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**UTILIZATION OF RENEWABLE ENERGY SOURCES
IN SOUTH AFRICA**

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Abstract

The study attempts to investigate the challenges and opportunities connected to the implementation of renewable energy sources in South Africa. In doing so, it has three specific objectives: firstly, to assess the current state of renewable energy utilisation in the country; secondly, to identify the challenges that hinder the adoption of renewable energy sources; and thirdly, to explore the opportunities that exist for increasing the use of renewable energy in South Africa.

Renewable energy sources such as biomass, wind, and solar power have great promise in South Africa. Although coal is inexpensive, the country's heavy dependence on it creates serious environmental risks. As a result of the tremendous strain being placed on the nation's coal-fired power facilities, it is crucial that alternative energy sources be investigated and developed.

The interest in renewable energy is clearly on the rise in South Africa, as seen by the search data. This is because there is not enough electricity to go around because the country is dependent on fossil fuels. Therefore, a transition plan is essential for making the switch to renewable power. Load shedding, where electricity is sometimes cut off, is a major hindrance to people's and businesses' ability to function normally.

The use of renewable energy is on the rise in South Africa. The country has made great strides in the use of these resources in recent years. According to the survey, several renewable energy sources, solar and wind were the most well-known. In reality, the most up-to-date information from South Africa's Energy Department demonstrates that all provinces make extensive use of solar PV, wind, and concentrated solar power (CSP). The biggest percentage of renewable energy in operation in South Africa is found in the Northern Cape province after the Western Cape Province comes the Eastern Cape Province.

Currently, solar photovoltaic (PV) and wind power account for the vast majority of South Africa's renewable energy capacity of 10,445 MW. By 2030, the government aims to have 40% of the country's energy come from renewables. To a large extent, renewable energy projects in South Africa owe their success and expansion to the Renewable Energy Independent Power Producer Procurement Programme (REIPPPP). So far, approximately 100 renewable energy

projects with a combined installed capacity of over 6,000 MW have been purchased under this programme. (Akinbami, O. M, 2021).

The results of the study show that there are several barriers to the broad implementation of renewable energy sources in South Africa. It can be challenging to integrate renewable energy sources in some locations or among some people due to the high initial expenses involved, despite the fact that they can be cost-effective during their lifespan.

The intermittent and fluctuating nature of renewable energy sources presents a hurdle. Their power production might fluctuate according to weather conditions or other variables, making it difficult to rely on them as a steady source of electricity. Batteries and pumped hydro storage are two examples of energy storage technologies that might be used to solve this problem. However, these storage methods can be costly and time-consuming to implement.

Corruption has hampered anti-corruption measures and contributed to a severe lack of openness in the energy industry, both of which have had negative effects on the country's clean energy agenda (Ting, M. B 2020). As a result, Eskom, the state-owned energy supplier that provides about 90% of the country's electricity, has been completely mismanaged. An energy crisis has emerged as a direct result of poor management's failure to adequately fund the construction of new power plants and related infrastructure.

The constraints of integrating renewable energy into South Africa's power infrastructure are a major barrier to its widespread adoption. Incorporating intermittent renewable energy sources is difficult since the system was designed to support centralised coal and fossil fuel-based power generation. This raises concerns about the reliability of the grid and the difficulty of keeping the infrastructure up to date.

Nonetheless, the South African government has demonstrated a firm dedication to renewable energy through its investment strategy and existing projects, which will centre on wind, solar PV, and CSP technologies, among others.

Northern and western South Africa receive very high levels of solar radiation, making this country an excellent site for solar power plants. According to the results of the survey, solar power is the most popular renewable energy source, hence the government should put more money into solar energy projects. Batteries and pumped hydro storage are two examples of energy storage technology that can help smooth out the fluctuations in output from renewables.

An existing coal plant, for instance, will be converted into an energy storage facility as part of the Eskom Just Energy Transition Project.

There are a number of initiatives in the works that will position South Africa to become a world leader in green hydrogen generation. A 50 MW hydrogen electrolysis plant is being built in the Northern Cape as part of the Ubuntu Green Energy Hydrogen Project. With the help of renewable energy sources including solar and wind, the Boegoebaai Green Hydrogen Development Programme hopes to create 28,000 tonnes of green hydrogen annually.

South Africa has established goals to increase the country's usage of renewable energy sources. The REIPPPP (Renewable Energy Independent Power Producer Procurement Programme) has been crucial in fostering the expansion and improvement of renewable energy initiatives around the country. The \$8.5 billion investment plan agreed to speed up the transition from coal to renewable energy reflects the government's dedication to a sustainable energy future. (Akinbami, O. M, 2021).