THE SOLAR ENERGY OUTLOOK

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For decades, solar has been like the Rodney Dangerfield of renewable energy. Rarely has it received the respect it has deserved. But by all accounts, 2013 was a watershed year in that respect. In Q3 alone, 930 megawatts of PV were installed in the United States — and in the last two and a half years, total global PV capacity grew from 50 gigawatts to over 100. Sure, 2013 saw its share of failures and disappointments. But according to some of the best and brightest minds in the solar industry, the coming year may play itself out as the dividing line between past and future.

According to clean energy expert Jigar Shah, one of the most heavily underestimated solar markets in the world today is the United States. "I think you're going to see extraordinary growth in the U.S. next year, through 2016," Shah confidently stated. "Many are projecting somewhere in the neighborhood of 7,000 to 8,000 megawatts in 2016. But that number could easily be doubled to 14 gigawatts in 2016 alone."

Looking beyond 2014, Shah sees even further robust industry growth — one aided, not hindered, by the looming expiration of the federal investment tax credit (ITC). "Everybody expects the 30 percent tax credit to expire and to move to a 10 percent federal tax credit in 2016," Shah said, adding that the majority of solar industry players are actually looking forward to that expiration.

To show the superiority and applicability of the developed ANN model, results from the proposed ANN model have been compared with the conventional model adopted by Malaysia Energy Center and another mathematical model based on regression.The proposed approach utilizes actual hourly records of various meteorological parameters, such as ambient temperature T-a, solar irradiation G, relative humidity RH, and wind speed Ws as input variables. The hourly meteorological data were collected over 9months in the year 2009 from a 92-kWp installed PV system in Selangor, Malaysia. The data were divided into two sets: training data, which are a set of 1849 (April-October) hourly data, and 578 (November-December) hourly records of working as test data. Four ANN models have been developed by using different combination of meteorological parameters as inputs, and, for each model, the output is the PV module temperature T-m. It was found that the model using all parameters, including RH and Ws as inputs, gave the most accurate results with correlation coefficient (r) 95.9%, and 0.41, 0.1, and 4.5% for MBE, RMSE, and MPE, respectively. With the model's simplicity, the proposed approach can be used as an effective tool for predicting the PV module temperature, for any type of PV systems, in remote or rural locations with

no direct measurement equipments. The developed model also will be very useful in studying PV system performance and estimating its energy output

"Most people in the solar industry recognize that the financial innovations we've had in 2013 are actually *helped* by the tax credit sun-setting in 2016," Shah said. He explained that presently, approximately 40 percent of investment capital is required to come from tax equity. The remaining 60 percent can come from debt or sponsor equity. Shah said once the 30 percent tax credit drops to 10 percent, the depreciation can be used by the sponsor equity to shelter their own gains. "You could actually do without tax equity altogether and just be 100 percent sponsor equity," Shah said. "It's much easier to raise that kind of money than it is to raise tax equity."

Edwin Feo, COO for Coronal Management LLC, agreed. "Ultimately, the industry has to deal with the demise of the ITC," he said. He added that what is needed is "improvement on balance of system costs and financing costs to effectively replace the credit with cheaper sources of capital. That amount of leverage can negate the loss of the full ITC."

Study aims to effectively compute the shadow areas (shaded areas) on rooftops. By using the Hillshade module, the buildings' elevation data and the solar azimuth and altitude angles at different hours were calculated to obtain the hourly sun/shade grayscale values. The grayscale values were then integrated into binary images to calculate the shadow areas on rooftops. This study suggests that the rooftop solar photovoltaic installation capacity is some 12,428.5 MW and power generation capacity 15,423.75 GWh in Taiwan.

Last year, Saudi Arabia's plans to launch a massive renewable energy program was the big news coming out of the Middle East – but internal wranglings have resulted in uncertainty about the future of the project. Looking elsewhere in the region, it appears that Jordan may wind up upstaging its neighbors by pursuing steps to reduce its dependence on imported energy, which currently stands at 97 percent. The plan, which involves the initial procurement of 200 megawatts (MW) of solar energy and 200 MW of wind power, is intended to increase the kingdom's share of renewable energy contributions from one percent to 10 percent by 2020. Marc Norman, director of marketing and communications for the Middle East Solar Industry Association (MESIA) and project finance lawyer at Chadbourne & Parke, sees this as a landmark project. "If you look at the region as a whole," Norman said, "Jordan definitely emerges as a leader for now. My view is that they're setting a template and emerging as a model for the wider region." Round one is primarily being deployed in the southern region of Ma'an. Later stages may prove riskier, as Jordan plans to switch focus to the northern and eastern parts of the country, close to the border with Syria.

References

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