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Author:

Anindya Bhattacharya
Policy Researcher
IGES Economy and
Environment Group
bhattacharya@iges.or.jp

Institute for Global Environmental Strategies
財団法人
地球環境戦略研究機関

Renewable Energy: A Strategic Policy for Sustainable Development

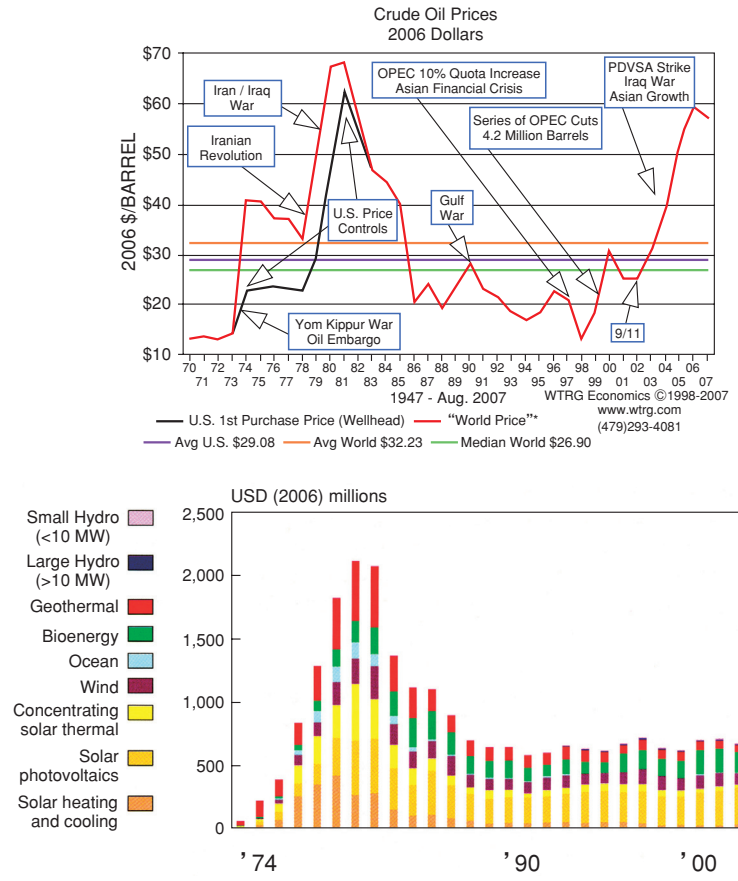
Anindya Bhattacharya

There is ample evidence of underproduction of renewable energy across the world, in spite of there being the necessary resources to produce RE, including technology and finance. It seems politicians and law-makers have yet to be persuaded about the importance of renewable energy to solve the problem of energy security and sustainable development and to act on it seriously. As a matter of fact, renewable energy sectoral investment is highly correlated to the international oil price movement. This further proves the continued myopic views of the law-makers about the spectrum of benefits that renewable energy brings. Hence, a lack of steady policy support for renewable energy is not only jeopardising the matured development of this promising market but also stopping the world from taking advantage of using it for multipurpose benefits including its use as a risk hedging instrument in the increasingly uncertain conventional energy market. Renewable energy policy has fallen into the trap of a boom-bust cycle of world economy and the corresponding international energy price fluctuation. Such policy is therefore unable to deliver its full benefit to society, including creation of green collar jobs and even reducing the electricity tariff for consumers. To overcome this bottleneck, the author has suggested a two-tier solution. First, mainstreaming risk-explicit cost benefit analysis of renewable energy policy at a country-specific level and second, improving regional cooperation to harness the maximum benefits of available resources scattered across countries with geographical proximity. It is indeed a strategic choice for the policy-makers to decouple renewable energy development activities from the boom-bust cycle of economy for seamless progress towards sustainable development.

Many Governments and law makers have not yet been persuaded on the direction of mainstreaming renewable energy generation in the overall energy policy development processes in the world. Renewable energy-based green power policy is still considered to be an expensive path for development, and so even after several boom-bust cycles of the world economy, policy makers remain hesitant to take a target based approach to increase green energy supply in the total energy mix. There are several other cases in and around Asia where in spite of having excellent potential and a good enabling environment, renewable energy is still heavily underproduced. It seems that politicians and lawmakers are yet to be persuaded about the use of renewable energy to address the issues of energy security especially in the case of energy price fluctuation. It has been estimated that out of 2700 Twh total theoretical potential of renewable energy in Asia, only around 6% has been harnessed (Romero et al 2008). In fact, technical and financial constraints can limit the commercially available renewable energy by around a half of the total theoretical potential. While it is true that many governments are now proactively promoting renewable energy in the face of imminent price hikes for fossil fuels due to increasing demand, there are several countries which have not yet taken actions to add more renewable energy into the supply mix and which are still focusing on a future energy supply based on fossil fuel. As a matter of fact, the new concept of Green New Deal, a green economy policy initiative which also includes renewable energy, might also be very short lived indeed as it primarily depends on the individual country's plan of future development and growth.

"Whenever there is an increase in oil price, more green energy budgets tend to be introduced into the market."

In the past, whenever the price of fossil fuel fell for various reasons including economic recession, there was a sharp reduction in renewable energy investment and Research and Development (R&D) budget along with a drop in decisions to adopt new policies to promote renewable energy. Figure1 below consists of two juxtaposed graphs showing the trend in the last couple of decades of total research and development budget allocation for renewables especially solar and wind in IEA member countries, and compares this trend to international oil price fluctuations. It indicates that whenever there is an increase in oil price, more green energy budgets tend to be introduced into the market. This is not only the case for the developed world but also in developing countries too. Anticipating more uncertainties in the world economy in the near future, oil and other fossil fuel prices are expected to remain volatile in nature. Hence, renewable energy will continue to be subject to the boom-bust cycle of fossil fuel prices in the international market.



Source: IEA, 2008

Figure 1: Renewable energy R&D budget compared to the crude oil price

"Inconsistent and fluctuating government policies in the renewable energy sector creates boom/bust cycle in the market jeopardising any long-term investment planning by companies."

The major problems arising out of such fluctuation in renewable energy policies are a decrease in investment interest from the private sector companies in this sector as well as an increasing amount of sunk cost[1] which is finally becoming irrecoverable and is a bad investment for the whole economy. Overall, the inconsistent and fluctuating government policies in the renewable energy sector creates boom/bust cycle in the market jeopardising any long-term investment planning by companies. The renewable energy sector is still in the developing stage and so needs continuous policy support from the Government to become matured. It is difficult for private sector investors to afford longer market uncertainties while the main onus is on the government to create enabling environment for renewable

[1] Sunk cost refers to the investment which never gives a return to the investors.

energy investment. As a matter of fact, abandoning one 5 MW wind farm (on-shore) project during its construction period will generate around USD5 million in sunk assets which will never give any return. Similarly, a 10 MW solar PV project if abandoned can generate USD25 million in sunk assets plus around 70 year-round jobs (Kobos et al.)

Lack of understanding of comprehensive benefits of renewable energy use is perhaps the main reason of failure to persuade the law makers for having a stable renewable energy policy in the country. There could be three main reasons for lack of understanding. The first one is, having negative perception about the relatively longer time span needed to accrue the benefits of high-cost renewable energy compared to conventional energy. Although the gestation periods for renewable energies are much shorter than conventional large scale power plants but their pay back periods are still very long mainly due to high installation costs and lower off-take level. In Japan, pay back time is around 10 years for solar energy even with the increased level of Feed-in-Tariff scheme. It may take more than 5 to 10 years to observe the net benefits of the green energy supply in the economy.

"Having negative perception about the relatively longer time span needed to accrue the benefits of high-cost renewable energy"

The second one is, underestimating the co-benefits of renewable energy such as power sector investment risk coverage. Benefits are accruable even in a shorter time. Renewable energy investment in an investment portfolio for the electricity sector can be considered a substitute to risk insurance premium which is paid mainly to mitigate the adverse impacts of a sudden rise in oil prices or a sudden increase in carbon price. The mechanism of using renewable energy as risk coverage insurance is based on the modern financial market portfolio theory whereby an increasing number of less risky assets in an investment portfolio whose investment returns are not correlated among each other can actually hedge the risk of single asset investment. The investment return should be seen from the portfolio's total return perspective rather than any individual investment return. Energy portfolio diversification with more renewable energy options whose fuel supply risk is nil or very low could actually give a wider space for risk mitigation of fossil fuel price fluctuation.

"Underestimating the co-benefits of renewable energy such as power sector investment risk coverage."

The third one is, ignoring the benefit of larger use of renewable energy to create downward pressure on retail energy prices. More renewable energy means reduced demand of fossil fuels for power generation and therefore, reduced price of fossil fuels in the market. Less expensive fuel can further help to compensate consumers' additional spending on higher electricity tariff due to increased level of expensive renewable energy supply. It has been estimated that in the United States, a 1% drop in natural gas demand can reduce the long-term wellhead gas price by 0.75-2.5% (Wiser, 2004) and there would be a subsequent reduction of retail gas prices on the market. In certain cases like wind and solar PV technologies, use of renewable energy may not increase the retail tariff for the consumers (like remote area water pumping, refrigeration, street lighting etc. WEC, 1994) but can still help to reduce the fossil energy demand and prices subsequently. Moreover, as explained by Neij (1997), learning-by-doing can also reduce the costs of renewable energy supply which further increases the net benefits of renewable energy for retail fossil energy price reduction. There are three different studies (EIA, UCS and Tellus) shown together in Figure 2 below which demonstrate the impacts of increasing renewable energy generation (by increasing RPS quota from 10% to 20%) on average wellhead gas price on the US market. It has been estimated that increasing RE generation from 50 to 800 Billion kWh can reduce the average wellhead gas price by 60 cents/MMBtu. This indicates that even though renewable energy is apparently expensive, it has a certain damping effect on the fossil fuel price by controlling the demand in the market[2]

"Ignoring the benefit of larger use of renewable energy to create downward pressure on retail energy prices."

[2] Set of these studies predict that increase in renewable energy generation can cause a reduction in US natural gas consumption within the range of 1 to 11% and this can further suppress the natural gas prices within the range of zero to 18% (Bolinger et al. 2008) (The broken line indicates the trend of decreasing well head gas price compared to increasing level of renewable energy generation)

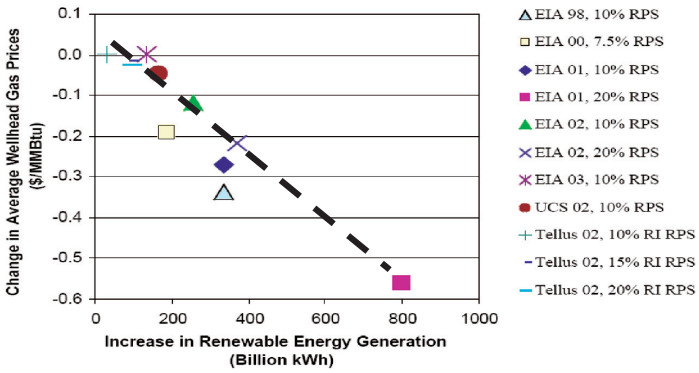


Figure 2: Renewable energy generation Vs Wellhead Natural Gas Price

It is a policy decision of the law-makers to create an enabling environment first where investors can invest more in renewable energy in spite of it not being cost competitive. In the end, by virtue of the economy of scale and learning by doing, the renewable energy sector itself can break the inertia of growth which will bring benefits to the consumers by helping to reduce the electricity tariff. Thus an increase in the supply of renewable energy can bring an additional benefit to the whole economy in the long term.

"Risk explicit cost benefit analysis of the renewable energy is very much needed."

In this respect, risk explicit cost benefit analysis of the renewable energy is very much needed. Policy makers should think of an effective alternative to reduce the risk of international fossil fuel price fluctuation and its negative economic and financial consequences on the national economy. Risk covering financial instruments like forward contracts and options which sometimes account for a half of the total supply cost, often play a decisive role in investment planning in the highly price-sensitive energy market. In natural gas importing countries like the United States, power companies are paying 0.4 to 1.7 cents/kWh (Bolinger et al, 2008) additionally to the gas supplier as price premium just to have a long-term price contract to avoid very high prices in the spot market. From 1996 to 1999 oil importers in the United States already paid around USD 5 per barrel as premium for a 12 month contract compared to the world average price of crude oil, which is around 17 to 20 billion USD per annum (EIA, 2009). Very recently, US crude oil futures for delivery in 2014 are traded at USD 80/barrel while the market price was just USD 50 /barrel. This further indicates that even during the lower crude oil price oil importers are still ready to pay hefty premiums (USD 30/barrel in this case) just to avoid supply uncertainty. Risk explicit cost benefit analysis of the power sector investments can influence the investors in favor of renewable energies even though they are apparently more expensive than the conventional sources. It is therefore, important for the law makers to create an enabling environment in the market where the investment risks not covered by the government are explicit. It has been estimated that a 1% increase in renewable energy supply in the Japanese electricity supply portfolio can reduce the portfolio risk by 1% which can significantly reduce the expenditure on risk-covering premiums (Bhattacharya and Kojima, 2010).

"Regional cooperation can help to have cost competitive renewable energy supply domestically."

Regional cooperation can help to have cost competitive renewable energy supply domestically. Policy-makers can also think of increasing multi-country regional cooperation to enhance the utilisation of renewable energy in the domestic market. There is unlikely to be uniform distribution of the renewable energy potential among the countries. To avoid both underutilisation and higher marginal production costs, regional cooperation among the countries to harness all possible potential of renewable energy can overall bring a win-win solution to the problem of high cost. Quite often it happens that the RE potential lies within the country which has less capacity to harness, in contrast to having less potential than a more capable country. To avoid such disparities, having cross border renewable energy infrastructure development can be a win-win solution. It has been estimated that

Jinghong hydro power project in the Yunnan province of China can export more than 3 million kW of electricity to Thailand over a cross border transmission system by 2017. This would be around 30% less expensive compared to the cost of same amount of electricity production in Thailand (Bhattacharya et al. 2009). Similarly, a power transmission line connecting China, Republic of Korea (ROK) and Russian Far East (RFE) can help to bring hydro electric power from RFE to ROK during summer and RFE to China during winter to meet the peak demands. RFE power flows to China can displace coal-fired power generation within China. As a matter of fact the net benefits of such interconnection could be around USD 750 million per year as avoided costs in the recipient countries like China and ROK (Hippel, 01). Moreover, this kind of project can also bring a win-win solution to the macroeconomic effects on both the countries in terms of increased GDP. Both China and Thailand can expect their respective GDP to increase by USD76 and USD47 million respectively thanks to this Jinghong hydro power project alone. In addition, both the countries would be able to reduce CO_2 emissions by 1 million tonnes each. Table 1 shows the impacts of Jinghong cross border hydro power project investment on China and Thailand.

Table 1: Impacts of energy sector investment on economy and environment in Asia

Countries	Cross border hydro project investment	Impact of cross border hydro project investment on GDP growth	Impact of energy sector investment on CO_2
	Million USD	Change from BAU (Million USD)	Change from BAU (mil.t-CO_2)
China	3090	76	— 1.0
Thailand		45	— 0.9

Source: Bhattacharya and Kojima, 2009

"Creating green collar jobs."

Creating green collar jobs. Policy-makers can use renewable energy to create a new employment category called 'green collar jobs' and can then even improve the national employment rate amidst global economic downturn. Table 2 shows the job creation potential of each renewable energy technology on a global average basis which is indeed comparable to conventional power generation cases. In fact, the US economy under the Obama administration is now emphasising the green growth mechanism in spite of the ongoing economic recession to create more "green-collar" jobs to address both the environmental and the economic development issues together. It is expected that this new economic stimulus package worth around USD one trillion, can create more than 3.5 million jobs in the United States. Table 2 below shows how different renewable energy technologies can create employment at different stages of development. It appears that there are more jobs created during the commissioning period than after commissioning. Nevertheless, the renewable energy sector can further nourish the development of a skilled global labour force that is required for its long term operation and maintenance activities. In Asia, given the potential of renewable energy generation and given its employment generation capacity, around 1 million jobs can be created[3]. Apart from such organized sector job creation, renewable energy can immensely contribute towards the rural livelihood generation through unskilled and semi-skilled job creations. Renewable energy can even engage women in the income generating activities in the rural areas which can further create multiplier effects on the national economy as well (Mehta et al.). Finally, while the policy-makers puzzle over the issue of effective utilisation of the billions of dollars of special stimulus money to revitalise the economies across the world, investment in renewable energy can bring relief to the economy.

[3] Number of jobs has been estimated using both the REN21 projection of number job creation per MW of renewable energy and estimated Asian renewable energy potential (Romero et al. 2008). As a conservative estimate it is assumed that only 50% of the total theoretical potential would be harnessed.

Table 2: Employment generation potential of renewable energy technologies

	Estimates of Employment Coefficients (No. of Job/MW)		
Technology	Manufacturing & Installation	O & M	Total
Thermal (Conventional)	2	5	7
Small hydro	11.3	0.22	11.52
Wind	2.6	0.3	2.9
Biomass	3.7	2.3	6
Solar PV	7.1	0.1	7.2
Waste to energy	3.7	2.3	6

Source: REN21 RE Global Status Report 2007, p37

Conclusion

"Renewable energy can bring a win-win solution to this world which is reeling under severe economic, social and environmental crisis."

By virtue of its less risky characteristics coupled with other benefits including dampening impacts on fossil fuel prices, electricity tariff and enlarging impact on macroeconomic outputs, employment status etc., renewable energy can bring a win–win solution to this world which is reeling under severe economic, social and environmental crisis. Moreover, based on the previous discussion, renewable energy can be treated as context neutral strategic solution for sustainable development and can be freed from any conditionality of the surrounding economic situation. Unfortunately, global renewable energy policies appear to be very unpredictable and closely follow the trends in fossil fuel prices, which is further linked to the economic boom-bust cycle. Instead of their context neutrality nature, the reality surrounding renewable energy development is still very much subject to context. However, we can no longer afford to continue with such swinging policies of renewable energy which can permanently jeopardize sustainable economic growth. The world cannot afford to see another oil shock in the near future either, and so needs to invest more on renewable energy. If so, that will determine the point of no return on the path to sustainable development. Policy and law makers should realise that given the level of uncertainties in the modern economy, it is almost impossible to predict the energy market with any reasonable certainty. As a matter of fact any delay could prove very costly. It is much safer to develop an alternative like renewable energy to protect the world from future energy uncertainties and to ensure a sustainable growth path. Continued promotion of renewable energy is therefore indispensable for modern society.

References

Bhattacharya, Anindya and Kojima, Satoshi 2009. Impact of Cross Border Energy Infrastructure Investment on Regional Environment, Society and Climate Change. In *Infrastructure for a Seamless Asia.* Tokyo: Asian Development Bank and Asian Development Bank Institute.

Bhattacharya, Anindya and Kojima, Satoshi 2010. Power Sector Investment Risk & Renewable Energy: A Japanese case study using portfolio risk optimization method. Working Paper, Economic Analysis Team, IGES, Hayama. (Under review of Energy Policy Journal special issue on Renewable Energy Investment)

Bolinger, Mark and Wiser, Ryan 2008. The Value of Renewable Energy as a Hedge Against Fuel Price Risk In *Analytical Methods for Energy Diversity & Security* edited by M. Brazilian: Elsevier.

Energy Information Administration. 2008. *Financial Reporting System Survey - Form EIA-28.* Washington D.C.: EIA

Energy Information Administration. 2009. *Independent Statistics and Analysis.* Washington D.C.: EIA

Hippel, David F. 2001. Estimated Costs and Benefits of Power Grid Interconnections in Northeast Asia In *Northeast Asia Grid Interconnection Workshop.* Beijing. Nautilus Institute.

International Monetary Fund. 2008. *World Economic Outlook - Financial Stress, Downturns and Recoveries.* Washington D.C: IMF.

International Energy Agency. 2008. Deploying *Renewables: Principles for Effective Policies.* Paris. IEA.

Kobos, Peter H., Erickson, Jon D., Drennen, Thomas E. 2006. Technological learning and renewable energy costs: implications for US renewable energy policy. *Energy Policy* 34 (13):1645-1658.

Mehta, Aasha K., Mohapatra, G., Ali, A., Mukherjee, Suparna D. 2009. Renewable Energy for Rural Livelihoods in MNRE-UNDP-FRG Project Villages in Rajasthan and Uttarakhand: A Report. New Delhi. Indian Institute of Public Administration.

Neij, Lena. 1997. Use of experience curves to analyse the prospects for diffusion and adoption of renewable energy technology. *Energy Policy* 25 (13):1099-1107.

Romero, Jane, Elder, Mark, Bhattacharya, Anindya,. 2009. Strengthening ASEAN+3 Renewable Energy Strategies. *International Energy Journal* (in press).

Institute for Global Environmental Strategies
2108-11 Kamiyamaguchi, Hayama,
Kanagawa, 240-0115 Japan
TEL : +81-(0)46-855-3700
FAX : +81-(0)46-855-3709
E-mail: iges@iges.or.jp
http://www.iges.or.jp

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