The Visualization of International Renewables Energy Evolution

Huei-Chu Liao

Chi Liu and Yin-Chen Xie

Department of Economics, TamKang University, rubyliao@mail.tku.edu.tw

(1) Overview

Renewable energy grows much faster than any other energy over last decade. According to the renewables market report (IEA, 2017), the renewable energy installation shows yearly new records in past few years. And, two-thirds of all global net electricity capacity growth in 2016 is from the renewable energy. IEA attributes the above achievements to three factors: strong government policy support, technology improvement, and the arrival of giant emerging economies spurred steps change economies of scale. Although some experts believe the renewable energy will continue to grow fast, the others have opposite view since some countries already revised the favorable policies (e.g. from Feed in Tariff to competitive option) due to the cut of Government's subsidy budget, and less suitable sites can be found for new renewable energy installation.

The purpose of this paper is to reveal the evolution of world renewable energy development by applying the visualization techniques. We will draw many visualization figures to capture the movement of different renewable energy in different countries. We believe some snag shots of the renewable energy evolution would help us to better capture the possible trend of world renewable energy.

(2) Methods

After reviewing all related articles, we tackle this issue step by step as below:

1. Collect yearly renewable energy data for all countries from IRENA.
2. Focus on the renewable electricity capacity and the renewable electricity generation per hour.
3. Draw all renewable energy trend figures for top 10 countries.
4. Calculate the yearly electricity capacity factor for each renewable energy for top 10 countries (e.g. Top wind power capacity installation countries) .
5. Examine the accuracy of the data if the capacity factor is greater 1
6. Observe the movement of the capacity factors and examine the policy implementation for top 10 countries.
7. Deduce the most probably renewable trend in top 10 countries.

(3)Results

Using yearly renewable electricity capacity and the renewable electricity generation data from 2005 to 2015 for all above data, we follow above process to trace the movement of many capacity factors in different countries. Our preliminary visualization Figures reveal many interesting findings. Currently, we found some important issues needed to be notified. For example, the renewable energy of some countries keep rapid growth for last decade such as China, while others barely has no growth (e.g. Russian). The observation of renewable electricity capacity factors trend also reveals some interesting phenomenon. We found the renewable electricity capacity factors of most countries are decreasing. This findings may implies that more renewable electricity facilities in recent years may be installed in the less favorable locations.

(4)Conclusions

Renewable energy grows fast over the last decade. However, some experts doubt that the past growth rate my disappear soon. In order to capture the future development of renewable energy, this

paper uses the visualization techniques to draw a lot of figures for main renewable energy countries. By examining these Figures (e.g. Figure 1 below), we found some interesting implications. One of our preliminary results shows that the renewable development patterns are very different from one country to the other country. Currently, we found government policy may play more important role to expand the renewable energy development rather than the renewable energy site consideration.

Major References

IEA, Renewables 2017: Analysis and Forecasts to 2022.", Resources, Conservation and Recycling, Volume 124, September 2017, Pages 152-161

Schuh, M.A., J.M. Banda,T. Wylie,P. McInerney,K. Ganesan Pillai,R.A. Angryk, "On visualization techniques for solar data mining", Astronomy and Computing, Volume 10, April 2015, Pages 32-42

Squalli Jay, "Renewable energy, coal as a baseload power source, and greenhouse gas emissions: Evidence from U.S. state-level data", Energy, Volume 127, 15 May 2017, Pages 479-488

Keywords: Visualization, Renewable Energy, Capacity Factor

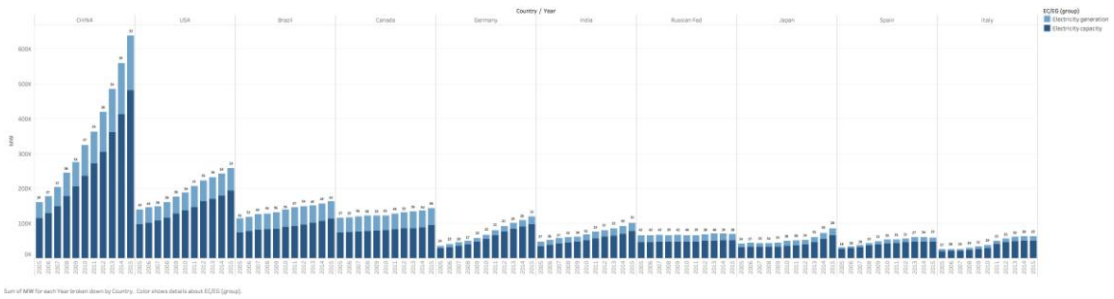

Figure 1: The Evolution of Renewables Energy of Top Ten Countries