Renewable Energy

ARISTOTLE ATLANTIC PARTNERS

Thought Piece

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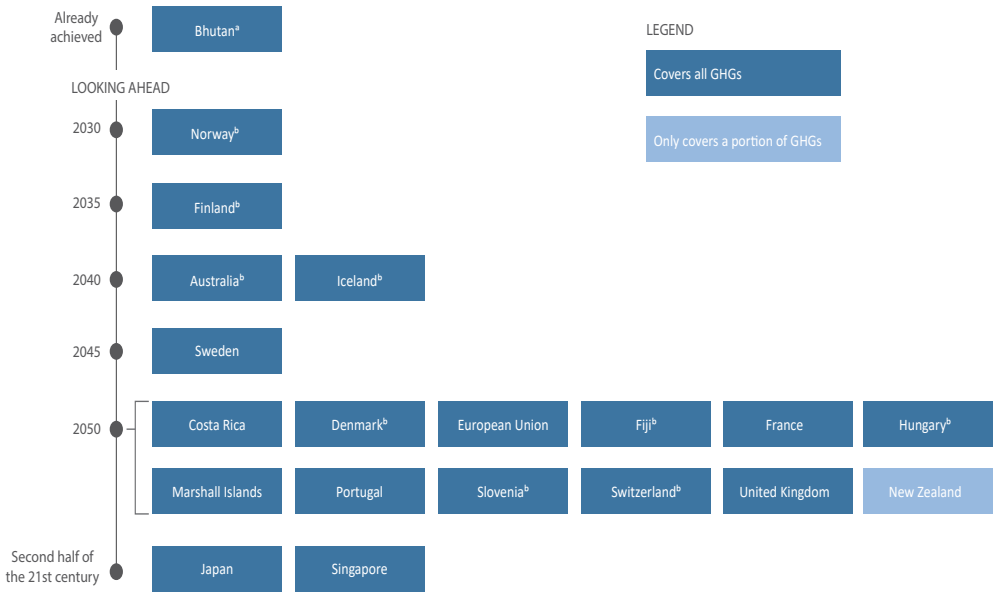
Renewable energy has been gaining market share of global electrical power generation. We believe the contribution of greenhouse gases to global warming has triggered worldwide cooperation to reduce emissions. Government mandates, consumer choice and declines in the cost of renewables have promoted the growth in renewables. The main causes of greenhouse gas production are largely due to transportation, electricity generation, general industry, commercial and residential, and agriculture. The source of funds to drive the investment cycle in renewables can come from a combination of public and private investments. Globally, we are seeing countries fund large-scale renewable projects. This reflects the movement to enact laws in some countries to meet net-zero emissions by specified dates. This list currently stands at 20 countries committed, which in our view, will only grow with time. Corporations in many sectors are also looking to deploy capital in renewable energy projects. BP, one of the world's largest oil and gas companies, has stated, "We aim to be **a very different kind of energy company by 2030** as we **scale up investment in low carbon**, focus our oil and gas production and make headway on **reducing emissions**. Our **strategy** kickstarts a decade of delivery towards our **#bpNetZero ambition**."

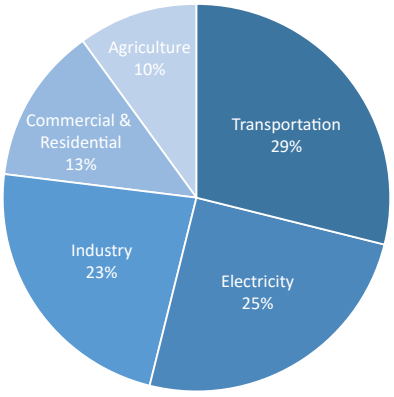
The Timing of Countries' Net-Zero Emissions Targets



Notes: GHG - greenhouse gas. Additional countries and regions have proposed adopting net-zero targets, including Ireland, the Netherlands, and Spain: some, such as Chile are far along in the policymaking process.
a. Bhutan's commitment is to maintain its carbon neutrality.
b. For these countries, we assume complete coverage of GHGs, since no exclusions have been noted explicitly, and means of target achievement include all sectors.

Source: Adapted from Levin and Davis 2020, as adapted from the Energy & Climate Intelligence Unit. World Resource Institute

Total U.S. Greenhouse Gas Emissions by Economic Sector in 2019



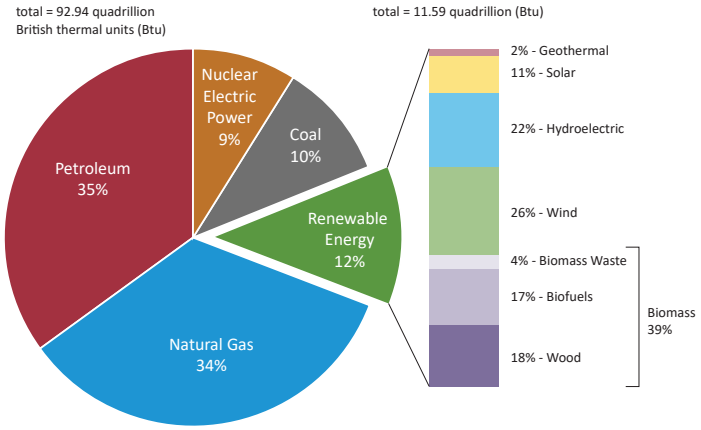
Total Emissions in 2019 = 6,558 Million Metric Tons of CO2 equivalent. Percentages may not add up to 100% due toindependent rounding.

Source: Environmental Protection Agency, 2019

Declines in the cost of renewable generation equipment and the components used to create the equipment have also been a factor in the attractiveness of renewable power generation. Domestically, renewable energy consumption was 12% of total energy consumption in 2020, according to the U.S. Energy Information Administration (EIA). However, renewables are gaining market share, especially compared to coal fired generation, which is in a decade-long decline. We believe solutions for storing the power that is generated by renewables will likely help increase renewable's share in the future.

Global solar photovoltaic installed capacity has grown approximately tenfold since 2010 to over 700 GW of generation capacity in 2020. Projections are for an over tenfold additional increase by 2050, according to BloombergNEF. Some of this growth and projected growth can be attributed to the declines in prices of solar

U.S primary energy consumption by energy source, 2020



Note: Sum of components may not equal 100% because of independent rounding.
Source: U.S. Energy Information Administration, Monthly Energy Review, Table 1.3 and 10.1. April 2021, preliminary data

components, which have improved the economics of solar electricity generation. Although there has been a spike in the price of solar grade silicon in early 2021, prices of photovoltaic modules declined by 89% over the previous decade due to advances in technology and scale.

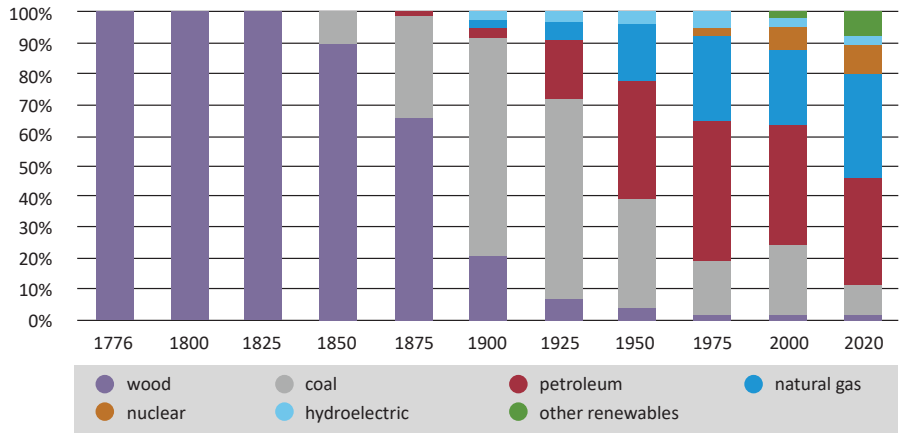
The global installed base of onshore wind generation has grown to 679 GW in 2020, up from 280 GW in the year 2012. Forecasts from BloombergNEF project an over fivefold increase to 3,800 GW by the year 2050. While the decline in the total installed cost per KW of onshore wind has not been as significant as the decline in solar costs, from our perspective, the decline is still an impressive 59% over the past decade. The offshore wind generation market is smaller than the onshore market, but the trends in growth and the declines in installed costs are similar to the onshore market.

Hydropower is a mature source of power generation, yet it has continued to grow generation capacity in the low single digits annually in recent years. Despite the maturity of the market, growth is expected to continue, though at a rate of less than 1% a year on average over the next three decades. One issue that growth of hydropower faces is the impact that construction of additional dams would have on the ecosystem. We believe this impact will limit hydropower's growth.

Bioenergy encompasses a variety of methods of converting biomass into energy. Some of these biomass feedstocks include sugars, starches, plant-based oils, waste and algae. Most of these bioenergy systems convert biomass into combustible materials, which are then burned to generate power as an alternative to burning coal, oil or natural gas. Bioenergy has grown approximately 5% per year since 2012. Growth is slowing and is only projected to increase 1% a year for the next 30 years.

Although renewable power has clear benefits for the environment, its ability to provide power on a consistent basis is a challenge. For example, on overcast days and at night, solar power generation is weaker or nonexistent. Wind speeds vary, and therefore the power a turbine can generate varies as well. Fossil fuel generated power is currently available as a backup to renewables for these periods of slack generation, but there are alternative technologies being developed to store excess power. Battery storage, both at utility-scale and sized for single-family homes, is one of these technologies. Utility-scale battery storage capacity in the U.S. quadrupled between the end of 2014 through March 2019—from 214 MW to 899 MW, according to the EIA. While this is a very small fraction of the four trillion KW generated in the U.S., EIA data from last November indicates battery storage capacity will exceed 4,525 MW by the end of 2023, a 400% increase. Lithium-ion batteries account for over 90% of large-scale battery storage power capacity in the U.S. The challenges for utility-scale batteries are safety concerns (fires), as well as cost effectiveness and recyclability at the end of a battery's life. On the smaller scale, companies including Tesla and Generac have developed battery solutions for the home. Tesla's Powerwall, although primarily marketed as a backup

Shares of total U.S. energy consumption by major sources in selected years (1776-2020)



Source: U.S. Energy Information Administration, Monthly Energy Review, Appendix D.1, and Tables 1.1 and 10.1, April 2021, preliminary data for 2020
Note: Wood includes wood and wood waste; other renewables includes biofuels, geothermal, solar and wind

power solution (an alternative to a home fossil fuel-powered generator), can also be paired with residential solar panels to store excess power for when the sun isn't shining. Generac, a leader in home backup generators, has developed a similar home power storage system branded the PWRcell.

Another company that we expect to benefit from the trends in solar energy and power storage is Enphase Energy, a global energy technology firm and one of the world's leading suppliers of solar microinverters. Enphase Energy delivers solutions that connect solar generation, storage and management on one intelligent platform. The company has developed products that integrate solar and power storage, which can expand the addressable market for its products. Enphase Energy has produced significant revenue and earnings growth over the past couple of years, and consensus estimates suggest that this growth will continue into the future.

Hydrogen fuel cells are a rapidly growing alternative fuel used mostly for backup power and in the powering of commercial vehicles. Since hydrogen is very combustible, this may limit its use more broadly within the consumer automotive industry. As with any fuel, as the infrastructure grows there is the potential to drive costs down and expand use cases. The added plus for hydrogen is the flexibility to transition from a natural gas-led conversion to a water-based sustainable alternative. The investment opportunities in hydrogen range from processing and infrastructure companies to fuel cell companies like Ballard Power Systems and Plug Power. We believe hydrogen will likely be one of the most attractive investment opportunities given its abundance and ease of use. For example, both Amazon and Walmart use Plug Power's hydrogen fuel cells to power many of the forklifts in their warehouses. The biggest near-term opportunity in transportation will be in areas where the vehicle stays or returns to the same facility like a warehouse or bus depot. A secondary use of hydrogen fuel cells is for backup power generation taking the place of fossil fuel generators. Longer-term opportunities could include commercial trucks, but this would require building the infrastructure around fueling stations. Still, we believe this is a more attractive opportunity than batteries given their range issue and time to recharge.

We believe the outlook for renewable power is bright. Advances in electrical power storage will likely increase the reliability of renewable energy to close the reliability gap with fossil fuels. The global focus on the environment by governments, the public and investors, combined with the decreasing costs of renewable power generation, bode well for continued renewable power market share growth.

Disclosures:

Source: BloombergNEF's New Energy Outlook 2020