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Algeria's Strategy to shift towards a Green Economy:

The Energy Transition as a Strategic Option.

BENAZZA HANAA

hanaa.benazza@univ-tlemcen.dz

University of Tlemcen, MECAS Research Lab, (Algeria)

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Abstract:

Algeria is one of the largest energy-producing and exporting countries in the world, and considering Algeria one of the three largest fields in the world in the field of solar energy, renewable energies as a clean energy can play an important role in adopting the principles of the green economy in Algeria. In this context, the Algerian government has adopted several programs and strategies to achieve the energy transition from hydrocarbons towards these clean energies which became an imperative and inevitable necessity in order to achieve the energy security.

By the adoption of the national renewable energy development program 2011-2030, it is expected that about 40% of electricity produced for domestic consumption will be from renewable energy sources by 2030. This strategic choice is motivated by the availability of a huge solar potential. To reach its renewable energy targets, the ministry of energy transition and renewable energy has launched in the second half of 2021, a call for investors for its megaproject of 1000 MW of solar photovoltaic power plants, the projects is divided into lots of 50 to 200 MW each.

Keywords: Renewable Energy; Energy transition; Green Economy; Algeria

1. INTRODUCTION

In light of the environmental deterioration on the one hand, and in light of the energy crisis on the other hand, it became necessary to move towards an environmentally friendly economy that works to reduce the opposite effects of climate change, global warming and pollution, and waste management, which was called as " **the green economy** ", which is considered a tool to mobilize countries towards sustainable development.

In this context, many countries have developed national plans to advance the green economy, and Algeria, like these countries, also approved many reform initiatives aimed at diversifying the national economy and strengthening energy security, taking into account environmental considerations. In the context of these endeavors, and considering Algeria one of the three largest fields in the world in the field of solar energy, renewable energies as a clean energy can play an important role in adopting the principles of the green economy in Algeria and achieving the goals of sustainable development, especially in the field of green energy, Creating green functions, green buildings, green investment, etc., which guarantee a better life for all.

So, what is the energy strategy adopted by the Algerian government to shift into the green economy? And is the energy transition towards renewable energies the most effective solution to this shift in light of the endeavors of sustainable development?

This is what the current research paper is trying to answer by dividing it into three axes:

- ✎ Green economy: definition and principles.
- ✎ The potential of renewable energies in Algeria.
- ✎ Algeria's strategy to shift towards the green energy under the umbrella of the green economy.

2. Green economy: definition and principles:

2.1. Green economy definition:

Society faces a major transition ahead to curb climate change and reverse environmental degradation. Green economics looks at how economies based on fossil fuels can make this transition. **The United Nations Environment Program** describes the green economy like this (Young, 2022):

"A green economy is defined as low carbon, resource efficient and socially inclusive. In a green economy, growth in employment and income are driven by public and private investment into such economic activities, infrastructure and assets that allow reduced carbon emissions and pollution, enhanced energy and resource efficiency, and prevention of the loss of biodiversity and ecosystem services."

As defined by **the European Environment Agency**, a green economy can be understood as one in which "environmental, economic and social policies and innovations enable society to use resources efficiently –enhancing human well-being in an inclusive manner, while maintaining the natural systems that sustain us".

Fig.1.Inclusive green economy

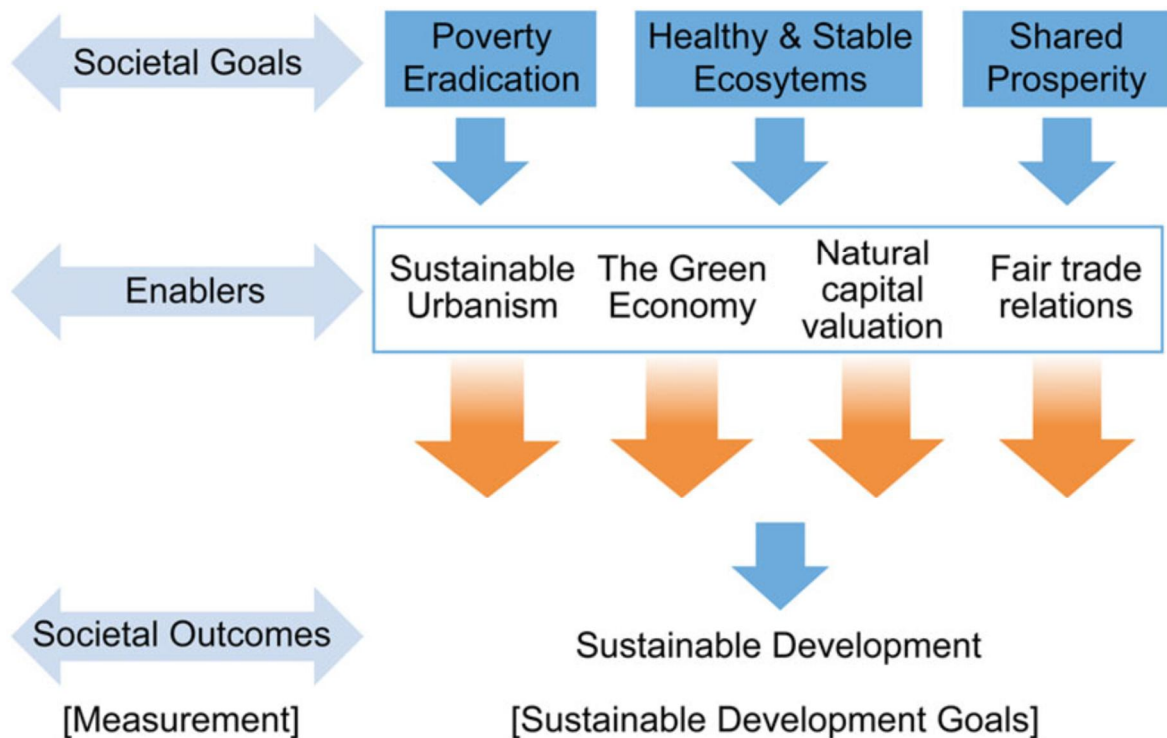


Source: (switchtogreen)

In short, we can be said that:

- ✓ The green economy is the economy that aims to achieve sustainable growth and sustainable development without prejudice to the ecosystem, which means that, is the environmentally friendly economy.
- ✓ the Concept that aims in practice to ensure an increase in prosperity and an increase in the quality of life and social equality, while halting the depletion of natural resources and reducing environmental risks, as a tool to realize sustainable development.

Visualizing the green economy between societal goals and outcomes can be summarized in figure. (2) (Georgeson, Maslin, & Poessinouw, 2017)

Fig.2.The green economy between societal goals and outcomes

Source: (Georgeson, Maslin, & Poessinouw, 2017, p. 9)

2.2. Green economy principles:

Inclusive green economy is a balanced and realistic pathway to sustainable development. As an economic model, it differs from traditional ones in that it takes due consideration of environmental and social externalities, and does not focus on GDP growth as ultimate economic goal. It rather focuses on resource efficiency and on ecosystems, as a building block of the economy, taking into account that environment degradation undermines long term economic growth and human development.

The green economy can be seen as a set of principles, goals, and actions that include an adherence to the principles of sustainable development, a rational use of natural and social capital, the creation of green jobs, and the eradication of poverty. The practical application of the above principles and actions is revealed in green growth (Jeziarska-Thöle, Gwiazdznska-Goraj, & Dudzinska, 2022, p. 5)

An Inclusive Green Economy (IGE) is a thriving economy that delivers the linked economic, social and environmental outcomes sought by the SDGs. It follows five key principles (Green Economy coalition , 2020):

- A. **Well-being:** A green economy enables all people to create and enjoy prosperity. A green economy must create genuine, sustained, shared wellbeing, going beyond mere monetary wealth to prioritize human development, health, happiness, education, and community.
- B. **Justice:** The green economy promotes **equity within and between generations**. A green economy emphasizes equity, equality, community cohesion, and supporting human rights – especially the rights of minorities and the marginalized. It seeks a just transition and serves the interests of all citizens, including those yet to be born.
- C. **Planetary boundaries:** The green economy safeguards, restores and invests in nature. A green economy recognizes that all human flourishing depends upon a healthy natural world. It defends the intrinsic worth of nature, and protects biodiversity, soil, water, air and other ecosystem capitals.
- D. **Efficiency & sufficiency:** The green economy is geared to **support sustainable consumption and production**. A green economy is low-carbon, diverse and circular. It recognizes that planetary boundaries place practical limits to economic growth, and aligns economic incentives with true costs to society.
- E. **Good governance:** The green economy is guided by integrated, accountable and resilient institutions. A green economy builds institutions that combine dynamic democratic accountability with a sound basis in natural and social science and local knowledge. Civil life prioritizes public participation, informed consent, transparency, and accountability.

3. The potentials of Renewable Energies in Algeria:

When we talk about renewable energies we mean the energy that will not run out, in other words the energies that are naturally replenished. Algeria's renewable energy potential is enormous, mostly focused on solar.

3.1. Solar energy in Algeria:

Algeria has one of the highest solar deposits in the world with an average duration of sunshine of nearly 2000 hours per year, which can reach 3900 hours in the highlands and the Sahara.

The energy received daily on a horizontal surface of 1m² is around 5 KWh over most of the national territory, i.e. nearly 1700KWh/m²/year in the North and 2263 kwh/m²/year in the South of the country.

Algeria's solar potential is equivalent to a volume of 37,000 billion cubic meters of natural gas, i.e. more than 8 times the country's natural gas reserves, with the

difference that solar potential is renewable, unlike natural gas¹⁰. (tiziri, 2020) Table (1) gives the solar potential in Algeria.

Table.1. Solar potential in Algeria

Regions	Coastal region	Highlands	Sahara
Area (%)	04	10	86
Average sunshine duration (Hours/year)	2650	3000	3500
Average energy received (Kwh/m ² /year)	1700	1900	2650

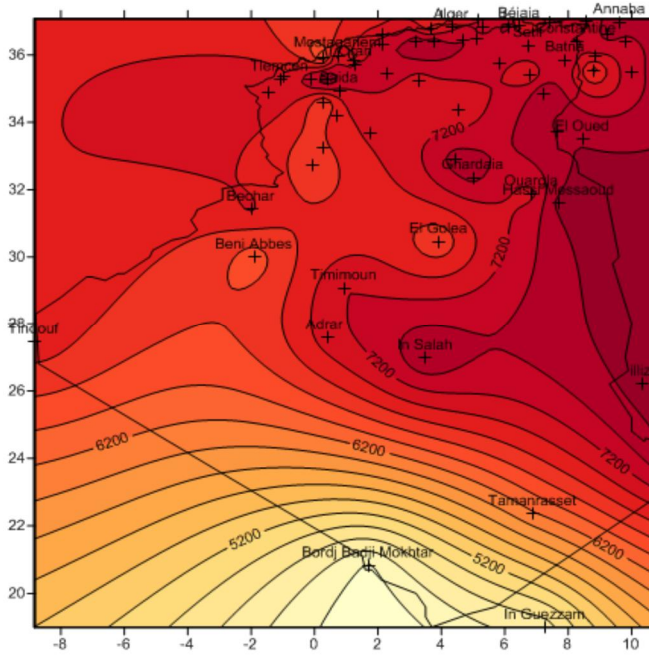
Source: (tiziri, 2020, p. 303)

Looking at Algeria's geographical location, we find that it is full of great potential in the field of solar energy, as Algeria is one of the most important countries of the Maghreb in terms of radiation duration, where the bright sunshine in the national soil is estimated at 169,440 TWh/year, and the average Solar radiation ranges from 5 to 7 kilowatt hours per square meter/day. A study conducted by the German Space Agency also showed that the Algerian Sahara is the largest solar energy reservoir in the world in terms of duration of exposure to the sun, in most of the homeland, which exceeds 2000 hours annually, which may also reach 3900 hours in the high plateaus and deserts, which is enough to cover 5000 times of the current needs of the homeland from this energy and exploit it for multiple uses. (Abdou Ali Eltahar, 2018, pp. 142-143)

The climatic conditions in Algeria are favorable for the development of solar energy due to the abundant sunshine throughout the year, especially in the Sahara region-see figure (3).

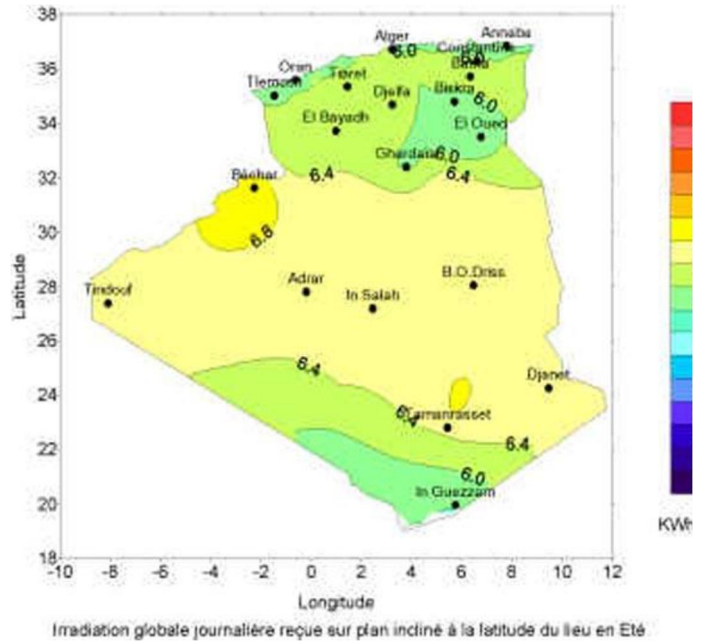
Fig.3.Algeria'sdaily global solar irradiance received

Daily global solar irradiance received on Normal plane in July



Source: (Abdeladim, et al., september 2014, p. 4120)

Daily Global Solar Irradiance received on Inclined Plane in Summer



Source: (Hadji, 2016, p. 19)

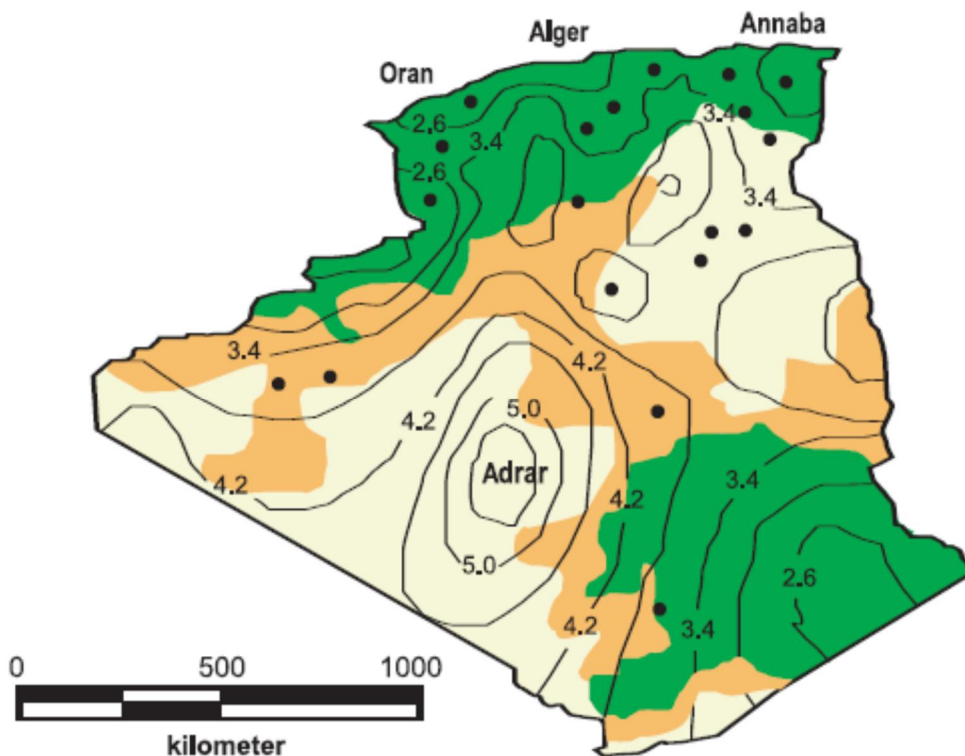
3.2. Wind energy:

Algeria has significant potentials of wind energy, as winds blow on Algeria that carry with them a lot of moist marine and continental desert air with an average speed of more than 7 m/s, especially in coastal areas, which provides the possibility of generating an annual energy estimated at 673 million watt-hours in the case of installing a wind turbine At a height of 30 meters in the case of winds with a speed of 5.1 m/s, which is an energy that allows to supply 1008 homes with energy. (Abdou Ali Eltahar, 2018, p. 145)

The South Algeria is marked by higher wind velocities than the North; this is particularly true in the South-West where velocities are more than 4m/s and exceed 6m/s in the Adrar region. In the North Algeria, it appears that the average velocity is not very high. However, we notice microclimates in the coastal areas of Oran, Béjaïa and Annaba, on the highlands of Tiaret and Kheiter, as well as in the region bounded

by Béjaïa in the North and Biskra in the South (Abdeladim, et al., september 2014), as show in figure 4.

Fig.4.Wind chart of Algeria



Source: (Abdeladim, et al., september 2014, p. 4120)

3.3.Biomass energy in Algeria:

Algeria has good biomass energy potential in the form of solid wastes, date palm biomass, crop wastes and forestry residues. Solid waste is the best source of biomass potential in the country. According to the National Cadastre for Generation of Solid Waste in Algeria, annual generation of municipal wastes is more than 10 million tons. Solid wastes are usually disposed in open dumps or burnt wantonly. In recent time, **they are starting to use recycled jute-bags** to minimize the impact of solid wastes (Zafar, 2020).

That what "Nakheel" company (an Algerian biotech company) have thought , when it took decision to research and invest in bio-ethanol production using dates from the abundantly growing palm trees in North Africa and the Near East as a raw material (Khenfri, Grinat, & Bournissa, 2018, p. 8).

Limestone in the north of Algeria is also considered an important reserve for the geothermal heat, and there are more than 200 hot mineral water sources, especially in northeastern and northwestern Algeria.

4. Algeria's strategy to shift towards the green energy under the umbrella of the green economy:

When we talk about the energy transition, we mean the transition from a specific pattern of energy production and consumption to another pattern that is more efficient and effective than the first in the framework of achieving certain goals. Or, in short, the transition from a pattern that relies on depleted traditional energies to a more effective and efficient energy pattern that relies on renewable and clean energies.

The energy transition to this renewable energy-green energy- responds to various objectives, considering the economic dimension, energy efficiency, and ecological responsibility.

Amid profound shifts in global energy and its first new government in nearly twenty years, Algeria announced the transition of its energy model away from hydrocarbons to renewable energy. This is significant given that Algeria generates almost all its power from hydrocarbon resources. But years of low oil prices and an absence of significant oil discoveries have left the government with a stark choice to either push a bold renewable energy agenda or consume its oil and gas export revenues. Since Algeria's state-driven economy is 60 percent funded by oil and gas export revenues, it is no surprise that it chose the former and unveiled a comprehensive energy transition plan as part of its 2020 Five Year Development Plan. Algeria's energy transition plan consists of three structural components (International Trade Administration, 2021):

- ✓ a new government ministry;
- ✓ a regulatory reform;
- ✓ And a new national renewable energy company.

● **Ministry of Energy Transition and Renewable Energies:** In June 2020, the government created this ministry, the first of two new bodies to manage and carry out the transition plan. The government hopes to end managerial problems of competing prerogatives witnessed in earlier renewable energy initiatives by creating this new ministry. The government will also provide the new ministry with the resources that energy transition planners need to better manifest initiatives.

● **Regulatory Reform:** On January 25th, 2021, the Ministry of Energy declared that the 2002 law on electricity would soon be reformed to open the market to small and medium-sized enterprises working in renewable energies, reduce natural gas consumption, and accelerate renewable energy production. Furthermore, the ministry

indicated that any price changes would only apply to electricity operators and large consumers versus consumers at large.

- **National Renewable Energy Company:** On April 19th, 2021, the government created a stand-alone renewable energy company, SHAEMS, under the authority of Ministry of Energy Transition and Renewable Energies. It will serve as a one-stop-shop for all prospective investors, EPC contractors, service providers, and other renewable energy ecosystem players. It will also issue renewable energy tenders, award contracts, and negotiate power purchase agreements.

The plan includes three substantive pillars: a National Energy Conservation and Efficiency Program, a National Renewable Energy Development Program, and a new National Energy Mix Model (International Trade Administration, 2021).

A. The National Energy Conservation and Efficiency Program:

Energy conservation and efficiency efforts will improve energy efficiency by ten percent annually in transportation, housing, and industry.

B. The National renewable energy development Program 2011–2030:

Algeria has launched in 2011 an ambitious transition to alternative and clean energy with the adoption of the program for the development of renewable energy which is spread over the next two decades.

This national program was developed in order to promote concrete actions in the fields of energy efficiency and renewable energy. In fact, it is expected that about 40% of electricity produced for domestic consumption will be from renewable energy sources by 2030. This strategic choice is motivated by the availability of a huge solar potential.

The US\$ 120 billion program, consists of installing up to 22,000 MW of power generating capacity from renewable sources between 2011 and 2030, of which 12,000 MW will be intended to meet the domestic electricity demand and 10,000 MW destined for export (Abdeladim, et al., September 2014).

C. New National Energy Mix Model:

According to the statements of the Minister of Energy Transition "Benatou Zayan", the Algerian government's plan and strategy for the year 2030 includes devoting a new model that is heading towards a balanced energy mix according to a new energy transition law that the ministry is currently preparing and issuing. He added that the desired priority is ensuring the energy security of the country by meeting the national demand in the long term, as he explained, through cooperation in various disciplines, with an orientation according to a well-thought-out

program for the production of green hydrogen and solar energy (Imededdine Cherif, 2022).

This plan aims to achieve green growth by resorting to innovative and digital energy technology, which paves the way for sustainable models that value the social bond and sustainable jobs.

This plan is based on five main axes:

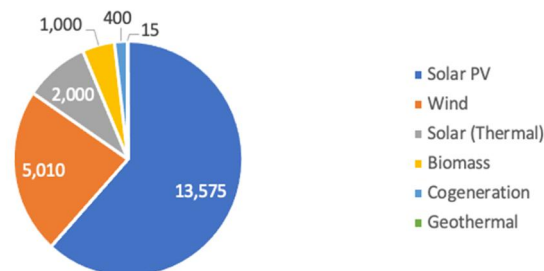
1. An extensive national plan for renewable energies
2. A multisector program based on saving energy consumption and energy efficiency.
3. An ambitious national plan related to the production of green hydrogen,
4. Developing a new energy transition law that establishes a new model heading towards a balanced energy mix in the 2030 horizons
5. Take measures to support the energy transition, in particular through training, research and development, normative work, communication and cooperation.

The country's energy mix model aims to reach at least 30 % power generation from renewable by 2030 and generate 25 gigawatts of power from green and blue hydrogen by 2050.

So, Algeria's renewable energy targets are ambitious relative to their timeframe. With approximately 450 MW of installed solar capacity today, Algeria would need to deploy an additional 5,000 MW to meet the solar capacity target outlined in the regulator's 2028 generation capacity scenario. To meet the official 2030 targets, 22,000 MW total of renewable capacity would need to be deployed. (Hochberg, 2020)

Fig.5.2030 Algeria renewable energy targets

2030 targetted renewable energy mix (MW)



Source: Algerian Ministry of Energy

To reach its renewable energy targets, the ministry of energy transition and renewable energy has launched in the second half of 2021, a call for investors for its megaproject of 1000 MW of solar photovoltaic power plants, the projects is divided into lots of 50 to 200 MW each. The goal is to develop renewable energy resources, the most abundant of which is solar energy.

5. CONCLUSION:

The energy transition in Algeria has become an imperative and inevitable necessity in light of the various different crises that the world is witnessing in general, whether economic or those related to the environment. In this context, the Algerian government has adopted several strategies to achieve this shift towards renewable energies as a strategic option to achieve the principles of green economy and energy security.

The strategy of energy transition towards renewable energies is at the heart of Algeria's energy and economic policies: It is expected that about 40% of electricity produced for domestic consumption will be from renewable energy sources by 2030. Algeria is indeed aiming to be a major factor in the production of electricity from solar photovoltaic and solar power, which will be drivers of sustainable economic development to promote a new model of growth. The national potential for renewable energy is strongly dominated by solar energy. Algeria considers this source of energy as an opportunity and a lever for economic and social development, particularly through the establishment of wealth and job-creating industries. And to reach its renewable energy targets, the ministry of energy transition and renewable energy has launched in the second half of 2021, a call for investors for its megaproject of 1000 MW of solar photovoltaic power plants, the projects is divided into lots of 50 to 200 MW each. The goal is to develop renewable energy resources, the most abundant of which is solar.

Although, the potential for wind, biomass, geothermal and hydropower energies is comparatively very small compared to solar energy ,this does not, however, preclude the launch of several wind farm development projects and the implementation of experimental projects in biomass and geothermal energy.

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