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Energy Transition and Wind Energy

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Abstract – *Energy security and sustainable development are on the top of the global agenda due to the impact of volatile energy prices, high demand for energy security, and concerns about environmental sustainability and global climate change. The new and renewable energy technologies address the challenge of achieving sustainable development while conserving the natural resources depleted by rapid population growth, urbanization and fossil fuel consumption fuel. The expansion of wind power is increasingly based on the urgent need to combat global climate change. Most countries now recognize the need to significantly reduce greenhouse gas (GHG) emissions in order to avoid environmental disasters*

Wind energy not only provides an energy source that completely avoids the emission of carbon dioxide, the most important greenhouse gas, but also does not produce fossil fuels or other contaminants related to nuclear energy.

***Key Words*: Renewable Energy, Wind Energy, Energy Transition, Fossil Fuels**

1. INTRODUCTION

1.1 Energy Transition

In general, energy transformation means a shift in energy sources that covers global energy demand. The current energy conversion from fossil fuels to low carbon energy is not the first energy conversion the world is experiencing. In fact, this is the fourth major shift to other energy sources. The first (1830-1950) is the transition from traditional biofuels (mainly wood) to coal, the second (1950-1980) consists of the development and introduction of refined oil products, and the third. (1980-2020) was accompanied by increased dependence on natural gas. [5][6]

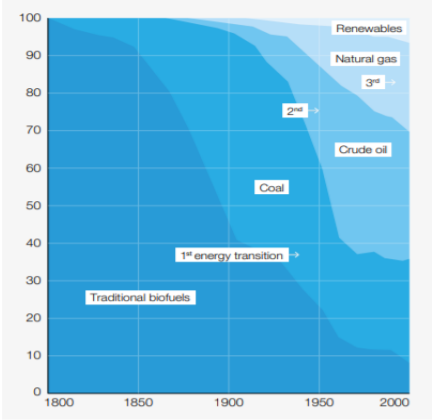

Fig-1.1: Global energy sources (%) and previous energy transitions

While today's energy shifts are driven primarily with the help of sustainability motives, previous energy shifts were primarily the result of a quest for economic prosperity, which in turn is for access to and consumption of electricity. It is closely related. To demonstrate this last point, the average per capita energy intake in OECD countries is 183 GJ, while the average in non-OECD countries is 54 gigajoules. [7] Economic prosperity, especially for developing countries, is as important as the desire for decarbonization when it comes to electricity migration. And this is an important factor. Over 800 million people (mainly sub-Saharan Africa) still live without electricity, and thousands, have access to very limited or unreliable power supplies. [8] Therefore, increased energy supply and electricity rights are good aspects. However, this must be addressed in parallel with emission reductions.

Over the last decade, renewable energy systems have seen the largest growth of over 30% per year, as well as the growth of coal and sub-coal power systems due to the depletion of natural resources and the consequent increased levels of fossil fuel and nuclear pollution. Shows the rate. Power usage [2]. Increasing energy demand can cause problems for distributors, such as grid instability and power outages [3]. The importance of producing more energy and the interest in friction-free techniques have led to an increase in the development of renewable energy structures. European momentum began in March 2007, when EU leaders adopted a binding target of 20% of energy production from renewable energy sources by 2020. India is

also preparing for a change with a Hercules target of 450 GW by 2030. This leads to the concept of energy conversion.

1.1.1 What is Energy Transition?

Energy conversion is a more comprehensive, sustainable and affordable security that provides solutions to global energy-related challenges while providing economic and social value without compromising the balance of the energy triangle. It can be defined as "a timely transition to an energy system."

In other words, despite the fact that state-of-the-art energy conversion is particularly hampered by environmental sustainability concerns it will only succeed if it provides energy security and access at the same time and contributes to the recovery and development of the economy. [1]

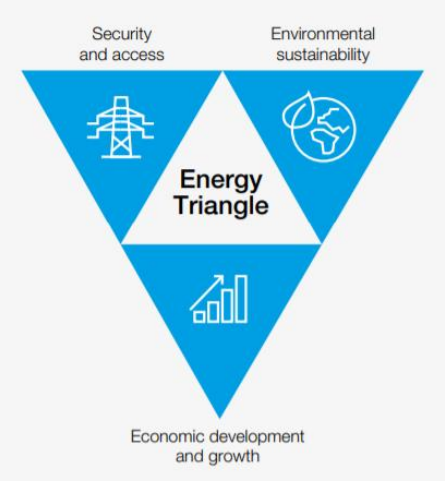

Fig-1.1.1.1: Energy Transition [1]

1.1.2 Need of Energy Transition

The transition of appliances to low carbon energy is being driven by the need to address meteorological trade. The science that contributes to the need for decarbonization begins with the Intergovernmental Panel on Climate Change (IPCC), the UN framework for assessing technical expertise related to meteorological change. A special file for 2018 [9] suggests that human activity is likely to be the cause of global warming of about 1 ° C above pre-commercial levels, global warming between 2030 and 2052. Is likely to reach 1.5 ° C. Current interest applies to maintenance.

Simply put, global warming presupposes that "more energy is emitted from this planet than is reflected by the environment." [21] This amount of retained energy, along with greenhouse gases (GHG), aerosols (each artificial, that is, of human interest, natural, that of volcanic eruptions), etc., is a factor of climatic factors. Motivated by expansion. [22] The least simple model means that there is a strong correlation between the detected temperature rise and the extended region of such radiative forcing, but the factor that has the strongest influence on the temperature rise. It also shows that is an artificial greenhouse gas.[23]

At this point, the focus is only on electricity-related CO2 emissions, as greenhouse gases in the electricity transition debate are not just CO2, but cause about two-thirds of the world's greenhouse gas emissions. It should be pointed out that. [24] Other energy-related emissions are methane (6% of CH4-average GHG emissions) emitted primarily by natural volatile oil leaks and flaring, and some nitrogen oxides (N2O-average GHG). 1% of emissions). The final non-energy GHG emissions are primarily from agriculture.

1.2 Wind Energy

Wind is a free, abundant and sustainable energy that occupies the largest share of renewable energy areas [10], [11]. The electricity generated using wind power is clean and environmentally friendly, as the flowers of wind energy no longer emit air pollutants. Once the turbines are built, their operating costs will be nearly zero [12]. Wind turbines convert the kinetic electricity (motion) of the wind into the mechanical energy used to generate the electricity. It is supplied by the generator, converted to electricity a second time, and then supplied to the grid for transmission to the power plant. Wind power has many advantages, including reduced greenhouse gas emissions by using a mill that produces electricity and starch when driven by the wind, and can reduce electricity costs. All turbines need wind as needed. It's just natural air, and air is everywhere.

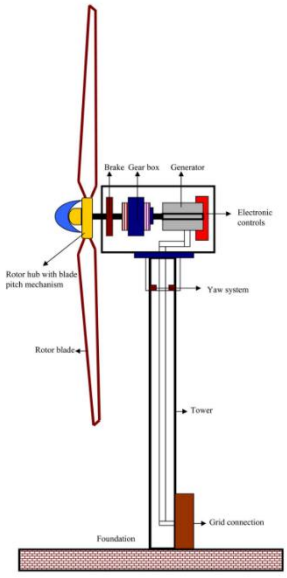

Fig-1.2.1: Schematic of a wind turbine

The first wind power was produced by a machine manufactured by Charles F. Brush in Cleveland, Ohio in 1888. The rated output was 12kW (DC). DC power generation continued in the form of a small, self-contained (off-the-grid) system until the 1930s, when the first large AC turbine

in the United States was built. Modern wind turbine generators are sophisticated machines that can generate megawatts of power, taking full advantage of the latest technologies guided by improvements in aerodynamic and structural design, material technology, machinery, power, and control engineering. .. Large wind farms and wind turbines have become commonplace in many countries around the world. In fact, the wind capacity connected to the grid is experiencing the fastest growth rate of any form of electricity generation.

Wind energy has the largest share in the field of renewable energy [18], [19]. Over the last two decades, grid-connected wind capacity has more than doubled, and wind turbine power costs have fallen to one-sixth of the early 1980s. [19]

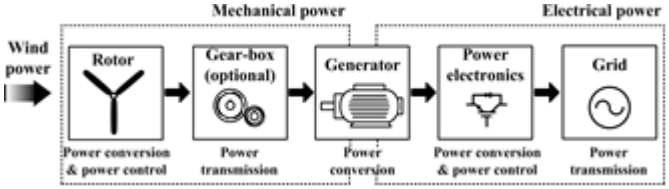

Fig-2.2.2: Basic power conversion principle in a wind power system

The required characteristics associated with a wind energy conversion system are:

• Available wind energy

• Type of wind turbine used

• Type of generator and power electronics used to connect to the grid.

Based on the aerodynamic principles used, wind turbines are divided into drag-based turbines and lift-based turbines. Based on their mechanical structure, they are classified into horizontal and vertical axis wind turbines. With regard to rotor rotation, wind turbines are divided into fixed speed turbines and variable speed turbines. Currently the focus is on horizontal axis, variable speed, lift-based wind turbines[19], [20].

2.1 Energy Transition in Wind Energy

Wind power is a choice that works in harmony with nature to promote social progress by rejecting the dark outlook of a world that has run out of oil and fuel [13]. Wind energy has been used for many years, but in fact it has produced a large amount of commercial electricity in the last decade. The unusual and unpredictable nature of wind strength limits its contribution everywhere, except when large power garages or intercontinental transmission are available. Environmental restrictions, including the presence of forests and guard areas, also limit the location of wind turbines, which may promote public popularity[14].

As stated by the GWEC (Global Wind Energy Association) [4], by the end of 2011, the cumulative wind energy installed worldwide was 237.7 GW. In 2011, wind increased by about 6% compared to 2010, with 40.6 GW of wind energy delivered online.

2.2 Wind Energy in India

India has abundant renewable energy sources that can significantly contribute to increasing energy demand. This study reviews the pattern of the Indian wind energy boom that began in the 1980s. The era of wind energy is now making a significant contribution to the era of electricity energy in India. However, China has recently surpassed India in terms of installed wind power capacity to become the fourth largest internationally. Therefore, if India needs to form an increase rate for international wind power zones, key regulatory and coverage issues need to be urgently addressed. The penetration of wind power is not limited by the technical problems of wind energy technology, but by regulatory, institutional and market barriers. It is well known that the existence of such non-economic barriers has a significant negative impact on the effectiveness of wind energy development policies, regardless of the form of the incentive system.

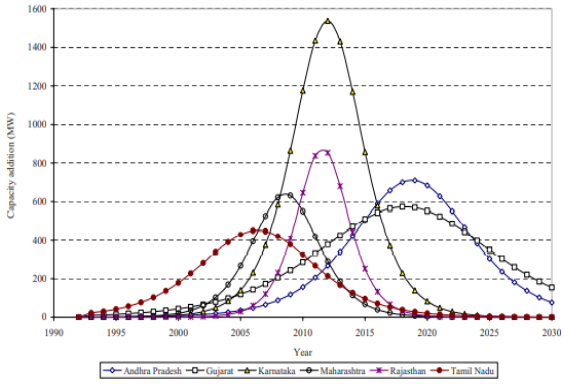

Fig-2.2.1: Projected values of capacity addition of wind projects in the six Indian states [17]

3. CONCLUSION

Despite future challenges, the report shows that the world can reach its climate goals in Paris by 2050 with the help of technology. Mitigating the effects of climate change means reducing floods, storms, droughts and other extremes caused by rising temperatures. Air pollution kills about 7 million people each year. Fossil fuels contribute to air pollution, which kills about 7 million people annually. The majority of victims are women and low-income countries. A future powered by wind energy has the potential to reduce energy costs. Production costs are falling and wind is expected to become a major source of energy in the future. Working together, the world can accelerate the transition to sustainable energy and a sustainable future.

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BIOGRAPHY

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