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Renewable energy going forward

Recently, the debate on climate legislation has reached climax in Washington D.C. The narrowly passed House bill (climate change and energy bill, H.R. 2454) and the to-be-voted Senate bill culminate in the “cap and trade” system. The cap and trade system is destined to require electric utilities and companies to reduce carbon dioxide emissions each year to meet the cap, or to purchase allowances from companies whose emissions are below their cap. Amid this debate, what can be anticipated going forward in the development and deployment of renewable energy, and how will solar energy play in the U.S. renewable energy arena?

U.S. legislation in the works

Companies and organizations are divided on the climate change and energy issue, driving in opposite directions. Nonetheless, the House bill that cuts CO₂ emissions has passed, albeit very narrowly. The bill cuts CO₂ emissions by 17 percent of 2005 levels by 2020 and by 83 percent of 2005 levels by 2050. Additionally, the House bill would curb the use of other chemicals, such as perfluorocarbon, hydrofluorocarbons and black carbon, which are deemed to emit greenhouse gases. The bill is also set, beginning in 2020, to make importers of energy-intensive products made in countries without greenhouse gas emission regulations to purchase allowances before their goods can cross into the U.S. (pending further debate.) The bill has made a major stride in encouraging the use of CO₂ emission-free energy resources.

On the state level, a renewable portfolio standard (RPS) requires that a minimum amount of renewable energy is included in the portfolio of the electricity resources serving a state (Ref: State Environmental

resource Center). Most RPS laws require states to increase the percentage of renewable power sources used from the current amount to between 10 and 20 percent over about 20 years. It is stated that increasing the amount of renewable power required over time allows industry to grow into the demand and can put the power industry on a path toward increased sustainability. RPS laws ensure that states will have a diverse energy portfolio to move into the future. More than sixteen states currently have RPS laws. Among them, California is the leader of the pack, to generate 20 percent of its electricity from renewable energy in 2010, and there is legislation pending now to take it to 33 percent.

Global activities and legislation

In the global landscape, the EU sets its goal to increase renewable energy penetration in the region of 27 member states to 19 percent by 2010 and to reduce its greenhouse gas emissions by 20 percent by 2020.

Germany, a leader in solar cell energy use and having the largest subsidized market for the past few years, is encouraged by the government’s goal to increase 100 MW per year and by the incentives to build plants producing solar energy products. Japan, another leader in PV technology, sets the application targets of an increase in PV electricity generation by 400MW per year through 2010.

China’s grand renewable energy goal includes a 20-gigawatt program cumulatively through 2020. Its government has pledged US \$100B allotments on renewable energy to make renewable energy account for 15 percent of total energy supply by 2020. Taiwan’s government has also designated solar energy (and LED) as a strategic industry, committing

to increasing its production capacity, subsidizing manufacturers’ R&D and offering incentives to consumers who use solar panel energy.

India, reportedly, has also announced an intention to adopt a 20-gigawatt program by 2020. Other countries, such as Australia, have introduced RPS, in an effort to move forward toward renewable energy.

Energy resources vs. environmental characteristics

Among the various energy-generating resources, for both fossil fuels and renewable, their respective environmental characteristics as described by NOPEC (Northeast Ohio Public Energy Council) is listed as below:

- Coal power: air emissions and solid waste
- Natural gas power: air emissions and solid waste
- Oil power: air emissions and solid waste
- Nuclear power: radioactive waste
- Biomass power: air emissions and solid waste
- Hydro power: wildlife impacts
- Wind power: wildlife impacts
- Solar power: no significant impact

It is noted that solar power is rated as most environmentally benign.

World PV installed capacity development

Presently, PV-generated solar energy constitutes a miniscule portion of total energy assumption. Yet its growth has been phenomenal. The installed capacity of PV generated energy in gigawatts (GW)



One megawatt solar field at Cerro Coso Community College's Ridgecrest location in California.

of production has increased from less than 2 GW in 2003 to nearly 10 GW in 2008, equivalent to 45 percent CAGR (compound annual growth rate.)

This year's significant dip largely stems from two mega-events: global economic downturn in a broad scale and the steep drop in Spain's solar installation. It should be noted that Spain was the country that contributed the highest weight to the solar installation in the global capacity growth in 2008, which was a unique and an exceptional event.

It has long been a belief that the wide deployment of solar energy relies on the government's initiatives and financial incentives. Indeed, at the initial stage, the government has played a crucial role to the adoption and application of solar energy as an environment-friendly renewable energy source as has occurred in Europe and Japan. Yet, with or without the government's engagement, how fast and to what extent that PV can contribute to the electricity generation in the U.S. and in the world largely depends on two fronts: cost (\$/W or \$/Kwh) and technology.

To fulfill a country's desires to sustain

its energy supply and to support an environmental-friendly stand, a myriad of activities in renewable energy, from the government to academia to the industry, have been implemented. With the vibrant global energy activities, what are the resulting geopolitical ramifications? Judging from the national plans and programs of both developed and developing countries, this is a global race and an opportunity to shine.

Going forward, a handsome growth rate is expected from 2010 onward, particularly in the measure of megawatts—a precise percentage growth rate may not be easy to fetch, but more than 50% annual growth would not be a surprise. Be prepared.

Dr. Jennie S. Hwang has extensive experience in global market and international business in her executive capacities with both corporate America and entrepreneurial businesses. She is inducted to the WIT International Hall of Fame, elected to the National Academy of Engineering, and named an R&D-Stars-to-Watch (Industry Week). Dr. Hwang is a member of the U.S. Commerce Department's Export Council, and serves on university, civic and Fortune 500 NYSE company boards. Among others, she has served on National Research Council's "Globalization Committee" and "Forecasting Emerging, Disruptive Technologies Committee". Her education includes Ph.D., M.S., M.A., B.S. degrees in engineering and sciences, respectively, and Harvard Business School Executive Program. An author of 300+ publications, she is also a worldwide speaker on trade, technology, business, education, and social issues. Tel: (216) 839-1000; E-mail:

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