philippines	327,995.92	6,317.00
Thailand	34,311.60	13,184.00
Viet Nam	165,945.89	5,380.00
China	529,372.80	184,686.00
Japan	1,132,265.25	105,460.00
Korea	18,718.00	36,802.00
Total	2,688,540.94	376,137.00

Source: Author estimated using capacity factors from EIA , 2005 and DOE, 1997

RE Policy Implications

There are four main implications:

1. EI leads to a prisoners' dilemma inhibiting RE promotion: Under this condition individual national policies will be insufficient to optimize the existing RE potential, hence, an international or regional approach is required.

2. EI increases the importance of cost, which favours fossil fuels over RE: Increases the importance of cost in the process of choosing electricity generation fuel types, making it more difficult to promote RE, unless supported by additional policy measures.

3. EI enhances the importance of grid interconnection and electricity trade: Increases the importance of physical trading of electricity. Hence, grid interconnection should be advanced not just to promote electricity trading but also to enhance RE generation.

4. EI does not easily shift endowments of RE potential or RE promotion policy development capacity: Increases the need for cleaner energy for the developing countries as most of the energy intensive industries shift to such countries. Inadequate systematic mechanism to give financial support as well as technical support to the DCs from the developed countries.

RE Policy Responses

- **Coordinated RE targets:** Addresses the prisoner's dilemma brought by EI and the cost factor of RE. Coordinated increases in RE targets among countries in the Asian region. Targets are differentiated depending upon the resource availability and potential. Developing countries can have lower targets.
- **Physical Integration Measures:** Enhances the importance of grid interconnection and electricity trade. Setting up cross border power grid interconnection facilities with a target date should be included in the regional infrastructural plan. Setting up regional level legal framework and compliance mechanism.

RE Policy Responses

• **Complementary policy measures:** To assist in shifting endowments of RE potential and capability. National policy should be first developed and the region needs several supporting policies:

- **Financial assistance:** Setting up regional level RE development fund for exclusive use in RE promotional activities. Streamlining financing mechanism for RE projects in terms of low interest rate, extended repayment schedule and embedded risk coverage insurance.
- **Technology transfer:** TT from the developed countries like Japan and Korea should be encouraged along with the provision of customization at the end use point. Technology support fund can be separately created and linked to the TT and RE development fund.
- **Carbon trading potential:** Taking greater advantage of carbon trading potential. Promoting CDM, Voluntary Emissions Reduction (VERs) schemes along with carbon offsetting projects for the corporate sector. Promotion of **Carbon Neutral** approach among companies.
- **Capacity Building:** Capacity development and knowledge dissemination activities have to be continuously encouraged in this region until certain target of RE generation is reached

Assessment of Policy Responses

Proposed policy	Strengths	Weaknesses
Coordinated RE targets	<ul style="list-style-type: none"> - could be linked to the ASEAN+3 initiatives - no additional costs relative to execution of country targets - only <i>timing</i> and <i>phasing of implementation</i> will be affected - minimize effects on country's competitiveness 	<ul style="list-style-type: none"> - competitiveness issues
Physical integration measures	<ul style="list-style-type: none"> - could be linked to the ASEAN+3 initiatives on trans-grid interconnection - will enhance the energy security in the region - will provide required electricity back-up during RE promotion 	<ul style="list-style-type: none"> - the necessary infra could be very costly - investments will only focus on profitable corridors - problem with ownership of the project
Financial assistance	<ul style="list-style-type: none"> - source of investment for DC 	<ul style="list-style-type: none"> - no clear source yet
Technology transfer	<ul style="list-style-type: none"> - technical capacity/capability building in DC 	<ul style="list-style-type: none"> - no clear source yet for funding and implementation
Capacity building	<ul style="list-style-type: none"> - capacity/capability building in DC 	<ul style="list-style-type: none"> - no clear source yet
Carbon trading 23/07/2008	<ul style="list-style-type: none"> - Could be linked to ASEAN+3 initiatives - no extra costs, more on promotion and awareness campaign 	<ul style="list-style-type: none"> - transaction costs

Assessment of Policy Costs and Benefits

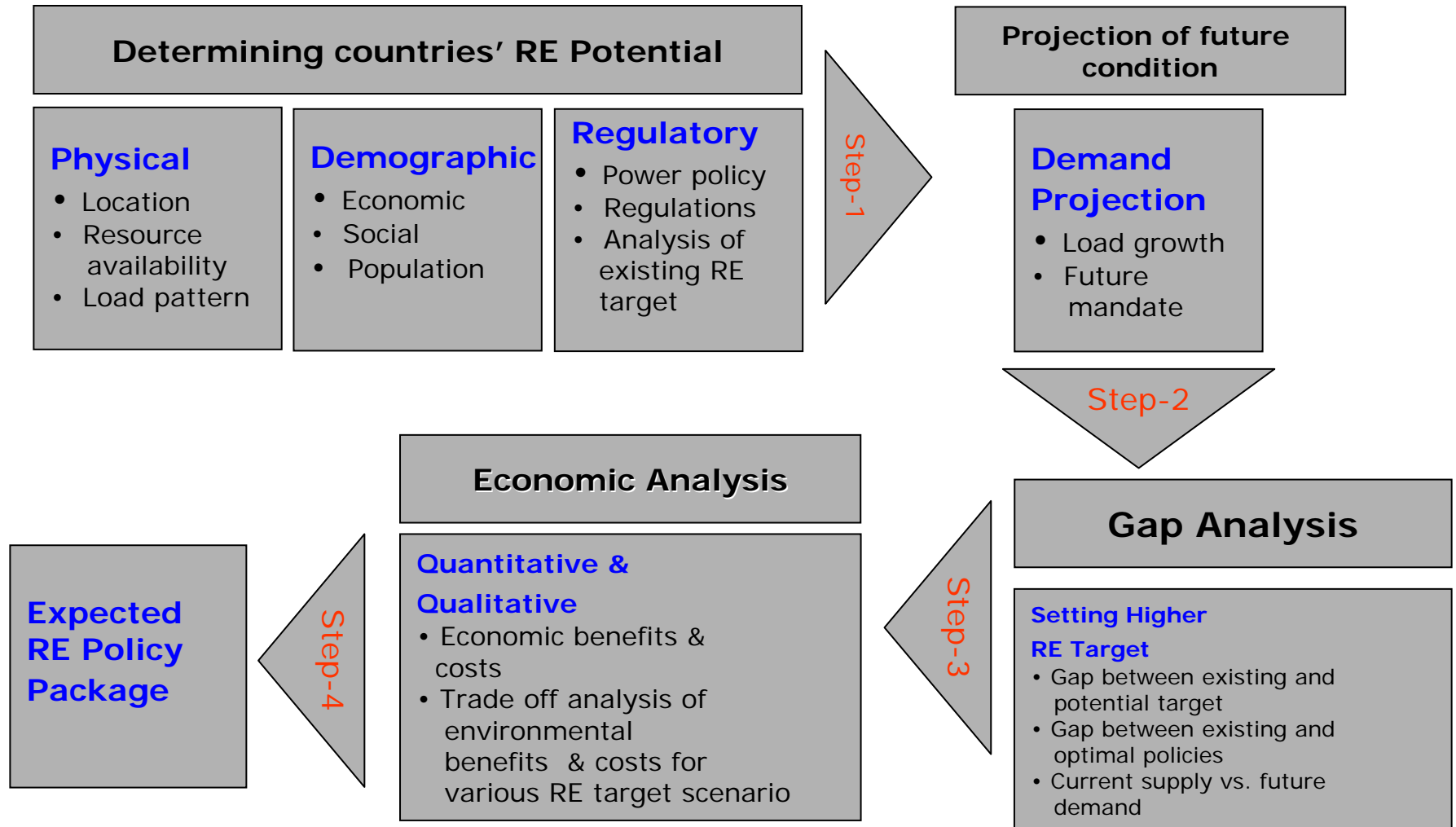
Proposed policy	Costs	Benefits
Coordinated RE targets	<ul style="list-style-type: none"> -costs for high level coordination and lobbying at the ASEAN+3 MoE - TA for regional study to coordinate timing and phasing of RE projects 	<ul style="list-style-type: none"> - minimize effects on country's competitiveness
Physical integration measures	<ul style="list-style-type: none"> - infrastructure costs (RE mini-grids to be connected to the main grid) 	<ul style="list-style-type: none"> -will enhance the energy security in the region - will provide required electricity back-up during RE promotion
Financial assistance	<ul style="list-style-type: none"> - seed money 	<ul style="list-style-type: none"> - source of investment to DC
Technology transfer	<ul style="list-style-type: none"> - seed money 	<ul style="list-style-type: none"> - technical capacity/capability building in DC
Capacity building	<ul style="list-style-type: none"> - seed money 	<ul style="list-style-type: none"> - capacity/capability building in DC
Carbon trading	<ul style="list-style-type: none"> - costs for high level coordination and lobbying at the ASEAN+3 MoE 	<ul style="list-style-type: none"> - additional source of funds for RE investments

Strategic policy guidance

- Pursue regional cooperation in advancing RE policies
- National policies aren't fully effective (maybe not very effective at all) without regional policies
- Renewable energy policy should be developed while taking economic integration into consideration in order to maximize its effectiveness
- A coordinated increase in RE targets could help to minimize effects on economic competitiveness
- Regional policies will not work without more technical and financial capacities in LDCs
- Enhanced interconnectivity of grid would greatly enhance the prospects of RE promotion

Part-IV : National Energy Case Studies

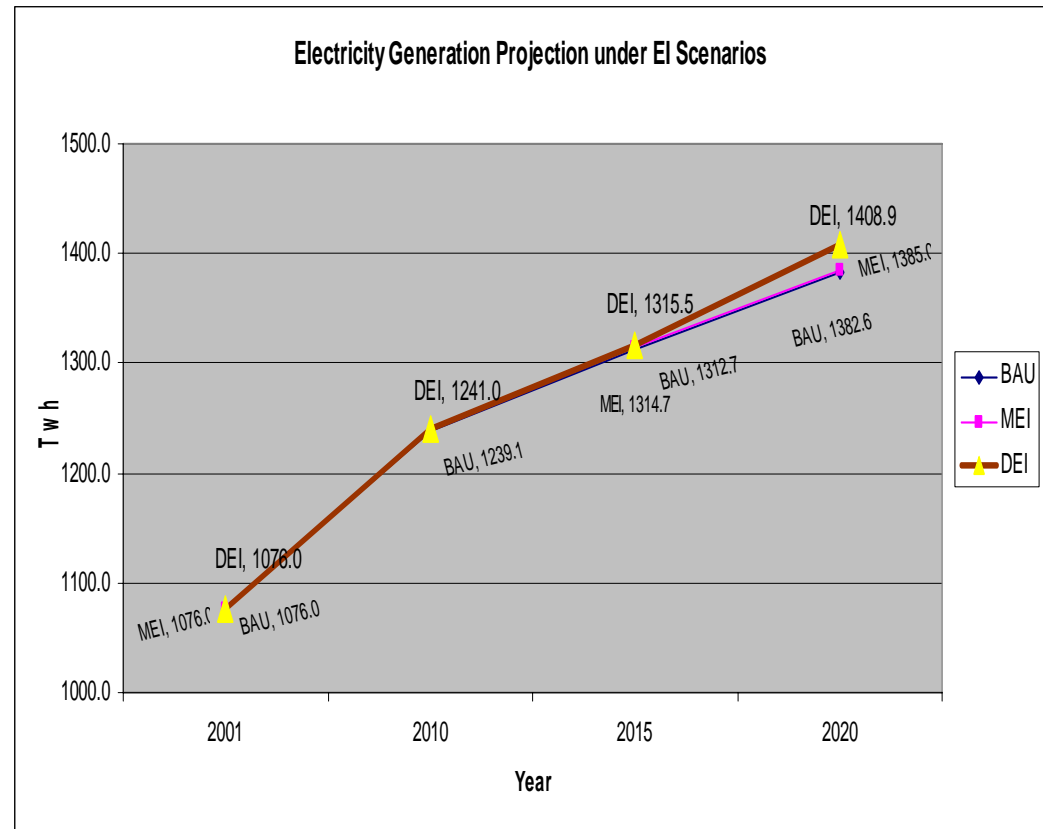
How to enhance RE in individual countries



a) Japan National Study

Effects of Economic Integration....2

- The modelling analysis also shows that Japan will experience around 2% addition growth in the service sector by 2020
- Finally we found that the net electricity generation in Japan will increase by 2.5% additionally.
- CO₂ emissions from the electricity sector itself will increase by around 9 Mt in total by 2020 due to deep integration effect.



Challenges to promote RE in Japan

Major techno-economic difficulties :

- **High cost of generation** of RE in Japan is an especially difficult problem - Japan is already one of the costliest countries - Economic integration further magnifies the importance of cost and its effects on the competitiveness of energy using industries.
- **Market structure:** existing power companies are not enthusiastic about RE.
- **Tough competition with nuclear power** which can serve as the base load.
- Most renewable energy **supplies power only intermittently**, and this creates various other technical problems while connected to the national grid.
- **Lack of technological advancement for handling** daily and seasonally fluctuating demand and supply from infirm RE sources with high peaks at certain times.
- Especially for wind, **Japan needs further advancement in turbine and rotor technology** to handle sudden surges in wind speed & frequent typhoons.
- **Lack of grid interconnection with other countries and power back-up** make the Japanese electrical supply system **highly sensitive to the demand and supply imbalance**. Hence, in-firm renewable energy supply in the Japanese grid is highly selective and sensitive in terms of grid stability.

Challenges to promote RE in Japan

Major policy level difficulties:

- **Renewable Portfolio Standard (RPS) the only market based policy in Japan, contains the following deficiencies:**
 - Very low target
 - Lack of long term goal (only 8 years)
 - Lack of demand side policy support
 - Lack of policy support for the new RE power plants
 - Undermining effect of the NRE subsidies in other polices due to low RPS target
- Ironically the **Japan's Kyoto Protocol target and its achievement mechanism are constraining the generation of more renewable energy in the country.** Currently RE generation target is linked to the KP target achievement, hence, diluting the interest of further development of RE once the dedicated % of KP target from RE is met.
- **Majority of the policies are voluntary in nature.**
- **Policy bias towards solar and wind** restricting other technologies.

Policy recommendations

Overview of the general policy recommendations

- The first important step is for Japan **to significantly increase its renewable energy generation**
- The second step is **to introduce a more ambitious, comprehensive set of policies**, on both the demand and supply side.
- The third step is **to increase the priority of RE , hence the resources devoted to renewable energy promotion** will make a wider range of policies possible.

Recommended Policy Packages

Package-1 (Modest)

Primary Policy
- Extended RPS

Secondary Policy (Fiscal)

1. Continuation of subsidy program especially for solar PV
2. Tax rebate for RE equipment manufacturing and import
3. Installation loan and tax moratorium
4. Community based RE generation support in terms of providing land, finance and other technical facilities

Package-2 (Ambitious)

Primary Policy
- FIT and
- Extended RPS

Secondary Policy (Regulatory)

1. Mandating RE power procurement by the Government establishments
2. Mandating RE power utilization by the residential and commercial building complexes

Secondary Policy (Fiscal)

1. Continuation of subsidy program especially for solar PV
2. Tax rebate for RE equipment manufacturing and import
3. Installation loan and tax moratorium
4. Community based RE generation support in terms of providing land, finance and other technical facilities

Standard Enabling Policies

Developing grid interconnection
Introduction of full cost accounting
Open access and introduction of standard long term PPA
Introduction of RE power transmission and distribution regulation

Least Cost Portfolio Analysis

- Used a simple social and economic costs benefit analysis method using the monetary values of various direct and indirect benefits of generating green power in Japan.
- Considered wind as the critical technology for Japan to promote RE in the national grid due to its various promising characteristics like very competitive cost of generation, technological advancement and good potential. Hence, used the wind energy supply curve for Japan to identify the economically feasible generation scale from wind source.
- Tried to identify the answers to the following three important queries:
 - a) What is the least cost technology portfolio option for Japan to promote RE for different % like 5, 10 and 15%?
 - b) Which technology portfolio gives the maximum social cost benefits to the country?
 - c) What is the maximum possible generation scale in terms of % of RE supply in Japan?

Creation of portfolios of different RE technologies available in Japan

- 6 different RE technology portfolios have been created to produce required units of RE electricity over the period of our assessment time.
- Developed the generation requirements of each technology for each portfolio and for each year.

<i>Portfolio 1</i>	<i>Allocation</i>	<i>Portfolio 4</i>	<i>Allocation</i>
Wind	50%	Wind	50%
Solar PV	50%	Waste to energy	50%
<i>Portfolio 2</i>	<i>Allocation</i>	<i>Portfolio 5</i>	<i>Allocation</i>
Wind	33.30%	Wind	33.30%
Solar PV	33.30%	Waste to Energy	33.30%
Biomass	33.30%	Biomass	33.30%
<i>Portfolio 3</i>	<i>Allocation</i>	<i>Portfolio 6</i>	<i>Allocation</i>
Solar PV	33.30%	Wind	20.00%
Biomass	33.30%	Solar PV	20.00%
Mini/ Small Hydro	33.30%	Biomass	20.00%
		Mini/ Small Hydro	20.00%
		Waste to energy	20.00%

list of benefits and costs of RE generation in Japan

- Identified 3 direct benefits and 2 indirect benefits.
- Identified 1 direct and 1 indirect costs.
- Conducted the analysis assuming discount factors of 5 % and 7%.

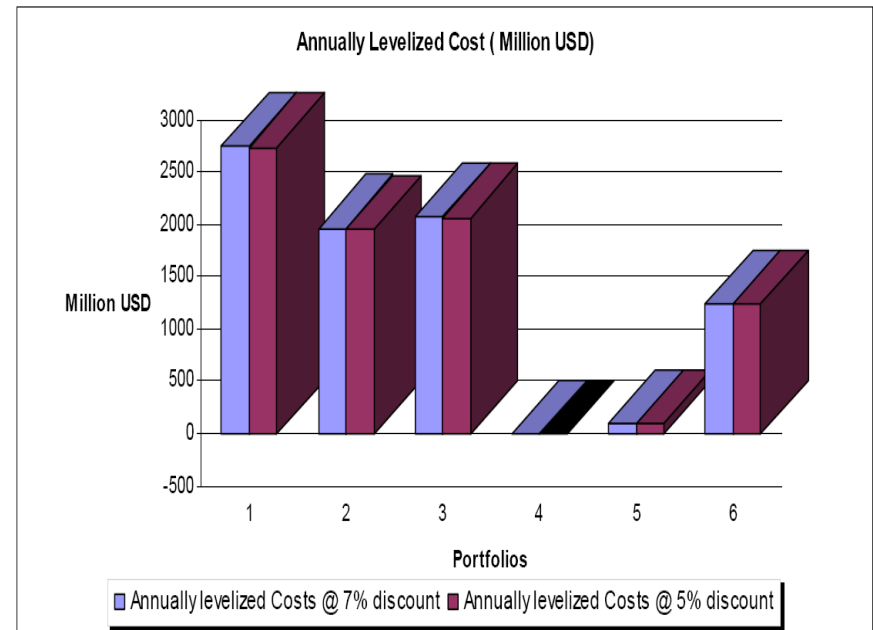
<i>Direct Benefits</i>	<i>Costs</i>
<p>1. Avoided environmental costs : Assuming CO2 trading price of \$20/ ton, Using ExternE emissions value</p> <p>2. Avoided Transmission and Distribution costs</p> <p>3. Avoided fuel costs: Fuel costs avoided due to displacement of future fossil fuel based power generation</p>	<p>1. Additional generation costs: Additional cost of RE displacement of FF based power due to higher fixed costs</p> <p>2. Environmental costs of RE generation</p>
<i>Indirect Benefits</i>	
<p>4. Income multiplier: Renewable energy generation</p> <p>5. Avoided unemployment compensation: Renewable energy generation</p>	

LCREPA: Results and Discussions

In this study we obtained three different sets of results depending on our initial three research questions

1. *Least Cost Technology*

Portfolio: Majority of the RE cost component depends on the installation and commissioning costs, hence, in a long terms scenario, wind and waste to energy portfolio (P-4) appears as the cheapest to supply more green power in the grid. In fact the costs of generation and supply become negative while increasing the generation target by 10 and 15%.

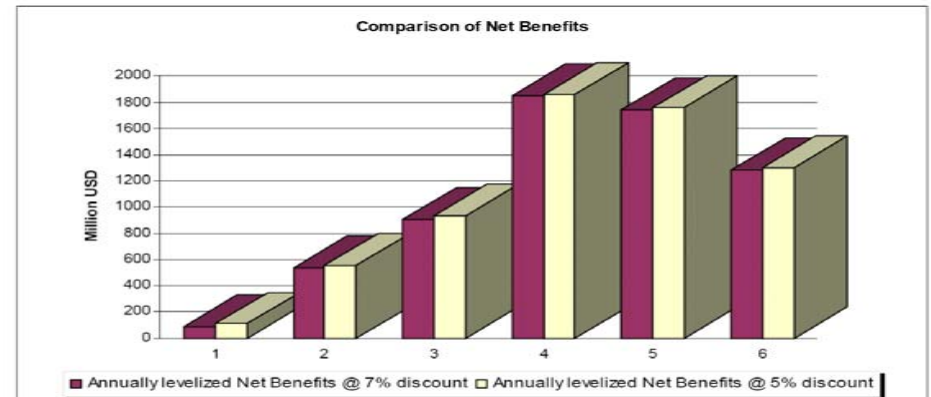
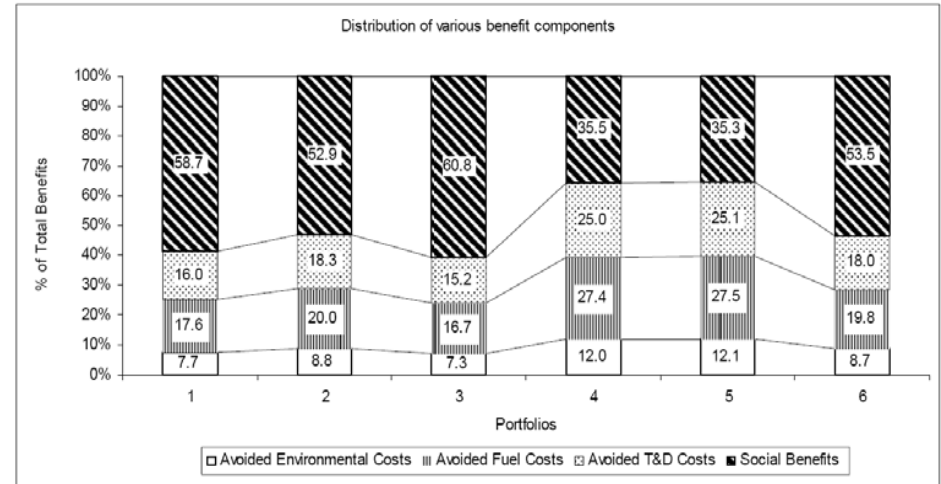


Authors estimated using the LCREPA model result using the major data sources of IPCC TAR (2003), TEPCO Financial Report (2007), EDMC/IEEJ 's Handbook of Energy & economic Statistics in Japan (2007), Global Status Report (REN21 2006), and World Bank RE Toolkit (2006)

LCREPA: Results and Discussions

2. Best Possible Portfolio (BPP): Identified the best possible portfolios in terms of their net benefits (benefits- costs) at different discount factors.

P-3 can bring the maximum social benefits in terms of job creation and avoiding unemployment dolls which could be the priority portfolio for the region where unemployment rate is high.



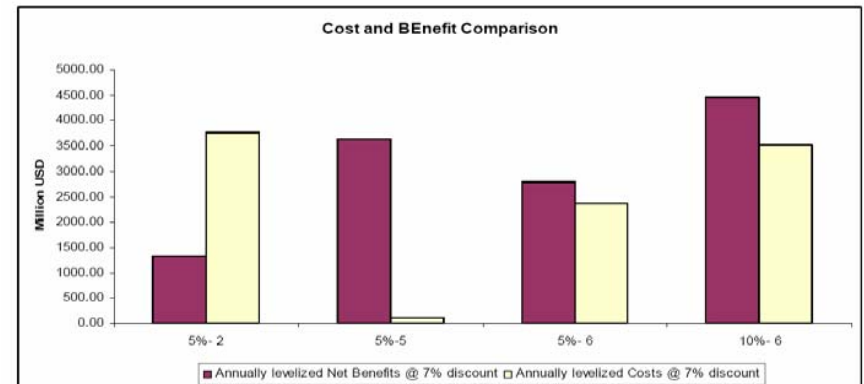
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LCREPA: Results and Discussions

3. Economically feasible RE generation portfolio : Conducted our feasibility assessment using the wind energy supply curve and the avoided cost of RE generation in Japan (7.5 Yen/Kwh) to find out the maximum possible generation from wind energy and then based on that we decided which portfolios can support that scale of wind energy production within the span of our 10 year time frame. It was estimated that 22 to 25 Twh/ annum are the maximum possible wind energy generation in Japan under the existing condition.

Economically feasible portfolios:

- Portfolio 2 with 5% target
- Portfolio 5 with 5% target
- Portfolio 6 with 5% target
- Portfolio 6 with 10% target



Authors estimated using the LCREPA model result using the major data sources of IPCC TAR (2003), TEPCO Financial Report (2007), EDMC/IEEJ 's Handbook of Energy & economic Statistics in Japan (2007), Global Status Report (REN21 2006), and World Bank RE Toolkit (2006)

Total costs of extended RPS implementation under 3 EI scenarios

Units : Billion USD at current price

EI Scenarios	RPS categories	RPS Policy Implementation costs	Portfolio #	Generation costs	Total Policy Costs
BL	5% Target	378.04	2	41.8	419.84
	5% Target	378.04	5	1.12	379.16
	5% Target	378.04	6	26.4	404.44
	10% Target	756.09	6	40	796.09
MEI	5% Target	431.90	2	41.88	473.78
	5% Target	431.90	5	1.12	433.02
	5% Target	431.90	6	26.45	458.35
	10% Target	863.80	6	40.08	903.88
DEI	5% Target	439.40	2	42.60	482.00
	5% Target	439.40	5	1.14	440.54
	5% Target	439.40	6	26.90	466.30
	10% Target	878.70	6	40.76	919.46

Conclusions & Recommendations

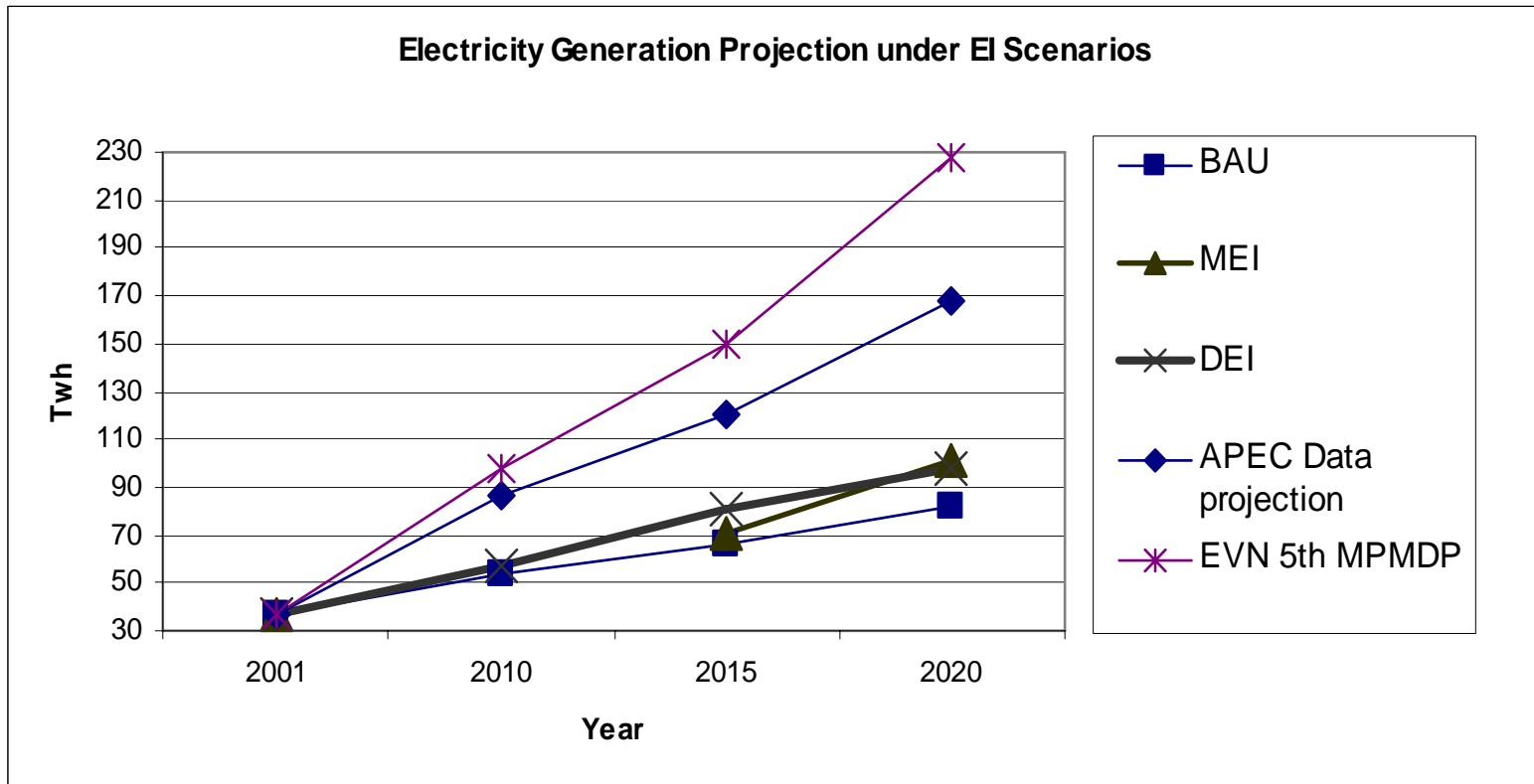
- **Japan can significantly increase renewable energy generation** by many fold, reaching a 10% share of RE, using optimal RE technology portfolio, at a cost of about USD 80 billion per year.
- Given the potential of renewable energy in the country and its increasingly dependence on fossil fuel imports along with the binding commitment for emissions reduction under the Kyoto Protocol, **Japan can achieve a better level of RE utilization with a manageable scale of economic effects** especially in terms of economic price competitiveness of RE.
- **Japan should utilize a wider range of renewable energy technology options** instead of promoting a limited number of specific technologies like solar PV.
- **Wind energy can play a vital role in the Japanese renewable energy market** in the near future. This study estimates that by 2013, fossil fuel based power generation might become expensive compared to onshore wind energy generation in Japan provided the capacity utilization factor of the wind firm remains at 35%.
- **Japan should not ignore the socioeconomic implication of renewable energy development in the country.** It can create more number of jobs than fossil fuel.
- **Japan should also promote cross country electricity trading** through grid interconnection which will provide additional benefits like energy security and ability to sell excess power.

Vietnam National Study

Effects of economic integration

- Vietnam is one of the countries that is most affected by the process of economic integration (mainly through increased GDP growth).
- GTAP-E model predicts that the Vietnamese energy sector will experience heavy growth especially in the electricity sector of around 168% compared to baseline scenario of 123% by 2020.
- Other industrial sectors will also experience high growth of around 180% compared to the baseline scenario.
- Related negative environmental impacts are also expected to increase. Increased renewable energy generation is important not only to address environmental impacts from integration, but also to promote rural electrification, which is another important goal of Vietnam

Effects of economic integration on electricity sector



Source: Author estimated using GTAP model result and compared with the data obtained from APEC and EVN 5th Master Plan 2006.

Major constraints of RE development in Vietnam

- The biggest drawback for RE power in Vietnam is the cost of generation. On an average the cost of generation is more than \$0.06 - \$0.07/kwh. Currently EVN cannot buy the power from the producers @ more than \$0.05/Kwh. So there is no incentive for the RE developers to generate power.
- Currently, GOV is not allowing any subsidy for RE generation and supply to the producers and on the other hand they are giving fuel subsidies for fossil fuel power generation to keep the cost low. Therefore, the RE developers are facing double punishments.
- Average electricity price in Vietnam is around \$ 0.055/ Kwh and EVN cannot sale power more than that under the GOV regulation so RE has become uncompetitive in all aspect.
- There is no policies regarding the environmental and social cost accounting of conventional power generation, or no preferential tariff mechanism for RE generation, transmission and distribution.
- No official Decree has been approved so far to promote RE in Vietnam. In 2004 there was an attempt to pass one decree, but got rejected by the Ministry of Finance in the logic of revenue loss of the country under the provision of reduction of import duties for RE equipments from abroad.

Major Policy Recommendations

Vietnam should focus on developing institutional capacity at the beginning and then gradually can move on to basically on-grid and off-grid type of dual system to meet different purposes. On-grid policies can help to reduce power imports while off-grid RE policies and help to enhance the efficiency and effectiveness of the rural electrification program. The followings are the strategic policies proposed for Vietnam.

Grid Connected RE Development policies (Target is about 5% of RE supply by 2020):

- Incorporation of installation cost subsidies maximum up to the level of 50%.
- Allow the fossil fuel based power generation tariff to reflect its Long Run Marginal Cost (LRMC) which is around 7.5 cents/kwh.
- Relaxation of import duties for RE equipment procurement by the VN companies.
- Gradual targeted removal of cross subsidization of the supply tariff to enhance the financial strengths of the power companies to create capital for investment in RE.
- Develop standardized long term PPA structure for the private sector RE developers and EVN.

Major Policy Recommendations

Off-Grid RE Development Policies (Targeting to reach remaining 5% of the total Vietnamese households which are not grid connected by 2020):

- Increase the concentration of demand in a smaller area compared to the existing scattered load pattern.
- Increase and develop continuous daily and seasonal load pattern for the region to have a better economy of power supply.
- Introduction of electric equipments for rural activities like rice de husking, battery recharging units, electric pumps for irrigation etc can improve the demand pattern in the rural areas which can be served better by the off grid system.
- Government should support the cooperative activities to develop RE power gen. facilities linked to rural sustainable livelihood activities.

Policy Assessment

Grid connected RE development

- **Impact of incorporating environmental damage costs:** Using small-hydro supply curve, it is estimated that connected RE can be increased by 245 GWh (from $Q_{eco} = 1210$ GWh to $Q_{env} = 1455$ GWh), about 20%. The net benefit is estimated around \$ 0.48 Million.

- **Impact of incorporating GHG emission damage costs:** At a CER price of \$5/ ton CO₂, global externality cost adds 62 VND/kWh (0.4 cent/kWh) to the avoided cost. This increases the optimal quantity by another 20% (from $Q_{env} = 1455$ GWh to $Q_{avo \cdot C-price} = 1725$ kWh). The net benefit is estimated around \$ 2.03 Million.

- **Impact of avoided power import costs:** Current price of imported power is 4.5 cent/kWh. Cost difference between imported power and SHP generated power is 1.4 cent/kWh. If this money is used for increasing Q_{econ} , SHP power generation could be increased by 750 GWh from 1210 to 1960 GWh. Grid connected RE supply can be increased by almost 70%. The net benefit is estimated around \$10.58 Million.

Policy Assessment

Off- Grid RE development

- **Impact of using RE to achieve rural electrification target** : At this moment, current price of rural electrification (for remote areas) is 22.8 cent/kWh) it is 19.6 cent/kWh higher than the case of RE generation (3.2 cent/kWh, according to EVN estimates). If 100% of electricity requirements in those remote areas is based on SHP source, the net benefit estimated would be \$ 44.64 million by 2020.

Strategic Policy Recommendations

- Viet Nam should encourage renewable energy generation with a specific target which could be around 5% of total electricity supply by 2020. Small and Mini hydro can be promoted to its fullest extent.
- Viet Nam should gradually reduce expensive power import while increasing investment in RE development.
- For remote and rural area power supply, renewable energy is an economically feasible option for Viet Nam.
- Since the cost of RE is expected to become competitive with conventional power by 2015 due to the planned reduction in subsidies, it is important to prioritize capacity building of the human resources at various stakeholder level.

Relevance to existing policy processes and current debates

- **Ongoing multilateral and bilateral trade negotiations, FTA/EPA negotiations**
 - RE equipment is still subject to significant tariffs in some countries
 - Consideration should be given to their impacts on promotion of RE use
- **Kyoto Protocol**
 - Measures to meet current Kyoto Protocol targets
 - Discussions on GHG reduction goals and measures after 2012
 - CDM/JI/Emissions trading
- **Asia Pacific Partnership**
- **Tripartite Environmental Ministers Meeting (TEMM)**
 - Input to the Trade and Environment Working Group
- **G8 Toyoko Summit**
 - New energy and global warming (renewable energy case study)
- **ASEAN + 3 countries negotiations**
 - Ongoing multilateral and bilateral trade negotiations (including Free Trade Areas / Economic Partnership Agreements)
 - Input to negotiations for harmonization of regional environmental standards in ASEAN + 3 countries

Thank You !