<https://www.power-technology.com/comment/changing-energy-mix-trends-power-generation-market/>

31 May, 2018

* Trends in energy generation prompted by concerns regarding climate change and cost of power generation
  + Making solar power and wind power to be in demand in relation to other forms
* Hydro power huge in Canada, South America, Eastern Europe

Growth of Renewables

* Change is already visible in North America and Europe, from coal to gas w/ expansion into wind and solar
  + Where in North America?
  + Abundancy in new shale gas deposits in the US
* APAC (Asia-Pacific) will lead the additions in solar power capacity
  + Thanks to China and India
  + Japan moving from nuclear to renewables
* Growth in renewables powered by falling costs of installations, positive governmental regulations
  + Promotion of reverse-bidding mechanisms over feed-in tariffs
    - Feed-in-tariffs (FiTs) promote individual ownership of renewable-energy-producing installations vs. mass-producers of renewable energies
    - Only 5 megawatts are eligible for these tariffs, possibly in the UK
    - How is this being implemented in Canada?
  + The above points will cause solar-energy generation to fall to a minimum, much comparable to thermal power generation
  + Coal-based generation will still be used here in hopes of maintaining base-load demands
* **US AND CANADA**
  + Changes will be a result of governmental regulations and costs of generation
  + Gas-based generation will prosper when:
    - Favourable economics related to operations of gas-based power plants
    - Confidence in long-term fuel supply
    - Government regulations that favour lower carbon emissions
      * Does this make it better to produce gas vs. coal energy?
    - Cost of building natural gas generators declined by 28% between 2013 and 2015
      * CAGR? (US Energy Information Administration)

Flourishing use of coal

* APAC
  + Higher growth rate in coal usage due to availability of cheaper coal in region
    - China, Australia and Indonesia are largest producers of high-grade coal
    - India, faced with high demands for electricity in the last decade, has turned to production and import of coal from local countries
  + Little regulation and cheap coal has allowed these countries to leverage the availability
* Coal-based plants are being converted to gas-based facilities along with the production of new facilities
* Solar/Wind (SW) power is aided by the declining costs of producing the energy
  + Originally, governments eased the production of these facilities through FiTs
  + With the falling production costs of equipment, it has become easier to implement reverse-auction bidding
    - This has allowed a boom in the construction of utility-scale plants and projects

Coal Substitute - Biomass

* Wood pellets being used extensively in NA and EU in exchange for coal and in Japan in exchange for nuclear
* Biomass can be more harmful for the environment than coal and gas produced energy
  + CO2 production is 1.5x of coal and 3-4x that of natural gas
  + .75 less nitrogen than coal emissions and pretty much no sulphur dioxide emissions
  + People argue that biomass will emit CO2 anyways through decomposition, yet the process is sped up when burning biomass as it can take years for dead trees to decompose
  + Methane a bi-product of decomposition and, therefore, burning it through biomass is better; methane has a greater impact on the environment than CO2
    - Methane is produced in wet, low-oxygen environments, such as wetland soils
    - Mishandling of biomass can result in increasing temperatures of holding, during which toxic gases are emitted as well as chance for spontaneous combustion

Conclusion on Biomass - it is relatively new and has a lot of issues to it -- not as deeply-studied as coal, gas, etc.

* Intermittency of wind and solar has resulted in a boom in energy-storage sector