

Renewable Energies in Algeria: A Study of Potinal and Opportunities □

الطاقات المتجددة في الجزائر: دراسة للإمكانيات والفرص

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Recieved: 10/10/2019

Accepted: 06/02/2020

Abstract:

Renewable energies are increasingly being recognized as one of the most important sources of clean energy to which the world pays special attention. Algeria is one of the countries with a wide range of renewable energies, many of which remain unexploited. There is a great gap between the possibilities available and the actual resources exploited

Considering that renewable energies are among the new approaches to reach development, we are trying to shed light on the most important projects adopted by Algeria in this context, which can drive the pace of sustainable development. The research concluded that Algeria had large untapped renewable energies.

Keywords: Renewable energies; Algeria; solar energy; wind energy ;Potinal .

ملخص:

يتزايد الاهتمام بموضوع الطاقات المتجددة، باعتبارها تمثل أحد أهم مصادر الطاقة النظيفة التي يولي لها العالم اهتماما خاصا. والجزائر من بين البلدان التي تزخر بإمكانيات متنوعة من الطاقات المتجددة والتي بقيت في كثير منها غير مستغلة، إذ توجد هوة كبيرة بين الإمكانيات المتوفرة وبين الفرص المتاحة.

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وباعتبار أن الطاقات المتجددة تعد من بين المداخل الجديدة لتحقيق التنمية نحاول من خلال هذه الدراسة تسليط الضوء على أهم المشاريع التي تبنتها الجزائر في هذا الإطار والتي يمكن أن تدفع بعجلة التنمية المستدامة فيها وذلك من خلال استعمال المنهج التاريخي والإحصائي من أجل الالمام بالموضوع. وقد خلص البحث إلى أن الجزائر تحتوي على طاقات متجددة كبيرة غير مستغلة.

الكلمات المفتاحية: الطاقات المتجددة – الجزائر – الطاقة الشمسية – طاقة

الرياح – الامكانيات.

Introduction

Algeria is one of the countries with many natural resources that have contributed and still financing the national economy, primarily oil and gas. But, the observer of the Algerian economy clearly notes the focus of Algeria on petroleum energy and its derivatives and neglecting the other energies at the same time. However, many regions of Algeria are well placed to exploit these renewable energy resources.

Algeria's exploitation of petroleum energy was not organized. In the form that led to the depletion of many wells, which wasted the rights of next generations in petroleum energy. In addition, petroleum energy is considered a polluting energy for nature, and Algeria, like the rest of the world, seeks to control more sources of clean renewable energies, in order to meet the shortage of future demand for petroleum energy and reduce the emissions of polluted air in the context of achieving sustainable environmental development.

In this article, we try to answer the following problem: **To what extent have laws and legislation contributed to activate the role of renewable energies in the Algerian national economy?**

Accordingly, we based our study on the following hypotheses:

1. Algeria has a great renewable energy potential, which will revive the Algerian economy, and this depending on the political will.

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2. Despite of the fact that Algeria has various potential of renewable energies, the technical and financial factors remain the main reason for not activating working with them.

Therefore, the research aims to know Algeria's potential of renewable energies, and the laws that organize using them and the actual reality of renewable energy projects.

The previous studies show up the research's relationship with other researches, and our research is not out of this framework since our study was based on an explanatory article entitled "Renewable Energies as an Approach to Sustainable Development" and it attempted to enumerate the potential of renewable energy in Algeria, noting its importance in achieving sustainable development.

Definition of energy:

Energy is defined as: ability, which is what man can do hard (from the word TAKA in Arabic) and It means that it is an activity or an ability to cause physical or mental action ,for example, he said that he gave the case all his intellectual energies , i.e., he has saved energy. So energy can be the ability to do something, it can create a work, and a work can happen with energy.(ابادي، 2005، صفحة 906).

For its meaning, it provided several definitions of energy, including the definition of **Shamsuddin Shittor**, who defined energy as: "... it drives the machines we use in our daily lives, in order to do hard work in our place which provides the necessary comfort, heating, lighting and cooling ..." (chittor, 2000, p. 32)

As **David Rose** defines it as: "a mere concept invented by physicists in the 19th century to quantify a wide range of natural phenomena" (marlote.2012.p55), **Virgil Moring Faires** and **Clifford Max Simmang** come up with an enlarged concept of energy and they considered it: "Energy is inherent in all matter. Energy is something that appears in many different forms which are related to each other by the fact that conversion can be made from one form of energy to another. Although no simple definition can be given to the general term energy, E, except that it is the capacity to produce an effect." (watson, 2017)



Among the comprehensive definitions of the concept of energy is the definition given by **Hisham Hariz**: “Energy is the main means by which people achieve a better world, greater comfort, happiness and optimal well-being, it is also the key to the growth of human civilization throughout the ages. (حرّيز،

And we can recognize the well-being and progress of man by being able to make the best use of his energy resources and give the best results. ” As we have seen in the previous definitions, the concept of energy has undergone many changes in human perception, they were initially perceived as being primarily linked to the human spirit and body, then man noticed the presence of some rigid substances that have the ability to produce energy without life, and concludes that energy can only be learned through its transformation from one form to another. It is also recognized that energy is a means of long-term development of people.

Energy Resources:

Scientists differentiate between sources of energy in terms of sustainability and depletion into two types of sources: renewable, and non-renewable.

a-Non-renewable sources of energy:

Fossil fuels are a source of energy of hydrocarbon origin: natural coal, oil, and natural gas. Fossil fuels store chemical energy to be used when burned. Fossil fuels are the main energy source, contributing 78.3% of the world's energy. (حرّيز، صفحة

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-Coal: Coal is one of the most abundant fossil fuels on earth and it's derived from wood. Its biomass is carbon and therefore produces heat energy when burned. Coal is a very unclean fuel compared to oil or natural gas(رافت، 1986، صفحة 24) Coal is mainly the result of plant and animal organisms under the soil and covered by sedimentary layers of sand and clay and completely isolated from oxygen, these organisms began to decompose in isolation from oxygen. This decomposition resulted in many types of carbon dumpsites.(الفلكاوي، 2015)

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- **Petroleum:** A general term for rock oil. It is commonly used to refer to crude oil. It is a fossil condensate, consisting of a mixture of crude oil hydrocarbons, black gold, and Oil, as a literary term, is a dense, flammable, greenish black liquid found in the upper layer of the earth's crust. It differs in appearance, structure and purity depending on where it is extracted. (الفلكاوي ا.، 2007، صفحة 25) It is an important primary energy source according to world energy statistics. Oil is the raw material for many chemical products, including fertilizers, insecticides, plastics and many plastic tools, foils, pipes, fabrics, nylon, artificial silk, synthetic leather and medicines. The American Petroleum Institute 'API' has divided it into: Light oil which is less than 870 kg m^3 . The average oil, which is less than 920 kg m^3 . And heavy oil from 920 to 1000 kg m^3 . Above heavy oil is more than 1000 kg m^3 . (رافت، 1986، صفحة 24)

Oil is one of the most used energies due to the increasing demand for synthetic fibers of plastics, plastics, paints and petrochemical industry. It is also an easy source of energy in terms of transport and storage.

- **Natural gas:** Natural gas is found in nature either solo in its own fields, or in oilfield areas, which is called associated gas. In the past, it was customary to dispose of natural gas coming out of the field in conjunction with oil or dissolved in it, by burning it after separation with special devices in the field

Because there are no pipes to transport it to cities where it can be used. But as oil prices soared, large pipelines were stretched over long distances to transport it to cities and industrial areas as a fuel. It is odorless and easily burns and is sulfur-free, which makes it non-polluting to the atmosphere. It can also be transported after liquefaction under low temperatures in special machines, in this case the cost is higher. Natural gas consists mostly of methane by more than 80%, followed by ethane, propane and butane.

Although natural gas is one of the most important sources of energy today (cleanest and most efficient, occupies the third place in terms of global consumption by 24%), it suffers from a lack of investment and technological research

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underdevelopment compared to oil due to the time difference in their discovery, interest in oil began in 1870, while natural gas (حريز، 1930). Its first industrial use began in the United States in 1930.

(صفحة 75)

-Nuclear Energy: The first appearance of nuclear power was on December 2, 1942, when the first nuclear reactor was operated under the stadiums of Chicago, USA, by physicists, headed by **Bohr, Bennheimer** and **Fermi**. This reactor was like a PILE heap, so it was called this. On that day, scientists saw this pile producing energy from the fission of the uranium atom. That day was the beginning of the era of fissionable nuclear energy and the success of one of the greatest discoveries known to man (حريز، صفحة 76). This energy has been used since the establishment of the first nuclear reactor in the United States.

This reactor is called 1-EBR and operates at 300 kW , and a group of States adopted this approach, first and foremost the former Soviet Union and used this energy for two purposes, first of all, military (armament), and secondly for peaceful purposes, the main ones are electric power generation, health and agricultural purposes. It contributes to reducing global warming caused by the burning of fossil sources. It reduces the cost of generating electricity so that it is less than coal and others. The common denominator is depletion, and nuclear energy is depleted where it is found in small quantities in nature. (رحايلية،

2015، صفحة 293)

B- Renewable Energy Sources:

Renewable energy is the energy derived from the natural resources of the environment and does not run out, and produces renewable energy from wind, sun and water, in addition to that energy resulting from tides, or geothermal one,. And The International Energy Agency (IEA) has defined it as: "Energy produced from natural sources that are constantly renewed directly or indirectly, such as the sun, wind, biomass, geothermal, hydropower, biofuels and hydrogen energy derived from renewable sources."



As defined also by the International Renewable Energy Agency: "All types of energy produced from renewable sources in a sustainable manner, including biomass, geothermal, hydropower, marine energy, solar energy and wind energy." Renewable energy is environmentally friendly, unlike conventional energy and the most important sources are:

-Solar energy: The sun is a star or an inflamed ball, the distance between it and the Earth about 49.61 million kilometers, and it radiates every second a total heat current of about $1033 \times 4 \text{ kW}$. A small part of it reaches the ground with a value of $105 \times 2.16 \text{ kW}$. The sun shines every day on the globe to blow a huge amount of energy, up to $1.73 \times 1710 \text{ watts}$. The sun is a huge ball of hot gases consisting of hydrogen, which is the main component of 70% and helium by 25%, carbon, nitrogen and oxygen 1.5% (حلام، 2014، صفحة 293).

The radiant energy sent to the earth by the sun is the most widespread source of energy and its importance lies in its limitlessness and freeness. Besides its access to remote areas that are not accessible to other sources In addition, it does not contribute in any way to the problems of environmental pollution (حريرز، صفحة 108). It is also considered as renewable energy that is inexhaustible and free of charge. They are not controlled by international or domestic political systems that limit their use, nor do they require sophisticated means of transport or technologies for their transformation. They are clean energies that do not pose a threat to workers.

Solar energy can also be converted to other forms, for example:

-Converts solar energy to thermal energy and is one of the simplest processes of converting solar energy.

-Convert solar energy into electrical energy by photovoltaic cells.

- Chemical conversion of solar energy, this conversion is carried out in the broadest form in the process of photosynthesis of all plants where they are used in the production of fuel and generate electricity and some gases.



-Hydropower: It is an ancient source of energy. Humans used water-powered wheels for irrigation and mills, but their importance was limited to the period of water flow in rivers. After the invention of steam machines and the discovery of coal, its importance was reduced, to be restored after scientific and technological development and the discovery of generators. In 1976, hydropower provided about 23% of the world's electricity production, and in 1985, world production reached approximately 3,200 TWh, or 18.4% of total electricity production (حريرز، صفحة 108).

Thus, hydropower is one of the most important energies. They are pure and environmentally friendly and are also easy and very inexpensive.

- Wind energy: Wind energy is a manifestation of solar energy, the sun raises the temperature of the layers of space, which is not the same temperature in all places and in different layers of elevation, but controls the angle at which the sun rays fall on this layer (حلام، 2014، صفحة 128). Experts estimate that 2% of the solar energy falling on the Earth's surface, which is converted to wind energy. So the latter is considered an indirect image of solar energy. The reason for the movement of wind is due to two main phenomena:

- First: is the movement of cosmic winds resulting from the variation of atmospheric pressure and the rotation of the Earth. The different in pressure causes the air to move from one area of high pressure to another with low pressure, and pressure arises from the thermal effects of the sun.

- Second: The exploitation of wind energy is fully linked to its speed, which should not be less than an average of a certain limit, which is 8 miles per hour and not more than a certain limit determined by the type of device used in the process of conversion. Wind power is enormous from which millions of kilowatts can be obtained, which is almost twice as much as today's oil and fossil fuel (رافت، 1986، صفحة 99). The International Organization for Standardization estimates wind power globally at about 2000 GW, which is twice the capacity of hydropower and until previous years, only 10 GW had been

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exploited of which 6.3 are in Europe and the use of wind energy has recently increased in some areas after the high oil price.

-Geothermal energy (geothermal heat): its existence dates back to the existence of the earth, and its name is derived in Latin from the first two words GEO means earth and THERMAL means heat. The earth's interior contains a tremendous amount of thermal energy from the reaction and decomposition of elements such as uranium and potassium as well as the melting of rocks (حلام، صفحة 131، 132) Which has been operating underground for millions of years and generated enormous thermal energy stored under the surface of the earth's crust with an estimated thickness of about 45 km, which made the earth a crucible containing molten metals extending to a depth of 3000 km and The temperature of this area reaches 3000 degrees Celsius . Earth's inner core is made of molten iron, with temperatures ranging from 4,500 to 5,000 degrees Celsius and another 3,000 kilometers deep into the center of the earth. This energy is used in several areas such as the production of electric power and heating, in addition to its use in fumigation, sugar refining and drying food products.

-Biomass energy: The term biomass refers to substances of plant origin such as trees and agricultural residues and animal origin such as manure, as well as solid, industrial and human waste. This can be released through direct burning, fermentation or blow-out. 85% of bioenergy is available in developing countries in the form of firewood, 13% in animal manure and 2% in agricultural residues. Biomass is transformed by physico-chemical thermal methods into energy or energy carriers, and the most common methods are the mechanical preparation of the living mass, such as giving residues of wood and straw in the form of molds or small balls or extracting vegetable oils. (حرير،

صفحة 112)

The yield on electricity generation is about 20%, and when heat is generated to 70%, biomass can be converted to gas at 70% or 80% by using air to produce generator gas.



Renewable Energy in Algeria:

Fossil energy is the mainstay of Algeria's energy sector, as oil and gas are strategic suppliers that generate significant financial returns and are the main source of hard currency; it is also counting on this energy to drive growth in various fields, Development programs are linked to the development of the quantities of hydrocarbons produced and their high international prices. However, low oil prices have led Algeria to seek alternative energies, especially with the adoption of sustainable development, which had to preserve the rights of next generations, especially the right to a clean environment.

The Algerian legislator defined renewable energy as "forms of electric, kinetic, thermal or gaseous energy obtained from the conversion of solar radiation, wind power, geothermal and organic waste, hydropower and biomass utilization techniques." And he added: "It is the sum of the ways in which a significant energy economy can be used, using bioclimatic engineering techniques in the construction process." (الجريدة الرسمية)

الجزائرية، 2004، صفحة 10)

Algeria is among the countries with a huge wealth of renewable energy in addition to its oil and gas resources. The most important sources of renewable energy available are: solar energy primarily, wind and hydropower.

Solar energy in Algeria.

Due to its geographical location on the highest solar fields in the world, the following table shows the solar energy in Algeria:

Areas	Coastal Zone	High plateaus	Desert (Sahara)
Space %	4	10	86
Average solar power (hr / year)	2650	3000	3500
Available power on average (kW / m ³ / year)	1700	1900	2650

Table N° 1: Table showing solar energy in Algeria: Solar potential in Algeria (kWh per square meter per year) (%)

Source: Sonelgaz(2007), The Development of Renewable Energies in Algeria, Total Technical Papers Algeria, p 2.

The table shows the duration of sunshine throughout the national territory, estimated at about 2000 hours per year and can reach up to 3900 hours in the high plateaus and desert. The daily available power on a single square meter of up to 5 kWh on most parts of the national territory , that is about 1700 kWh per square meter per year in the north of the country and 2263 kWh per square meter per year in the south of the country. (Sonelgaz, 2007, p. 2)

Among the most important components of solar energy in Algeria are the following:

- The abundance of sunny desert land most days of the year, and the sun extends more than 2000 hours a year.
- Algeria's desert is one of the largest deserts in the world and it is characterized by extreme heat, especially in the summer where the temperature exceeds 60 degrees. The desert area in Algeria represents more than 80%, which helps it to make more use of solar energy.
- Many studies indicate that Algeria's solar energy even allows it to export this type of energy to other countries. This is due to the vastness of Algeria and its continued exposure to high amounts of light and electromagnetic radiation from the sun.
- There are commitments to many countries in the world, including Algeria in the International Climate Index, through which Algeria is committed to reducing the polluting emissions that cause global warming and climate change.
- Algeria has small and scattered rural communities. The rural population is estimated at 41% of the total population. For practical or economic reasons, it is sometimes impossible to connect these villages and rural areas to the main electricity grid. Therefore, the logical solution in this case is the exploitation of solar energy in these remote communities.
- There are many ways in which solar energy can be effectively exploited in Algeria and can be classified into three

main categories: thermal applications, electricity production and chemical processes.

- Clouds decrease in many desert areas more qualified for this type of energy exploitation.

- Algeria has a large area for the construction of solar panels and accessories, with an estimated area of 238,174 km² compared to 36 million solar from the 2010

statistics. It is the largest African country in terms of area and tenth globally and to get 1000 watts of electricity we need 7 to 10 square meters of these panels. (جاية، 2016، صفحة 63).

- Several feasibility studies in several countries, including Algeria, have shown that the capital invested in solar energy can be restored within three to five years, after which the executor of solar projects can obtain clean, low-cost energy.

Their importance to Algeria can be summarized in:

- The Algerian per capita electricity consumption increased by 24.7 kWh (hour / year), which makes solar energy a role in reducing the burden on increasing demand for electricity.

- Reducing carbon emissions in Algeria. (فروحات، 2012،
صفحة 123)

- Increasing the export capacity of oil. Instead of consuming oil in factories, it can be sold at the international price.

- Saving the huge material cost incurred by the Algerian budget due to the use of electric energy produced by oil, in addition to that it costs a great effort of excavations, which may affect some of the projects established such as streets and others. As well as the extension of wires over long distances, which increases the cost of this energy, it is estimated that the cost of generating electricity using solar energy in Algeria is approximately 0.12\$ / kWh. (وزارة الطاقة، 2010)

Although solar energy is taking an important place in the Algerian government's programs as one of the alternatives related to renewable energy, it is still far from being realized, and we will show that later.

Wind energy in Algeria.

Thanks to Algeria's vast area, it has several power-generating zones. According to CREDEG, the average wind speed is 2 to 6 m / s. The center has identified several realities that are suitable for the exploitation of wind energy, where the wind speed exceeds 4 kilometers per hour, like in: El Ouadi, Bejaia, Setif, Bordj Bou Arreridj and Tiaret , with the possibility of exploiting wind energy in the southern regions such as Tindouf, Timimoun and Basharr, which means that there are several areas in the national territory are eligible for the best use of wind energy. (Sonelgaz, 2007, p. 3), the following map shows wind energy locations in Algeria:

37 TWh/year:

- ✓ 1 TWh on the coast
- ✓ 4.5 TWh on the highland
- ✓ 31.5 TWh in Sahara

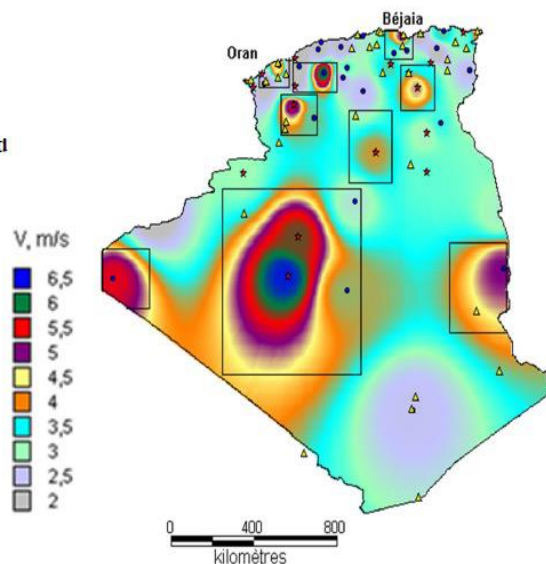


Table N° 1: Maps showing wind energy location in Algeria.

Source: CDER(2017), Renewable Energies in Algeria: present situation and projection, p14.

-Hydropower potential in Algeria.

Significant amounts of rain fall on the Algerian region, estimated at 65 billion cubic meters annually, but only a small percentage of them are exploited, estimated at 5%. Thanks to Algeria's vast area, estimated at 2.4 million km², its terrain and climate vary from north to south. This has affected the annual rainfall rates and the distribution of water resources, where

Algeria has about 20 billion cubic meters. Of these, 12 billion m³ are surface waters, 95% of which are concentrated in the north, while groundwater is estimated at 7 billion m³.

In recent years, rainfall has been declining due to global warming which led to the evaporation of rainwater. Renewable utility water is currently estimated at 25 billion m³, two thirds of which is surface water (103 dams completed and 50 dams in progress). (la ministere de ressources en eau, 2000)

Algeria, according to its large area, is characterized by a scarcity of surface water, which is mainly limited to a part of the northern slope of the Atlantic mountain range. The water potential of Algeria is estimated at less than 20 billion m³, of which only 3% is renewable. And non-renewable water resources include aquifers in the north of the Sahara, with an estimated 30 surface waterways in Algeria, mostly in the hill region and it flows into the Mediterranean and is characterized by an irregular level with an estimated capacity of 12.4 billion m³. (ذبيحي، 2000، صفحة 233)

Hydroelectric power generation is only 3%. The remaining percentage is generated from natural gas in particular, due to the weak exploitation of this energy because the number of power plants based on hydropower is insufficient in addition to the lack of good exploitation of existing plants.

-Biomass and geothermal energy in Algeria.

Biomass in Algeria is diverse and is mainly embodied in:

A - Living energy in Algeria: concentrated in cattle breeding farms and the conversion of date waste in the south, and the residues of the olive oil industry. It is based on dry-waste electrical power generation projects left over from food processing industries. The average amount of ground seeds or cores per year is estimated at 70,000 tons. So far, dry residues from the olive oil industry have been used as domestic fuel, making this energy social, economic and environmental. (Sonelgaz, 2007, p. 4)

B - Geothermal energy in Algeria: This energy is derived from the geothermal ground. Although Algeria is new to the exploitation of this energy, research programs have been able to

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map an initial "geometric" map that has detected more than 200 hot springs in the northern region of the country, (minester de l energie des mines, 2004)

Which can be used in agricultural heating and drying, animal husbandry, agri-food industry, The average temperature of these sources is 45 degrees Celsius, and there are sources with very high temperatures of more than 118 degrees Celsius in Ain Welman and Biskra, which helps generate electricity. Algeria also has a subterranean layer of hot water that sits on an area of several thousand square kilometers called the aquatic and alpine layer or "big boat". It is bordered to the north by Biskra, to the south by Ain Saleh, to the west by Adrar and to the east by the Tunisian border. The average temperature of this water is 57 degrees (ذبيحي، صفحة 30). The initial exploitation of this layer produced an annual power of 700 megawatts. As global awareness of environmental issues increases, everyone recognizes that it is necessary to conserve the planet and to take into account the environmental aspects of the use of conventional energy, natural gas, coal and petroleum, as the main cause of environmental pollution (وزارة الطاقة، 2010، صفحة

(6. And Classification of conventional energy is among the depleted resources from which it is impossible to form new balances or needs for long periods of time, possibly hundreds of thousands of years or more.

This led to the interest in providing an alternative element of energy which is renewable energy that Allah blessed the wealth in our country, especially the solar one. Not forgetting the significant amounts of wind energy and biomass in Algeria (ذبيحي، 2000، صفحة 237). It has been mentioned in several studies from inside and outside the country on the possibility of Algeria to compensate its revenues from traditional energy with renewable energy, and to become a source of electrical energy from those renewable sources if its investments from renewable energy resources are activated and exploited well.

The reality of the exploitation of renewable energies in Algeria:



Algeria has been adopting policies aimed at promoting the renewable energy sector and developing its use since 1982. Therefore, it monitored a set of organizational structures and projects, some of them have been accomplished and some have been still only studies that the Algerian government has been unable to activate. Among the most important organizational and institutional structures are:

a. **The Center for the Development of New and Renewable Energies (c.d.e.r):** It collects and evaluates information regarding solar, wind, geothermal and biomass, and funding research in the field of activating and exploiting renewable energies. (وزارة الطاقة، صفحة 7)

b. **Solar Equipment Development Unit: (u.d.e.s).** The unit's function relates to the development of solar equipment and the completion of experimental models of solar-powered thermal equipment for domestic, industrial and agricultural use, as well as equipment for electrical, thermal and mechanical systems that disturb the development of solar equipment. (فروحات، 2012، صفحة 128)

c. **Agency of Promotion and Rationalization of utilization of energy (A.p.r.u.e).** It works to activate and implement energy control policies by promoting the use of renewable energies and implementing various programs that have been approved within the framework of energy control within various sectors (industry, transport, agriculture). (ذبيحي، 2000، صفحة 130)

d. **New energy Algeri:** Established in 2002, it is a mixed company between the national company Sonatrach, the national company Sonelgaz, and the Sim Food Complex. The company's activities revolve around the promotion of renewable energies through activating the partnership between home and abroad, through the activation of a series of projects through which Algeria was able to provide 1000 families with electricity in twenty isolated villages in the south with solar energy. In 2012, it supplied electricity to nearly 2000 homes in Tamanrasset, Adrar, Illizi and Tindouf. In 2007, Algeria successfully supplied

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300 wind-powered homes and 18 villages with solar power. In 2007, a hybrid power plant was built using solar and natural gas to produce 180 megawatts of electricity. (وزارة الطاقة، صفحة

22) Algeria has launched series of projects to develop the use of renewable energy, including:

1-The program for the Great South, which is devoted to the southernmost states: Adrar, Bashar, El Oued, Illizi and Tamanrasset, this program allows the provision of drinking water to the inhabitants of these areas (pumping or desalination), and provide lighting, as well as cooling the air inside the house in the summer.

2- Ourguila and Touggourt projects: for the rehabilitation of 18 agricultural greenhouses on an area of 7200 m² using the water of the alpine layer la nappe albiene.

3- Wind farms to pump water in Had a Sahari in Djelfa and Maamoura in Saida to cover the water needs for agriculture. 80 wind pumps with a capacity of 120 kWh and 160 solar pumps with a capacity of 240 kWh were provided in the development of pastoral plain areas. This is to provide electricity (from solar and wind) to 3000 homes and to provide 300 wind-powered homes in the south in Illizi.

4-The “Solar Villages” program is a complement to the 1988 project, and Sonelgaz is responsible for the completion of this project. The latter was devoted to abandoned areas with low population density in the far south.

5- The power plant in Hassi R'Mel: It is the first hybrid plant in Algeria. It opened on 15 July 2011 in the region of Telgemet, 27 km from the industrial complex Hassi R'Mel North and the project is an alternative source of clean energy and covers an area of 152 hectares. This project provides 150 MW of electricity, of which 20% is produced from solar energy. In addition to the use of gas turbines operating capacity of 130 MW. The plant was able to generate more than 5% of the total electricity production. (فروحات، صفحة 128-126)

Despite of the fact that these projects have been allocated by the Algerian government for the exploitation of renewable

energy, these projects are far from achieving a complete exploitation of this energy. Especially since the Algerian government has only internal funding for these projects. Many studies remain mere ink on paper in the absence of financial funding. On the other hand, most renewable energy projects in Algeria are based on solar energy, although Algeria has, as we have seen, a variety of untapped resources, such as wind and ground resources. This makes the problem not as much a policy problem as the sustainability of the implementation of this type of energy that requires high technology that Algeria is unable to provide without yielding to external partnerships.

CONCLUSION

The collapse in the price of oil highlighted Algeria's urgent need to activate new energies, capable of bringing in new revenues for the Algerian treasury. Especially since Algeria's vast area has allowed it to produce many renewable energies which are led by solar energy. However, renewable energies cannot replace conventional energies in the near future because the problem of renewable energies in Algeria is not a problem of resources, but a problem of policies and technology. The former requires a genuine desire to exploit this type of energy, which is absent from Algeria because most of its projects are stagnant and just ink on paper. And the second is the problem of partnerships; Algeria does not have the necessary technologies to exploit this energy. It needs to enter into partnerships that Algeria has so far been unable to be a winning party.

Our study concluded that:

- Renewable energies in Algeria are a real alternative and complementary to fossil energies, and one of the most important sources of energy in the future, especially solar energy, which is an opportunity and engine for economic and social development.
- Although the first renewable energy utilization policies were in the 1980s, this field of energy is still progressing at a weak pace, and this is due to the absence of effective policies and controlled laws to revive this field.
- Algeria has great potential in the field of renewable energies, but the cost of its use is still relatively high. However, it must look beyond the process of laying the ground to activate

the use of renewable energies, as the use of renewable energy reduces the operating and production costs of any project and thus provides a sustainable and friendly energy for the environment in addition to saving money.

In order to effectively exploit this type of energy, we propose a number of recommendations:

- Material and moral support for renewable energies by topping the list of priorities of the political agenda.
- Supporting and stimulating research in the field of renewable energy utilization in Algeria, especially solar energy.
- Establish partnerships with leading countries in the development of renewable energies in a manner that helps to cover Algeria's technological deficit.

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