

Renewable Power Generation Forecast

Zheng YANG

April 6, 2021

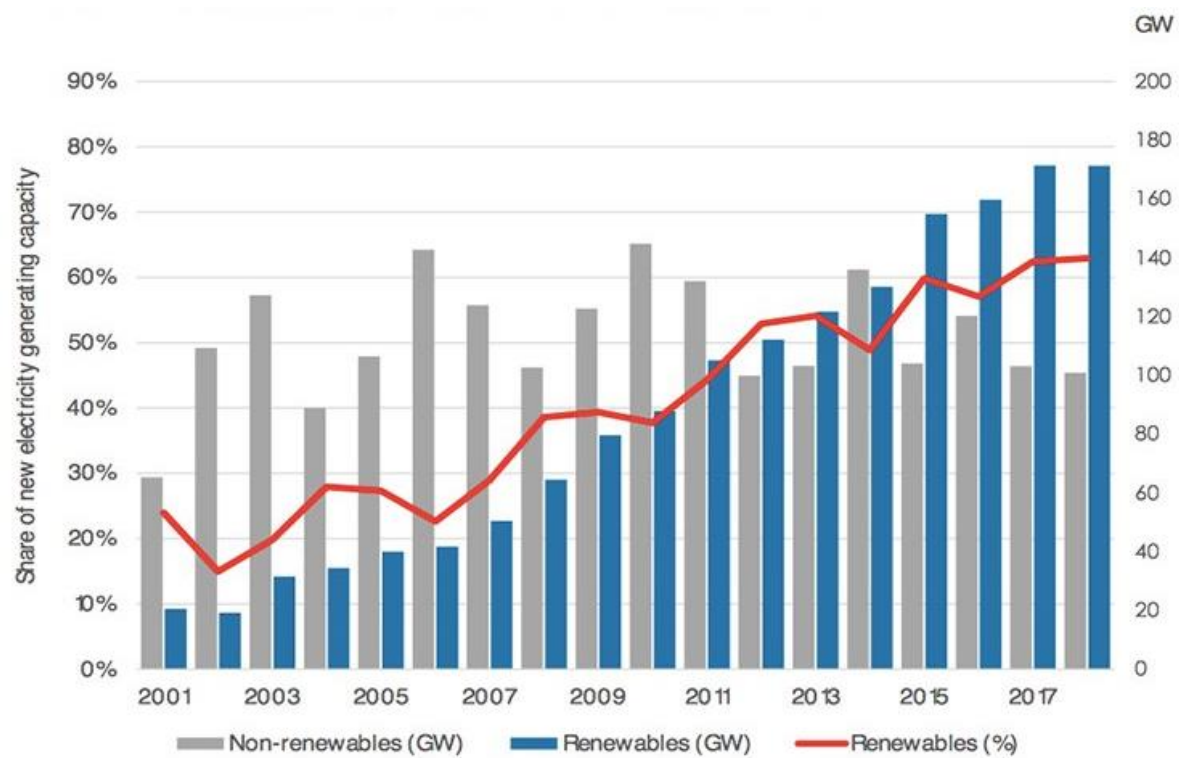


Figure. World renewable generation capacity and energy transition trend



Figure. Examples of solar photovoltaic panels

Renewable power production depends on the environment conditions (e.g., snow, high temperature, cloud) and is stochastic and uncertain in nature.

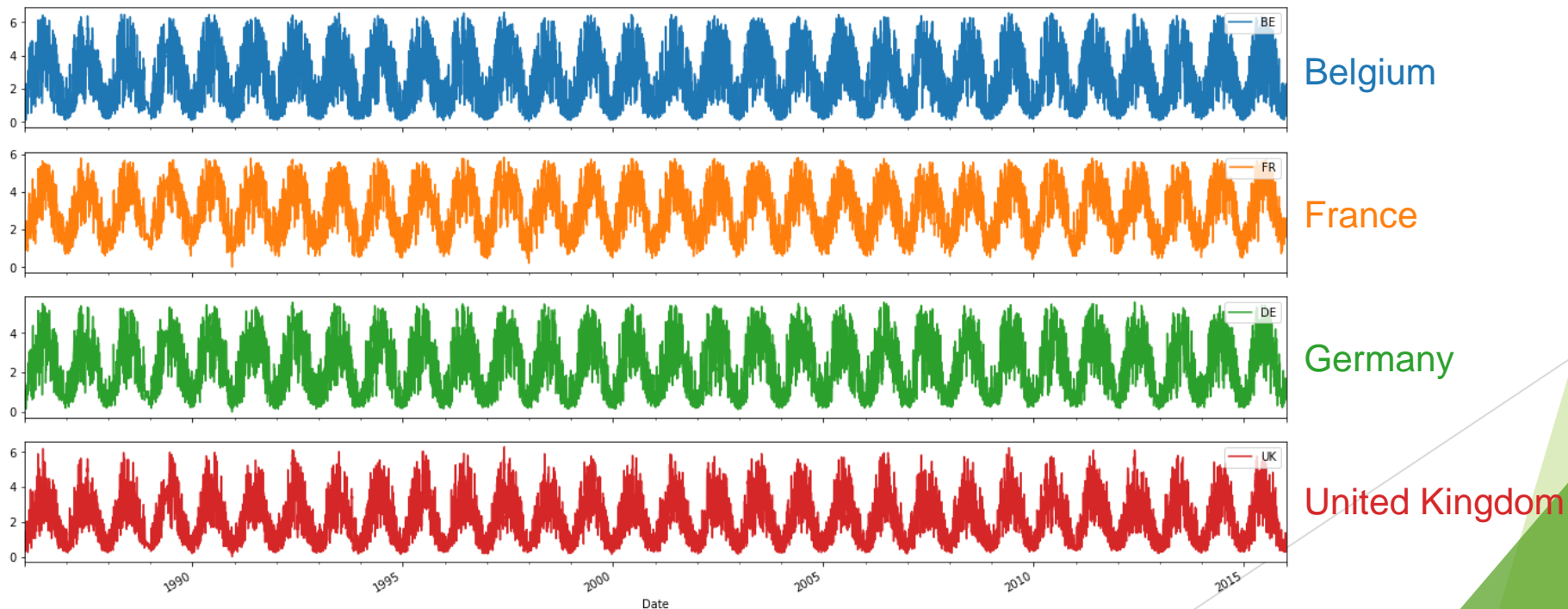


- To better analyze the characteristics and performance of renewable systems;
- To avoid either overstating or downplaying the possible role of renewable in the further energy transition:
- **Renewable power production data analytics and forecast algorithms**



EMHIRES dataset Part II: Solar power generation

- Published by European Commission, Joint Research Center
- 262,968 rows, 40 columns
- Hourly from 1986-01-01 to 2015-12-31
- 35 countries in European Union
- Link: <https://setis.ec.europa.eu/publications/relevant-reports/emhires-dataset-part-ii-solar-power-generation>



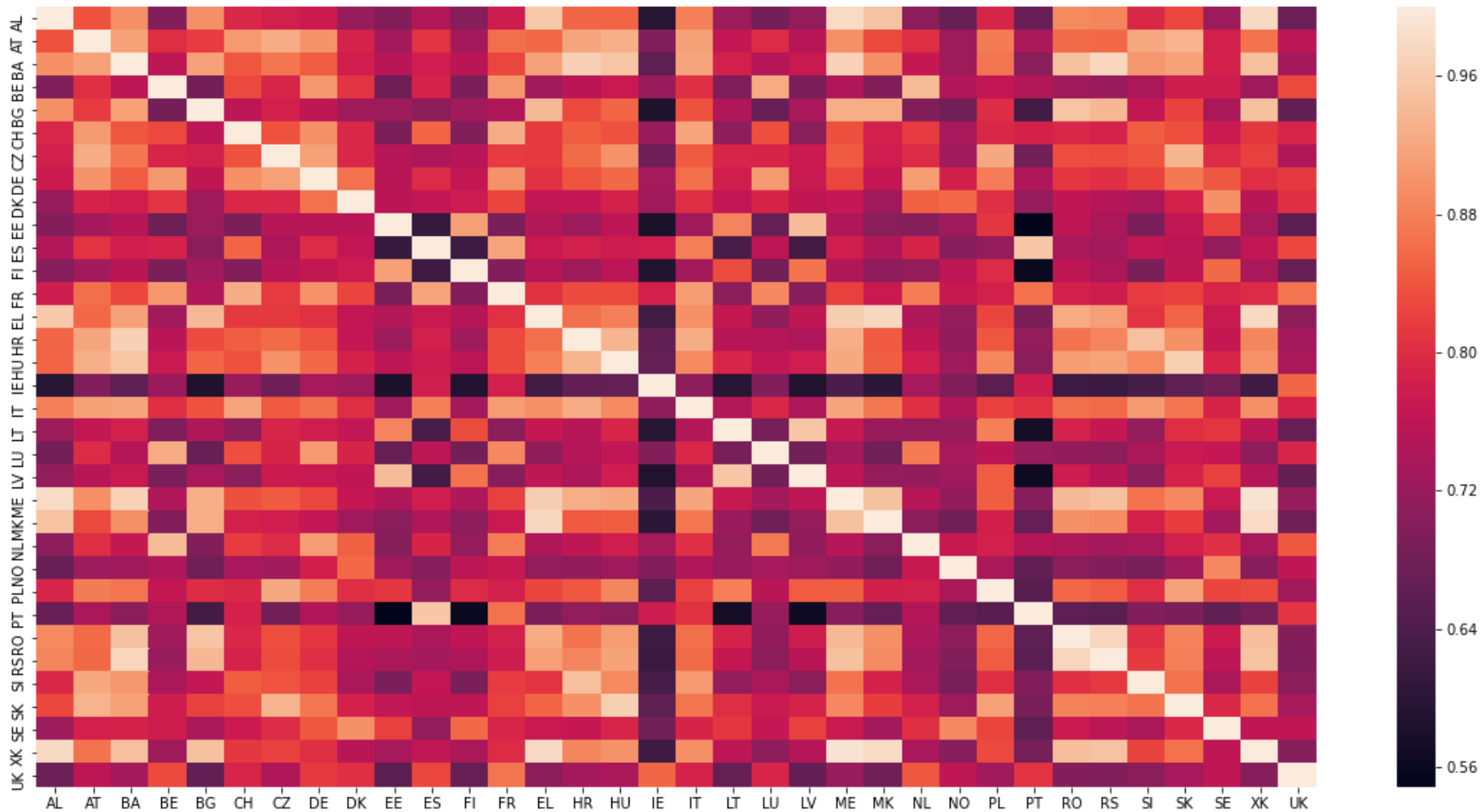
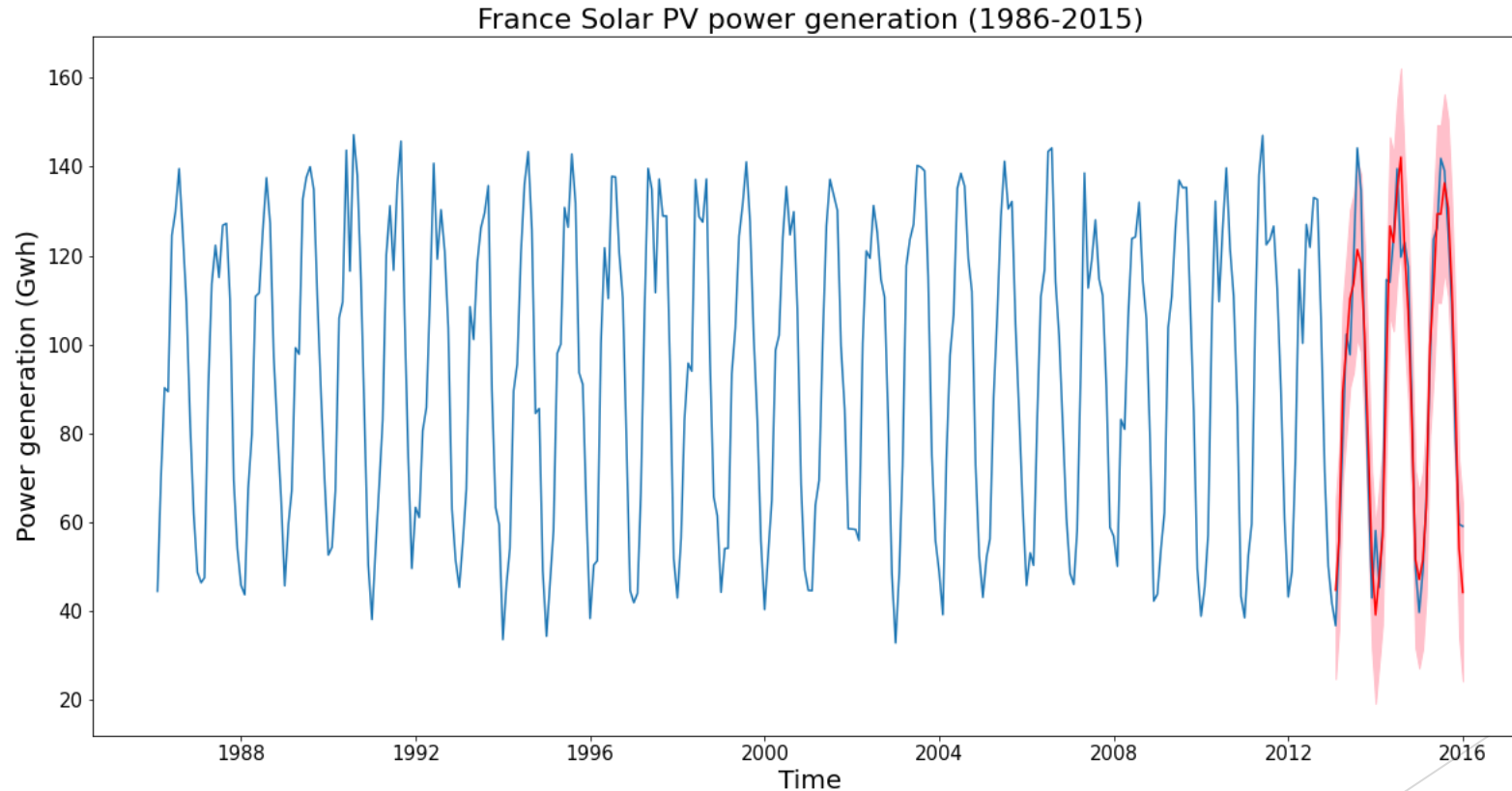


Figure. Correlation among power generation time series of different countries

There are potentials to integrate spatial-temporal characterization into feature engineering and algorithm development for forecasting

Preliminary analysis:

- Augmented Dicky-Fuller test for stationarity
- Use ACF and PACF to select model orders (BIC)
- Use SARIMA model to make one-step-ahead forecast (36 months)
- Visualize predicted mean values and confidence intervals



Next steps:

- 1) develop models to forecast the solar power generation for short term and long term;
- 2) feature engineering to integrate accurate representation of the spatial and temporal characterization of solar sources;
- 3) evaluate the impacts of meteorological and climate variability on the solar power generation;
- 4) quantify the relationships among different countries in terms of power generation time series;
- 5) develop on-line learning capability to continuously learn from past data;

The background features abstract, overlapping geometric shapes in various shades of green, primarily on the right side of the slide. These shapes include triangles and polygons of different sizes and orientations, creating a dynamic, layered effect. The colors range from light lime green to dark forest green. The text "Thank You!" is centered in the white space on the left.

Thank You!