Opportunities for Algeria to be located in the world's green energy markets through the exploitation of renewable energies
REALITIES AND PROSPECTS

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فرص الجزائر للتموقع في الأسواق العالمية للطاقة الخضراء من خلال استغلال الطاقات المتجددة
حقائق وأفاق

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Abstract: the purpose of this study is to give review about the challenges and the opportunities for Algerian energy sector specially the renewable one, taking into account the growing growth in the global green energy markets.

. The major results of this study confirm that the global green energy markets grow rapidly and make many countries seek to adopt them in their domestic and international energy policies. Algeria has huge capacities in renewable energy but there are no effective measures to elaborate the suitable strategy to get energy and take part in world's green energy market.

Keywords: green energy markets, Renewable energies, opportunities, realities, prospects**.**

Jel Classification Codes : Q2 ; Q4 ; O13 ; P28.

ملخص:

تهدف الورقة البحثية إلى إبراز أهم التحديات التي تواجه القطاع الطاقوي في الجزائر في ظل المعطيات العالمية المتزايدة لإنتاج واستغلال الطاقة الخضراء، الأمر الذي من شأنه أن يفتح أفاق جديدة تسمح باستغلال الطاقات المتجددة بالنظر للإمكانيات الهائلة التي تحوز عليها البلاد من أجل اقتناص الفرص المتاحة والتموقع الجيد في أسواق الطاقة العالمية الخضراء .

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تم التوصل من خلال هذه الدراسة إلى أن؛ أسواق الطاقة العالمية الخضراء في نمو متزايد، خاصة مع انخفاض تكاليف استغلالها والخصائص البيئية التي تقدمها، ما يتيح فرص جيدة يمكن لقطاع الطاقة في الجزائر انتهازها، كما أن حقيقة الإمكانيات الهائلة من الطاقات المتجددة التي تحوز عليها الجزائر تواجه ضعف في آفاق الرؤى الإستراتجية التي من شأنها طرح الجزائر كمنافس قوي في أسواق الطاقة العالمية الخضراء.

كلمات مفتاحية: أسواق الطاقة الخضراء، الطاقات المتجددة، فرص، حقائق، آفاق.
تصنيف JEL : Q2 ; Q4 ; O13 ; P28.

1. INTRODUCTION

The international community recognizes the vital importance of renewable energies, besides the energy effectiveness and of its conservation, not only to fight against the health and the environment degradation and to ensure a sustainable development in conformity with the international objectives relating to the climate, but also to contribute to the innovation as well as the regional and national development, and to the equitable commercial prospects. The users of clean energy are conscious of the importance of using renewable energies which produce few emissions if not no, which have little incidence on the water resources, the landscapes and the biological diversity and which do not contribute to increase the toxins contents of our environment. The electricity produced by photovoltaic solar energy, the wind power, geothermal energy, the hydraulic power to reduce the emissions by an increase in the proportion of energy coming from renewable sources is a significant action, which will result in an improvement of the quality of the air and on public health.

Algeria, as a country, is aware for the challenges and the opportunities which will be taken if it investigates in this field, because Algeria has not only extensive gas reserve but also huge renewable energy resources especially wind and solar power; for that Algerian government is showing great efforts to integrate renewable energies into their energy market by developing several researches and technologies in order to identify Algerian strategy. These efforts have permitted to Algeria State to improve the use of renewable energy by means of series of laws and official programs. The aim of this research is to give a review about Algerian capacities in renewable energy, and what will be released by following the adopted strategy, thus, the fundamental question is: **what are the sources of**

renewable energies that's Algeria has to develop in order to take part in world's green energy markets?

- **The hypotheses:** to give answer to the fundamental question we based our study on two hypotheses, they are:
  - Algeria has huge renewable energy resources and there is a suitable strategy for its exploitation.
  - Algeria has market share in the green world energy market, but there are no serious efforts to develop it in the future.

-The previous research: there are many researchers' shows similarities and differences in terms of purpose with our study as:

- Zhour Abada, Malek Bouharkat, (2018), **Study of management strategy of energy resources in Algeria**, Energy Reports, Volume 4, Pages 1-7, available on https://doi.org/10.1016/j.egyr.2017.09.004.

The study aims to establish projections on the strategy of management of energy resources in Algeria. It will be carried out in different phases: The first phase will be oriented towards the renewable and non-renewable potential available in Algeria. Then, understanding and analyzing the different aspects of the country's energy strategy (production, export), shows that the Algerian economy is mainly based on the export of exhaustible and polluting fossil fuels. While the integration of renewable resources into its energy strategy remains very low compared to the available potential.

The authors make at least an analysis of the current and future energy situation of Algeria to guarantee the energy security of countries. This study discusses the general energy strategy in Algeria and did not focus on green energy only.

- Kamel Abdeladim, Salim Bouchakour, A. Hadj Arab, Said Ould amrouche , September 2014, **renewable energies in Algeria: current situation and perspectives**, Conference: 29th European Photovoltaic Solar Energy Conference and Exhibition, At Amsterdam, The Netherlands.

The study present the national programme for the period 2011–2030, which was developed in order to promote concrete actions in the fields of energy efficiency and RE. 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 programme, consists of installing up to 22,000MW of power generating capacity from renewable sources between 2011 and 2030, of which 12,000MW will be intended to meet the domestic electricity demand and 10,000MW destined for export.

This study gives a review about the national production and consumption on renewable energy and didn't take the international dimension in the account

2. Algerian's renewable energy capacity

Beyond its hydrocarbon resources, Algeria has a high potential of renewable energy which it has the aim ambition to develop with foreign partners. We will show below the different sources of renewable energy in Algeria containing:

- Solar energy;
- Wind energy;
- Geothermal energy;
- Hydropower and biomass.

2.1. Solar Energy

Due to its geographical location, Algeria has one of the highest deposits Solar the highest in the world, estimated at five billion GWh / year. Sunshine duration on almost all the country exceeds 2500 hours annually and can reach 3600 hours (Highlands and Sahara). The daily energy received on a surface horizontal 1m2 is around 5 kWh of most of the country, or nearly kWh/m2/year of 1700 North and 2650 kWh/m2/year south of the country. The table below shows the solar potential of Algeria.

Table (1): solar potential of Algeria

Regions	**Coastal Region**	**Highlands**	**Sahara**
Surface (%)	**4**	**10**	**86**
Average sunshine duration (Hours/year)	**2650**	**3000**	**3500**
Received average energy (Kwh/m^2/year)	**1700**	**1900**	**2650**

The Source: the national report of Algeria about the climate change to the CNUCC,(2017), Algeria, p: 47.

The data presented is supported by data compiled by the World Energy Council that they stay in the same range: Annual average insolation for Algeria is rated at 2,000 hours while the high plateaus receive around 3,900 hours. This results in an average solar energy potential of 2,400 kWh/m2/.

2.2. Wind energy

The wind resource in Algeria varies greatly from one location to another. This is mainly due to topography and climate diversity. Algeria is a regime of moderate wind (2-6 m / s). The South is characterized by higher speeds than the North, especially in the south-west, with speeds exceeding 4 m / s and beyond the value of 6 m / s in the region of Adrar. This potential energy can be used for pumping water especially on High Plateaus, it be should noted that wind energy is far behind compared to other sources of renewable energy due to many challenges at first the lack of infrastructure (K. Abdeladim & al, 2014,p:4122) .

2.3. Geothermal energy

The main advantage of using geothermal energy is that this renewable energy source can provide power 24 h a day. This resource is generally invariant with less intermittence problems compared to other renewable resources such as solar or wind energy (Hacene M & al, 2010, p:512) . The Jurassic limestone of the North Algerian geothermal reservoirs is important, it gives rise to more than 240 thermal springs located mainly in the Northeast and Northwest of the country. These sources are often at temperatures above 40 ° C, the warmest is that of Hammam Chellala (eg Meskhoutine) at 96 ° C. These natural springs, which are usually leaks existing tanks, debiting alone more than 2 m3 / s of hot water. This represents only a fraction of the production possibilities of the tanks. Further South, the formation of continental infill, is a large geothermal reservoir which stretches over 700 000 km2. This tank, commonly called "water Albian" is operated through drilling over 40 m3 / s water of this aquifer is at an average temperature of 57 ° C. If one combines the speed of operation of the water Albian to the total flow of the hot springs, this will represent a power of 700 MW. There are three areas where the temperature gradient exceeds 5 ° C/100 M (H.Saibi, 2015, pp: 5-7):

- Relizane and Mascara
- Ain Sidi Aissa and Boucif.
- El Jebel Onk and Guelma.

2.4. Hydropower and biomass

The share of hydro capacity in the electricity production base is 4% or 230 MW. This low power is due to the insufficient number of exploitable hydro sites. The potential of biomass consists of biomass from forests, urban and agricultural waste. The current potential of the biomass of forests is estimated at about 37 Mtoe. The potential recoverable is around 3.7 Mtoe. The energy potential of urban and agricultural waste is estimated at 5 million tons of urban and agricultural waste is not recycled. This potential represents a pool of about 1.33 Mtoe / year.

3. The framework laws and the strategy used to develop renewable energy in Algeria

Restraint measures of greenhouse effect gases resulting mainly from combustion of fossil fuels were taken since the Rio Summit of Earth in 1992 and were followed by other rigorous measures decided in Kyoto in 1997 straightforwardly to impose the international community the penetration of Renewable Energies in a progressive and interdependent way. In accordance with the national energy policy, Algeria has decidedly chosen sustainable development as its energy strategy, and has defined also their regulatory framework for renewable energies, we will expose in this element:

- Framework laws for Algerian renewable energy;
- The strategy of renewable energy in Algeria.

3.1. Framework laws for Algerian renewable energy

The legal and regulatory framework adopted during the past years underscores our strong commitment. We can limit the essential of this framework in the following laws and decrees.

3.1.1. Law n°01-20 of 12 December 2001

The law relative to arrangement and sustainable development of costal, the container of this law is implicitly referred to renewable energy.

3.1.2. Law n°02-01 of 5 February 2002

The law relative to the electricity and to the public distribution of gas, promulgated in February 2002, liberalized the sector of electricity by opening to competition the production and the marketing of electricity.

This law which takes in account the protection of the environment envisages the integration of renewable energies in the energy mix of the country. It opened in other hand side, the way to the promulgation of other inciting measures in favour of renewable energies. Advantageous premiums are granted to the producers of electricity produced from renewable sources. The purpose of the promulgation of this law is the implementation of a national policy of control of the energy based on the rational use of energy, the development of renewable energies and the reduction of the negative effects of the energy system on the environment (A. Ainouche , H. Ainouche, 2005, p:4).

3.1.3. Law n°04-09 of 14 august 2004

The law relative on the promotion of renewable energy in the context of sustainable development, the law on renewable energies within the framework of the sustainable development promulgated in August 2004, makes possible to institute economic incentives founded on the environmental benefit of the electricity produced from renewable sources.

This law will constitute a basis for lawful instruments aiming at the encouragement of the development of renewable energies in their environmental and ecological dimensions.

3.1.4. Executive decree n°04-92 of 14 august 2004

This decree is about the diversification of electricity production costs, it was enacted in 25th of March 2004. The incentive premiums of this decree shall attract private investors to implement integrated solar combined cycle plants in Algeria.

In detail the decree defines technology – specific premiums that the electricity producer receives per KWH of renewable power injected into the gird.

3.1.5 The 2010 financial law

This financial law intends to create a new special renewable energy investment fund, financed by a 0.5 percent fee of the corporate oil taxes. This vehicle will have an estimated amount of €40 million p.a. at its command. One

of its first projects will be the co-financing of Algeria's first wind park in Adrar that will be built by the French company Vergnet (N. Supersberger & al, 2010, p:38).

3.1.6. Executive decree n°15-69 of 11 February 2015

The decree specifies how to prove the certificate of the origin of renewable energy and how to use it.

3.1.7. Executive decree n°17-364 of 25 December 2017

The executive decree clarifies the duties of the Minister of Environment and Renewable Energies.

As Algerian authorities are aware of the fact that so far, its attempts to incentivize renewable energy investments have been very limited success, a reformulation of its renewable energy law is currently under discussion, but it might take several years until its release.

3.2. The strategy of renewable energies in Algeria

Algeria has set up a national programme for the promotion of renewable energy sources in the frame of its sustainable energy development plan for 2050. This program was approved on 3 February 2011 by the Council of Ministers.

3.2.1.National Programme for renewable energies

Betting Algeria through the project of renewable energies, which is the priority in economic policy energetic to reach the 30 percent of electricity production intended for national consumption of the assets of renewed prospects for 2050 and through the stages starting from testing in all renewable energy technologies, then proceed to completion of pilot projects to enable then the embodiment of the major projects, especially in the field of solar energy which will be part of an effort to achieve local production in this type of energy for the manufacture of the first solar panel in Algeria at the end of 2013.

The financial Estimated cost of the national project to $ 60 billion equivalent to 4,500 billion dinars within 2030. And in order to access control technologies related to renewable energies in the time taken by all measures for the recruitment

of national capacities in this area, as well as to make this branch of industry source generators of jobs.

The program of renewable energies have 3 types of energy including solar PV production capacity of 3000 MW and about 7000 MW of solar thermal energy, as well as wind energy, with an estimated production capacity of 2,000 megawatts, adding that access to the control technologies of these kinds of energies remains the main objective of this program (H. Sharef, 2011, p:32).

3.2.2. The principal actors and Instruments to realize Algerian program for renewable energies

Algeria owns an institution which is able to promote the use of the renewable energy sources within the framework of activities of the diversification of our energy source. The following section provides a list of key players in the Algerian renewable energies sector (N. Supersberger & al, 2010, p:38):

- **The Ministry of Energy and Mines (Ministère de l'énergie et des mines)**

It control most of the technical, regulatory and economic aspects in the power generation sector through its directorate of electricity, and is responsible for the formulation and the application of a national energy policy. It also houses the Directorate-General for Renewable Energies.

- **The Ministry of environment and renewable energies**

Through its Directorate for Energy and Development, this ministry secures the technological aspects of the power sector and is responsible to enact laws for the promotion of sustainable development and renewable energies.

- **The National Society for Electricity and Gas –Sonelgaz-**

Sonelgaz is the backbone of this ambitious program, it plays a pivotal role, especially in the field of control of solar energy technologies to be considered mandated by the Ministry of Energy and Mines, it oversees all projects included within the program of renewable energies.

- **The company of new energy Algeria –Neal-**

It is a company created between Sonatrach, Sonelgaz and private company (SIM) in July 2002 having as object the :promotion and the development of new

and renewable energies, identification and the realization of projects related to these energies and definition, as well as development and the implementation of development strategies.

- **The Center for the Development of Renewable Energies -CDER –**

The centre was founded in March 1988, as a consequence of the structuring of the High Commission for Research. It elaborates and implements scientific and technological R&D programmes focusing on solar, wind, geothermal and biomass energy. The centre's activities range from the creation of a renewable energies.

- **The Algerian Institute for Renewable Energy and Energy Efficiency - IAEREE –**

Announced by President Bouteflika in September 2009, the IAEREE will be established in the new village of Bellil in the district of Hassi R'Mel (wilaya of Laghouat). The institute will work on technology and economic issues regarding the spread of renewable energies in Algeria and will closely cooperate with NEAL and other public and private sector companies (Anon. 2010). It will also host expert courses for the construction of renewable energy technology and the spread of energy efficiency measures on different skill levels.

the contribution of national experience in this project stressed on that the focus will be on the competencies of Algeria and involvement in production, research and conservation, and processing, pointing out that there is work at the level of complex Sonelgaz in coordination with research centers and laboratories with universities under the Ministry of Higher Education and Scientific Research about the capacity building of national engineers, technicians and teach them lessons in physics and English to master the control of new technologies.

4. Algerian renewable energies realities

The total power of all projects to date in the field of energy renewable, except for hydroelectric facilities was 250 MW, with 22 stations installed. Energy policy advocates increasing the contribution of renewable energy in national energy balance and encouraging energy-efficient systems.

The current total conventional installed electrical capacity of Algeria is 8 500 MW, and 40000 GWh. Gas is the primary energy source, and this is likely to stay so. The level of the natural gas volume produced for the domestic market will be about 45 bn m3 in 2020 and 55 bn m3 in 2030. The current RE capacity is about 250 MW (mainly hydro power), and represents about 2,7 % in the energy mix. The objective of the National Program is to increase the production capacity of photovoltaic modules by 200 MW/year. The target for 2017 is 5% RE in the energy mix (750 MW). The energy consumption per capita in 2011 was 1,140 kWh116. The rise of electricity demand is about 7% compound (annual growth rate) between 2010-2017.The electricity consumption is expected to reach 75-80 TWh in 2020, and 130-150 TWh in 2030. (African development bank, 2017, pp:80-81), we will try to show here:

- The project released in the field of renewable energies;
- The prospect of Algerian renewable energies.

4.2. The project released in the field of renewable energies

The energy policy of Algeria state has achieved to release many projects, which can be exposed Below (GH. Samrouni, 2007,pp:11-14):

4.2.2. The National Electrification Plan

They have release The Electrification of 18 villages in the solar PV:

- The Electrification of more than 1000 homes.
- The Electrification of 15 mosques.
- The Electrification of 15 schools.
- The Electrification of 20 stations (police stations, guards Communal …).
-

4.2.3. The Programme of Highlands HCDS

They have released:

- The Electrification of more than 4000 homes with a power = 800kwc.
- The 160 solar pumps with a capacity of 240 Kwc.
- The 80 wind pumps with a capacity of 120 Kw.

4.1.3. The programme of SONATRACH

This program has achieved:

- The Production of electric power systems by PV (2MW) for control of sinks for the upstream activity telemetry system
- The Realization of power systems électric way PV (0.3 MW) for the cathodic protection of oil pipelines.

4.1.4. Other Achievements

Such as:

- The Marking of 2300 km of tracks.
- The 10 KWP photovoltaic plant connected to the network Sonelgaz CDER (this project is a part of the Algerian-Spanish cooperation).
- The Service Station Naftal powered by solar energy (the Bridja-Staoueli a power of 7 kWp) conducted by the UDES.
- The Power supply PV monitoring stations routièreau advantage of the National Gendarmerie.
- The Reduction of flaring GN in energy industries (12 MTEP en 1978-3 MTOE in 2006).
- A hybrid solar power (PV) / diesel to 13 Kwc Illizi (300 homes / 2000habitants) directed by BP Solar as part of social investment.
- The Power-over 100 telecommunications sites (700 KWP).

5. The Opportunities for Algeria to be located in world's green energy markets through the prospects hoped to achieve.

The international community recognizes the vital importance of renewable energies, for that the using of the clean energy increase day by day in different fields.

5.1.The world's green energy markets

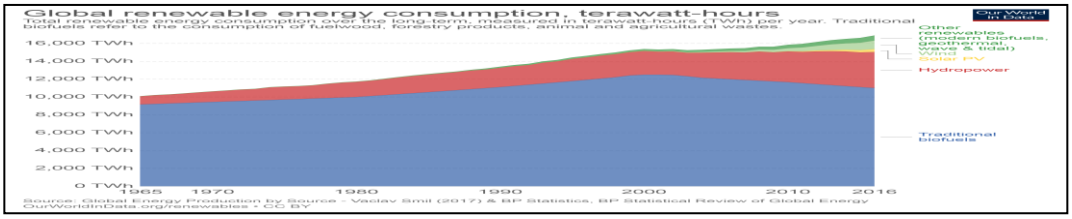
According to the International Energy Agency's (IEA) Renewable 2017 report, which says sharp cost reductions and improved policy support are paving the way for continued growth in the renewable sector. The report says record performance in 2016 "forms the bedrock" of the IEA's electricity forecast, which predicts renewable energy capacity will expand by 43% – or more than 920 gigawatts – by 2022. It adds that solar will continue to dominate the renewable market, generating far more electricity in the next four years than wind and

hydropower, for example. Among the top nations, China is the undisputed renewable growth leader, accounting for over 40% of the total global clean energy mix by 2022, and considers the united state as the second-largest growth market for renewable in the world.

5.1.1. Global renewable energy consumption in the world

The visualization below shows the global consumption of renewable energy over the long-term;

Figure (1): global renewable energy consumption



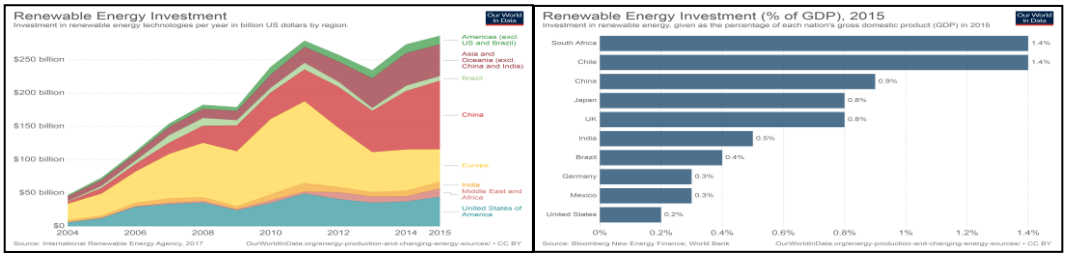
The Source: https://ourworldindata.org/renewable-energy, visited on 4/5/2019 at 21:00h.

As we see, the historical consumption of renewable energy has been dominated by traditional biomass .Today, traditional biofuels remain the largest source of renewable, accounting for 60-70 percent of the total, and the hydropower remains dominant, accounting for approximately one-quarter of renewable consumption.

5.1.2. Renewable energy investment in the world

In the graphs below we see global investments in renewable technologies from 2004 to 2015 (measured in billion USD per year) and the renewable energy investment of GDP:

Figure (2): renewable energy investment in the world



The Source: https://ourworldindata.org/renewable-energy, visited on 4/5/2019 .

As we see the world invested 47 billion USD. By 2015, this had increased to 286 billion USD, an increase of more than 600 percent. Investment has grown across all regions, but at significantly different rates. Most countries invest less than one percent of GDP in renewable technologies (with the exception of South Africa and Chile, which make an impressive contribution at 1.4 percent). When normalised to GDP, China remains one of the largest investors, at 0.9 percent. Interestingly, despite being the second largest investor in absolute terms, the United States invested only 0.1 percent of its GDP in 2015.

5.2. The prospects of Algerian renewable energy to be located in the international green energy market

The energy sector has developed an indicative program of development of renewable energy structured around the production of renewable electricity and thermal uses in order to achieve objectives of a contribution of 6%, in meeting the energy needs on the horizon 2020 and 30% in 2050.

5.2.1. Solar thermal

Based on projections of electricity generation, the goal of renewable energy penetration up to 30% in 2050, in national electricity production, results in a power generation of over 13000 GWH for the same horizon.

-The Prospects for renewable electricity production for the domestic market

The table below shows the predictions of the evolution production electricity from renewable energy from, 2020 to 2050, for the domestic market and the raising of national electricity demand in the same period.

Table (2): Prospects for renewable electricity production for the domestic market

Year	2020	2030	2040	2050
National electricity demand (GWH)	79504	111662	177090	280856
Domestic origin renewable (GWH)	4885	14041	37322	84372
Rate (%)	6	13	21	30

The Source: the national report of Algeria about the climate change to the CNUCC, 2017, Algeria, p: 181.

The production capacity of 6000 MW, will be achieved by 2050 which will result in a production of over 19 TWh, this production is exported mainly to the European market. Already, several sites have stopped to house these solar thermal power plants, projects the number of four developed by the company NEAL, which are located in the South (Hassi R'Mel, Méghaïer, Naâma).

-The Evolution of production capacity of solar thermal electricity

The table below describes the result predictions about the development of production capacity and electricity generation from solar thermal on the period of 2020 – 2025.

Table(3): Evolution of production capacity of solar thermal electricity

Year	2020	2030	2040	2050
Production capacity (MW)	0	2200	4000	6000
Electricity generation (GWH)	0	7049	12852	19338

The Source: the national report of Algeria about the climate change to the CNUCC, 2017, Algeria, p: 181.

Algeria has great potential in the field of solar thermal. For this purpose the predictions of this method of electricity production will reach 20% of total production electricity by 2050. The ability to install, at the end of the program, is estimated at 17 500 MW, this corresponds to an electricity production of 58 TW by 2050. The achievement of program objectives thermal concentration, in the short term (2019 -2025) should be done by hybrid solar / natural gas, with a share of 5% for solar, for the medium term (2019-2035), solar should take the major part in power hybrid solar / gas. For this purpose the production of solar electricity is expected to reach 80% of the total production of these plants. Finally, the long term, by 2035, these plants will be fully dedicated to the sun. The table below shows the objectives of this sector, in 2050.

- **The Perspectives of solar thermal concentration and of development of solar water heater in 2050**

The tables below show the potential increasing in solar thermal capacity to be installed and the electricity generation from that for the first table, the second table shows also the prospects hoped to achieve in development of solar water heater in the period of 2007 to 2050.

Table(4): Perspectives of solar thermal concentration in 2050

Year	2020	2030	2040	2050
Combined capacity to be installed	1250	5500	12300	23500

(MW)				
Electricity generation (GWH)	4000	17607	39454	75595

The Source: the national report of Algeria about the climate change to the CNUCC, 2017, Algeria, p: 181.

The prospect of development of this sector is based on the objective of installation of 2 million solar water heaters in 2050 and a collector area of more than 7 million m2. This corresponds to the equipment of community infrastructure and households remote areas.

Table (5): Perspectives of development of solar water heater in 2050

Year	2020	2030	2040	2050
Cumulative number of solar water heaters(Thousands)	85	283	776	2003

The Source: the national report of Algeria about the climate change to the CNUCC, Algeria, 2017, p:182 .

We can result, during of the first phase, the use of photovoltaic electricity will be reserved for the electrification of isolated sites where the network connection can be expensive. Based on an electrification rate of 98% of the country that would continue throughout the period prediction, the number of households that would not be scattered connected to national grid expected to increase from 170 000 currently to about 220 000 in 2025. The objective suggestion of electrification, by 2025, the PV of 100% of homes scattered. For the realization of this goal, the program consists of the proposed PV program implementation current different period, the more ambitious program that will provide electricity to 220 000 households. The photovoltaic program will result in the installation, by 2025, a capacity of 111 MW.

It is expected, during the period 2026-2050, the development of more consistent Photovoltaic, as the costs of this industry are expected to fall enough to be competitive with solar thermal and even against the wind beyond 2040.The objectives set for the photovoltaic consist of the contribution of this sector to6% in the balance of electricity production in 2050.

5.2.2. **Wind energy prospect**

The development programme for the production of wind power on the horizon 2050 will be approximately 4% of national electricity production. For the period 2008 - 2015, it anticipated the completion of a 100 MW wind farm, and the ability to install the end of the program from 2050, 5650 MW, representing a

production of 11 300 GWh. The table below shows the prospects hoped to achieve for wind power until 2050.

Table 6: Prospects for development of wind power

Year	2020	2030	2040	2050
Combined capacity to be installed (MW)	400	1100	2700	5650
Wind power (GWH)	800	2200	5400	11300
Part of photovoltaic in the national electricity production (%)	1	2	3	4

The Source: the national report of Algeria about the climate change to the CNUCC, 2017, Algeria, p: 182.

This table shows clearly that Algerian renewable energies policy is more important in the solar power than in the wind power.

5.3. Export of energy in Algeria

The economic sector of energy in Algeria includes local production and importation of primary energy, the energy consumption is based almost exclusively on fossil energy sources, hydrocarbons and especially natural gas.

, The balance of energy exports for 2013 showed an overall net exporter of balance 101.5 Mtoe. This balance has decreased by −7.2% compared to 2012, due to lower exports

o 2012. This reflects the decrease in exports of natural gas (−12.5%), crude oil (−11.8%) and LPG (−2.9%). In contrast, exports increased by 6.1% .While energy exports derived experienced in 2013 an increase of 1.7%. This increase is mainly due to the increase in exports of petroleum products which rose to 13.6 Mtoe Indeed, the increase in volumes processed by the refinery of Skikda rehabilitated and Arzew, allowed an increase in production and hence increased exports . In contrast, exports of electricity fell (−61%), reaching 97 ktoe in 2013(Z. Abada & al, 2017,p:4).

From the above statistic, we can note that the principal energy exported in Algeria is mainly the traditional one, and these is no strategy based on the exportation of energy produced from renewable sources, for that the Algeria government have to think to introduce the exportation of green energy in their strategy taking account the transition in the world to use more and more the clean energy, in order to benefits from their huge renewable resources ant take the opportunities given from the international green market.

It is therefore important to put in place an energy transition that will allow it to reduce its dependence on fuels by reserving oil only for noble uses, to save energy, to launch without delay the energy plan Renewable energy sources, for

example, a 1000 MW solar power plant would save 1.5 billion m3 of natural gas. It is also necessary to go towards a gradual truth of the prices of energy and water through pedagogy to train the eco-citizen of tomorrow in school but also in the university with the new professions of sustainable development (Z. Abada & al, 2017, p:6).

6. CONCLUSION

The level of fuels today are steadily declining, for this reason, the Renewable energy is indeed very important to mankind, the future of Sustainable energy can be only done with the help of renewable energy sources and this is really the main advantage that these energy sources have over traditional fossil fuels. World has come to a point where it has to not only satisfy ever-growing energy demand but also to do this on ecologically acceptable way in order to save our environment, and this can't be done without the renewable energy sources.

Conscious of the need to face its environmental problems and aware to take part in the fight against the climatic change, Algeria has affirmed its commitment to boosting the role of renewable energies, the government appears determined to maintain control over production. With significant growth in demand expected in coming years, along with a government open to investing in renewable energy, Algeria is endowed with significant resources of renewable energies and particularly solar and wind energies, for which the country has several sites among the most promising in world but the strategy of energy adopted to exploit them it's not efficient, because this strategy from (2011 until now) expect to produce 10٪ of energy from renewable resources but in fact just 3 to 5 ٪ of energy are produced from it and this **confirm that the first hypothesis is incorrect** .

Algeria could well become a leader in developing non-oil energy sources. However, aware of the risks posed by volatile oil prices (crisis of covid 19 exp) and the resulting need to diversify its energy mix, Algeria must tackle a number of difficult issues before it can take advantage of the long-term opportunities offered by renewable energy sources. Beyond this Algeria is looking for a close partnership with the European Union so that Algerian plants may help deliver the green energy needed for Europe to meet its targets, but Algeria until now they do not export the energy produced from renewable resources and there is no plan for

that and in this case, Algeria risk to lose the opportunities to take a part in world green energy market which confirm that **the second hypothesis is correct**.

Given Algerian's abundant solar, wind resources, biomass, geothermal, etc. represent a potential market for renewable energy technologies. Algeria could benefit from the targeted interventions that would reduce the local air pollution and help the country to tackle greenhouse gas emissions. Many factors that need to be considered and appropriately addressed in the shift to its sustainable development. These include a full exploitation and promotion of renewable energy resources, energy efficiency practices, as well as the application of energy conservation measures in various sectors such as in the construction of industrial, residential, and office buildings, in transportation, etc.

7. Bibliography List:

1. Books :

- David JC MacKa, (2009), Sustainable Energy - Without the Hot Air, published byUI5, United Kingdom.
- Richard Heinberg, David Fridley, (2016), Our Renewable Future: Laying the Path for One Hundred Percent Clean Energy, 2nd None ed. Edition, united state.

2. Journal article :

- Zhour Abada, Malek Bouharkat, (2018**),** Study of management strategy of energy resources in Algeria, Energy Reports, Volume 4, Pages 1-7, available on https://doi.org/10.1016/j.egyr.2017.09.004.

- Hacene Mahmoud, Nawel Spahis, Mattheus F.Goosen, Noreddine Ghaffour, Nadjib Drouiche, Abdellah Ouagued, January (2010), Application of geothermal energy for heating and fresh water production in a brackish water greenhouse desalination unit: A case study from Algeria, Volume 14, Issue 1, Pages 512, doi.org/10.1016/j.rser.2009.07.038.

3. Seminar article:

- Kamel Abdeladim, Salim Bouchakour, A. Hadj Arab, Said Ould amrouche, September, (2014), renewable energies in Algeria: current situation and perspectives, Conference: 29th European Photovoltaic Solar Energy Conference and Exhibition, At Amsterdam, The Netherlands.

- Hakim Saibi, (2015), Geothermal resources in Algeria, proceedings world geothermal congress, 19-25 APRIL Melbourne, Australia.
- Ghania Samrouni, les énergies renouvelables – les filières développés en Algérie, séminaire sur les énergies renouvelables en Algérie, Berlin, 11 juillet 2007.
- Abdelkrim Ainouche, Hakim ainouche, September (2005), promotion of renewable energies in Algeria for a sustainable development and better future for next generations, Contribution of 18th world petroleum congress, 25 – 29, Johannesburg, South Africa.
- Nikolaus Supersberger & al,(2010), Algeria – A Future Supplier of Electricity from Renewable Energies for Europe? Algeria's Perspective and Current European Approaches, Wuppertal Institute for Climate, Environment and Energy(CREAD), Bouzaréah, Algeria.

4. Reports:

- Energy Information Administration report, 2017, available on :www.eia.gov,
- The national report of Algeria about the climate change to the CNUCC,(2017), Algeria.
- African development bank, (2017), the renewable energy sector and youth employment in Algeria, Libya, Morocco and Tunisia.

5. Internet websites:

- Delware Riverkeeper network, 2020, **Natural Gas Versus Renewable Energy Alternatives**, available on : https://www.delawareriverkeeper.org/sites/default/files/Shale%20Gas%20vs%20Renewables.pdf, consulted on: 03/O2/2020).
- Hanan Sharef, **renewable energy in Algeria**, http://www.radioalgerie.dz/ar/index.php?option=com_content&view=article&id=9009:2011-07-20-10-47-16&catid=37:2010-05-03-13-12-08&Itemid=90, visited on 20/09/2019.
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