Electricity Generation from Renewable Sources: Algeria Cases (Situation and Prospects)

Amina Mekhelfi**,** Kasdi Merbah University,Ouargla, Algeria
Fatima Zohar Ben Seghier**,** High National School of Statistics & Applied Economics, Kola, Algeria.
Djeloul Benanaya, Khemis Miliana university Center, Algeria

The European Conference on Sustainability, Energy & the Environment 2018
Official Conference Proceedings

Abstract
The world is witnessing fast population growth. So, life needs are increasing especially, energy which is considered nowadays, as the sinews of life and the decisive factor in economic growth. Fossil energy is the most widespread and exploited, because it is the mainstay of economy of the most countries, the producing countries. However, all countries are worried about the danger of energy depletion on the one hand. On the other hand, fossil energy is the main cause of environmental pollution and global warming due to waste gases. The volatility of oil market and its impacts on world economy drive all countries to seek for another alternative instead of fossil energy to world needs in all aspects of life, mainly electricity generation from renewable energies. Algeria may play a role in this future, a major role in field of renewable energies because of diversity of its natural resources. This research aims at diagnosing the world renewable energies exploitation, as well as highlighting the renewable energies position in Algeria while referring to Algeria's efforts in this field, the study results show that Algeria possesses high potential in the field of renewable energies, in addition to political efforts tending towards reinforcing and developing renewable policy. However, generation of renewable energy represents only 5.5% of total fossil energy. This ratio is still low in comparison with Algerian energy potential. As a result, Algeria has little experience in renewable energy technologies because it relies on fossil energy and well-mastered techniques.

Keywords: renewable energy, fossil energy, electricity generation, renewable energy policy, Algeria.
Jet classification: Q20, Q35, Q48.

I. Introduction

Fossil energy, since its discovery in 1859 until the 21st century, continues to be the primary source of energy, because of its important and vital role in the economies of all countries. However, this fleeting energy has become the main cause of environmental pollution as well as the increase of global warming.

Due to the adverse effects of the oil industry's activity on the environment as well as the increased economic crises caused by the multiple fluctuations in oil prices since the 1970s to date, sometimes in declining, sometimes in increasing The average price of oil reached $43.73 in 2016 against 109.08 in 2013(Global.B.P, 2017), a decrease of 40%. These factors have led the international community and energy conservation experts expecting other sustainable alternatives to the environment through energy conservation experts to look for other sustainable alternatives to the environment, through the International Energy Agency created in 1974. The major concern of this community is the technological and economic strengthening of renewable energy such as solar and wind energy and other energy as an ideal solution for the alternative to fossil fuels.

At the climate conference, COP 21 in Paris 2015, COP 22 in Marrakech 2016, COP 2017 in Bonn. More than 190 countries agreed in Paris to reduce global warming to over 200 degrees Celsius, with the goal of minimizing global climate threats. Renewable energy is one of the most important tools to combat this climate change through the development and encouragement of rich countries as major investors in this field, aiming to provide their financial support to poor countries and owners of natural resources such as African countries. An amount of $100 billion per year concluded for their injecting in the climate budget of Cop21 until 2020. (Hirst, 2015)

Renewable energy may not yet be a substitute for fossil fuel because of its multiple derivatives, but its growth in recent years thanks to technological progress gives it a clear competitive advantage in the global energy market. Governments and the private sector have started to injected billions of dollars into the still-nascent market, such as China, which reached more than $103 billion in renewable energy investments in 2015(Buckley & Nicholas, 2017).

Europe has become a successful European model in this field as the most innovative and efficient sector. In 2015 in Germany, the percentage of electricity consumption generated by renewable energies reached 32.5% against 6.5% in 2000(Pescia & Energiewende, 2016), and which thrived further afterwards and the global investment in renewable energy in 2016 was about 241.6 billion dollars(J. Sawin, 2017).

Investment in the renewable energy sector considered a purely economic investment. The expansion of renewable energy industries has led to the decline of renewable energy technologies and the growing development of emerging economies as well as the evolution of new jobs. In 2016, renewable energy sources supported around 9.8 million jobs(J. Sawin, 2017), and 5 million hobs in 2011(J. L. Sawin et al., 2012)

Algeria, one of the oil- producing countries since 1958, a member of OPEC in 1969, classified 18th in 2015 in the world oil production through the Sonatrach company and 3rd producer in Africa. With a production of 671 barrels/ day in 2015, or 19% of African production against respectively 27% and 22% for Nigeria and Angola(Mouissi, 2016).Despite these characteristics cited, Algeria is one of the developing countries, investing in the field of RE. The year 1982 was the birth of high commissioner of RE conservation; its main task was the establishment of the infrastructures to start its activities. Five development centers and pilot stations have emerged afterward. Their purpose was and still to provide the scientific, technological and industrial databases of the RE development program. Algeria aims to generate about 30% of electricity from renewable sources by 2030(CDER,1990).

By its geographical position, the area of Algeria is the largest in Africa, with 2.381.741 $km^{2,}$ four times France and 60 times Switzerland, with many forests in the middle, however, the Sahara alone represents 84% of the territory. In addition to fossil energies, Algeria as well holds several sources of RE; sunshine throughout the year, considerable winds speed in the highlands, significant water resources. All of its natural energy qualifications make it one of the leading developing countries in the investment of energy's sustainable. By what was mention above, the problematic of this study comes as follows:

What is the current and future renewable energy policy in Algeria and what are its capabilities? Followed by these secondary questions:

1-Owning potential renewable resources will allow the development of RE production?
2-Owning RE technologies will allow the evolution of cleans energy production?
3-Owning fossil energy and mastering its technology can promote its own production of clean energy?

II. Methodology

This paper is based on works in terms of articles and books on the subject of the same theme, which is **"Electricity generation from renewable sources"**, joining this to the most credible statistical journals via their websites in the field of energy studies such as:
1-A.Boudghene Stambouli,& all, a review on the renewable energy development in Algeria: Current perspective, energy scenario, and sustainability issues, Renewable and Sustainable Energy Reviews 16 (2012): This article demonstrates the fundamental priorities of Algeria to use several renewable energies sources and environmentally friendly energy conversion technologies. It has shown as well that Algeria is endowing with large reserves of energy sources, mainly hydrocarbon and considerable potential for the utilization of RE sources especially with respect to solar energy. This document develops the RE potential different from Algeria targeted by the Ministry of Energy and Mines (MEM) according to the strategic plan which aims to reach 40% of RE (mainly solar) share in the production of electrical energy by 2030.
2- Journals (Ministry of Energy of Algeria, Algeria's RE centers reports (CDER), Arab future Energy Index AFEX 2016. the article is endowed with various statistics

from journals renowned at the international and national levels for renewable energy during the period of 2011 outlook to 2030.

III. Discussion and result

III.1 The production structure of electricity in Algeria and the role of renewable energy sources (reality and future)

III.1.1 The Algerian sustainable energy resources potential: Algeria is a country with a huge potential and varied in RE energy, it holds in(Semrouni, 2007):
1-Solar energy: 3600h of sunshine a year;
2-Wind energy: between 3 to 6 m/s;
3-Geothermal energy: 200 hot water springs in the north of the country (between 45° C and 98° C);
5-Biomass: 37 MTEP for forests, 30MT for urban waste;
6-Hydroelectricity with a potential 1500 GWH (with 6% of current electricity generation capacity).

III.1.1.1 Solar energy

Solar energy is one of the most important sources in Algeria, providing one the highest solar potentials in the world, with 86% of the national territory in the desert region (the Grand Sahara), Algeria holds between 2500 and 3600 h of sunshine a year. The average solar radiation in Algeria generates about 200 kwh/m^2, which is twice the radiation generated on the European continent(Grigorjeva, 2016), see figure1. The energy absorbed daily is on horizontal surfaces of 1m^2 is 5 kwh over the major part of the national territory or about 1700 kwh/(m^2 year) for the north and 2650 kwh/(m^2 year) for the south of the country see table 1(Missoum, 2015):

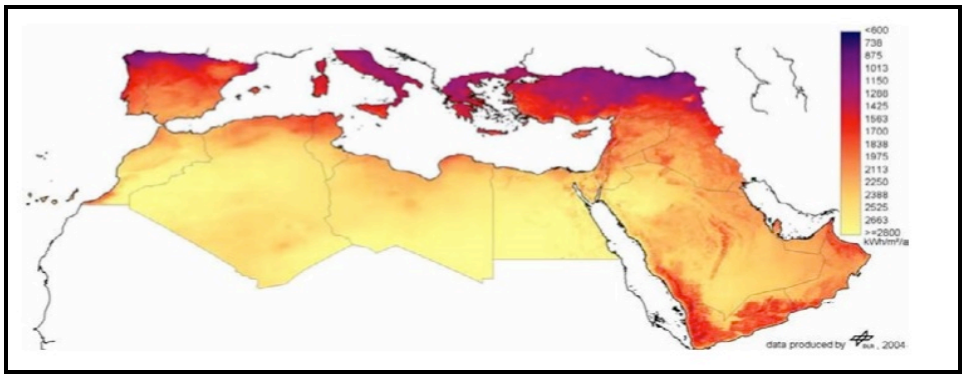

Figure 1 Geographic map of Algerian solar energy

Region	Coastal	High plateau	Sahara
Surface (%)	04	10	86
Average duration of saneness per annum (h)	2650	3000	3500
Average energy received (kwh/m^2 annum)	1700	1900	2650

Table 1 Solar potential in Algeria

III.1.1.2 Wind potential

The vast geographic of Algeria is divided into two regions, the north, and the south. A mountainous relief characterizes the north; however, the southern region is endowing with wind energy as mentioned in figure 2. They are particularly located in the region of Adrar in the southwest notably, with 4 m/s and more than 6m/s (Guerri, 2008) as well as Oran in the northwest, expanded from Meghress to Biskra in the east and from El Kheiter to Tiaret in the west. A number of sites along the coast have average wind speeds above 5.0 m/s, rising to over 8.5 m/s at 80m as seen in figure 3. This wind energy potential is ideal for water pumping especially in the high plains(Stambouli, Khiat, Flazi, & Kitamura, 2012).

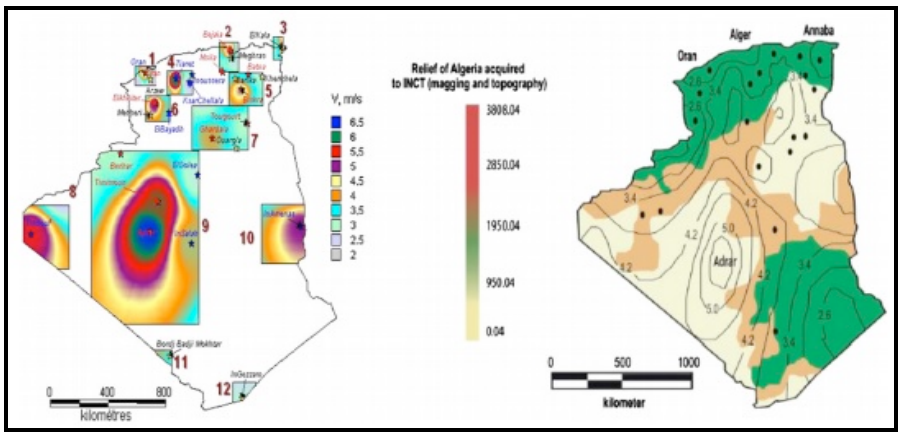

Figure 2 Wind chart of Algeria. Left: identified windy sites, Right: topography of the identified sites

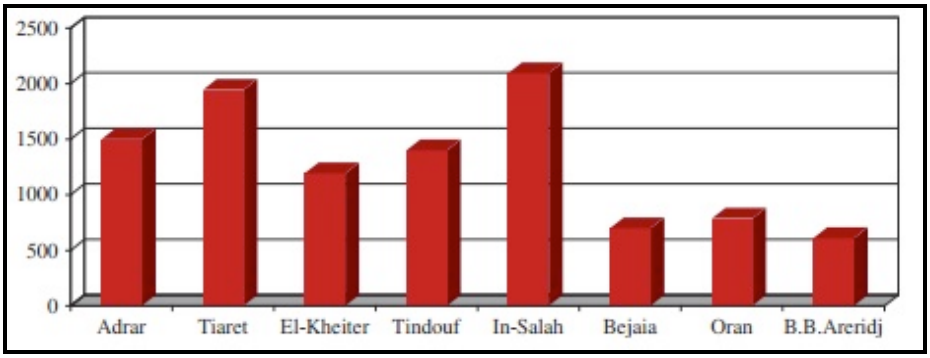

Figure 3 Average power output in the eight identified wind places.

III.1.2 State of renewable energy in Algerian energy policy

From the point of view of the legal framework, institutions, and programs in RE:

III.1.2.1 The legal framework

In the RE framework of the development of investments and technologies, the Algerian government has promulgated laws and regulations in this direction, several economic devices, organizations, and institutions were created to promulgate

technical facilities able to develop the renewable energy technologies such as (CDER) and (FNER). These laws(ME, 2016) and its institutions are represented in table 2 as follows:

Year issued	Law N°	Subject & content
July, 28, 1999	N°99-99	Control of energy
February, 05, 2002	N°11-02	Electricity and Distribution public gas channels
August, 14, 2004	N° 09-04	Promotion of capacities in the context of sustainable development
December, 30, 2009	N°09-09	Bearing of finance law for 2010 including its article 64 establishing the national fund for renewable energies and cogeneration (FNER)
July, 18, 2011	N°11-11	Including the Supplementary Finance Act 2011, noted the level of tax revenues which finances the National RE Fund and the expansion of the National Fund and the expansion of the field applied to cogeneration plants.
December, 20, 2014	N° 14-10	Bearing the Finance Act of 2015, Article 108 provides for the merger of the tow special funds "the National Fund for the Control of Energy (FNCE/FNME) and the National Fund for RE and Cogeneration (FNER).
2017	-	Introduction of the energy efficiency tax which contributes to the improvement of the National Fund for the Control of RE and Energy Cogeneration.

Table 2 Algerian Legal Text of RE

III.1.2.2 Algerian institutions of RE

The laws and decrees mentioned above have allowed the creation of the creation of several governing institutions in the field of RE:

RE Institutions	Year created	Their
1-Silicon Technology Development Unit (STDU) (Abderrahmane, Mghazi, 2018)	1988	Development of silicon technology, -Conduct scientific research and technological innovation, -Training for post-graduation in the shops of science and semiconductor materials and devices for applications in several fields such as photoelectric energy storage. This unit also contributes with the cooperation of several universities in Algeria,
2-Centre for RE Development (CDER) (CDER,2017)	March, 22th, 1988	-Collect, process and analyze data for accurate assessment of solar capabilities, wind/ geothermal and biomass; -Responsible for conducting research and development programs, scientific and technological of renewable energy

		systems. -Formulation of necessary research work and development technical procedures, physical equipment and means of measurement necessary for the exploitation of RE.
3- Solar Equipment Development unit (CDER, 2017)	By decree N°008 January 9, 1988 by the presidency of the Republic (Official Gazette N°06, February10, 1988	-Design and optimization of RE for the production of heat, electricity, cold water treatment; Implements studies and research development of technological processes prototyping and pilot production; -Realize technical-economic and engineering studies to set pilot installations to insure the transfer and the master of new technologies; -Define characterization techniques, test, quality control and compliance to insure qualification, approval and certification of developed equipment's. -the development of solar equipment, in particular the film with economic and engineering technical studies; -the completion of some prototypes and experimental production of solar, thermal and photoelectric equipment and some mechanical thermocouples.
4-RE Applied Research Unit (URAER), affiliated to the (CDER)	1999	-The national effort for research and training. Thus, by collaborating with universities and other research center; -as well as with the possibility of providing within the unit a training of quality in renewable energy starting from master level to the specialized PHD.
5-Financial incentives, it's National fund for RE and Cogeneration (NFRE/FNER)(Maged et al,. 2016)	In 2000 under law N°2000-116 to finance energy efficiency projects	-Encouraging clean energy propjets by financing them
6-RE Research Unit in Saharan Area (URERMS) (CDER,2017)	With Ministerial order N°76 of the May, 22nd,2001 at the level of the CDER	-Collect, exploit, process and analyze the whole necessary data for a precise evaluation of solar, wind and biomass energy in Saharan regions; -Operate scientific and technological works on the design and development of devices and equipment's for solar and biomass energy packaging; -Proceed to study the qualification and the

		adequacy of settlement tests, observation, experimentation, exploitation, measurement, reliability and endurance of solar and wind energy equipment, -Launch production and biomass valuation activities for energetic, environmental and agronomic purposes.
7-New Energy Algeria (NEA), created by two major players in the Algerian energy sector, namely the Sonatrach and Sonelgaz (CDER,2017)	In 20002	-The promotion and development of new and RE, -The identification and realization of projects with high technological value added new and RE; -The creation of a center of excellence dedicated to research and development (R&D) and training in the field of RE; -The development of win-win partnership, as part of the technological collaboration; -The consulting with national and international companies.
8-Centert for Research and Development of Electricity and Gas (CREDEG)	January, 1st, 2005	-the production, transmission and distribution of electricity, -pipeline transportation and distribution of gas, -The promotion of new and renewable energies, -Qualification of materials and equipment Electricity and gas. -Consulting and technical support, demonstration and certification, in the field of industrial electricity and gas; -Adoption of electricity and gas devices used by the local consumer; -State the means and equipment electrical and gaseous; -Introduction of new technologies and research technologies through applied and experimentation; -Development and promotion of the use of RE the targeted objectives of (CREDEG) are: -The safety of people and equipment goods, -Environmental protection, -Continuous improvement of the technical performances of the installations by the development of innovative solutions to the technical problems inherent in the development of SONELGAZ's business activities.

Table 3 Algerian institutions of RE

III.2.2.3 The national program of RE since 2011 outlook to 2030

Algeria has also developed an ambitious program for the evolution of renewable energy and efficiency since 2011 through their institutions and centers mentioned before. This program is defined for the different phases as follow:(MEM, 2012):
-2013: Planned to install a total capacity of around 110 MW;
-2015: A total power of nearly 650 MW should be installed;
-2020; An installation is expected to have a total capacity of approximately 2600 MW for the domestic market and an export opportunity of the order of 2000 MW;
-By 2030: Planned to install a power of nearly 12000 MW for the domestic market as well as an export opportunity of up to 10000MW.

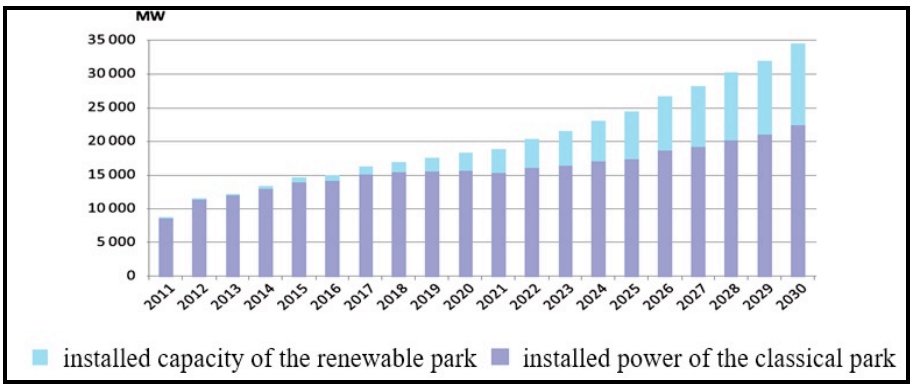

Figure 4 Structure of the national production park and outlook to 2030.

The aim of this program is to ensure the availability of 40% production on RE by 2030. The program focused on the development of wind, solar photovoltaic and thermal energy. The solar energy (PV and thermal) will present the largest source of clean energy production in Algeria with a rate of 60% of total production 2030 according to the objectives of the project shown in figure 5.

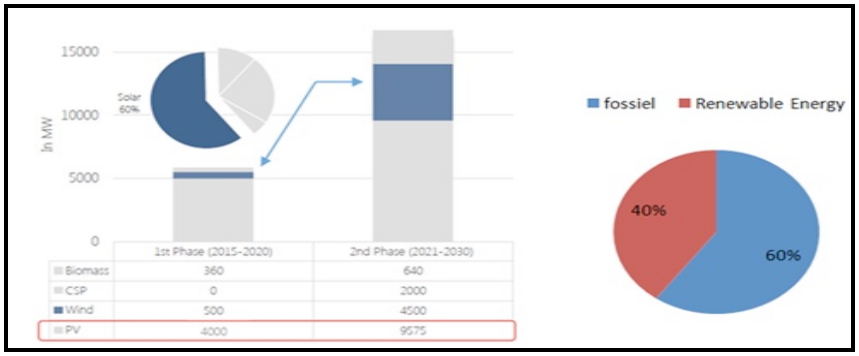

Figure 5 New RE program the year 2030.

The vision of the Algerian government is based on a strategy centered on the RE production of 22 GW in outlook 2030(Bakli & Tell Group, 2016), as mentioned in table 4.

Initial Renewable Energy plan	2030 Targets
Solar PV	13.5 GW
Solar CSP	2 GW
Wind	5 GW
Biomass	1 GW
Total	**22 GW**

Table 4 Initial RE plan 2030.

III.2 State of projects electricity generated by RE in Algeria

III.2. 1 Installed renewable power capacity evolution in Algeria from 2000 to 2017

Electricity production in Algeria is predominantly dependent on fossil energy, especially natural gas, contributing with 94.5% in 2010, followed by 5% hydropower and 0.5% of solar energy (League of Arab states, 2010). As shown figure 6, over the past decade, a reducing 93% recorded in 2015 in the generated electricity dependence by gas either a decrease of 1.5% replaced by 3.4% in RE production.(Grigorjeva, 2016)
The below figure shows that there is a trend towards diversifying the sources of electricity generation by focusing on other sources of RE, other than hydropower, especially wind energy and solar energy.

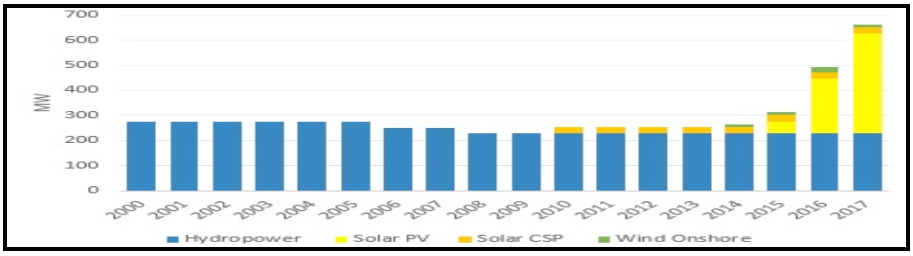

Figure 6 Installed Renewable Power Capacity in Algeria (2000-2017)

-For the solar energy: it was only in 2011, where exploited the solar energy as a sources of RE in Algeria, although Algeria has one of the highest solar potentials in the world with 86% of territory covered by the Sahara desert. Algeria provides for 25000 to 3600 annual sun hours, the corresponding average solar radiation equals to 2000kw/m^2 (Grigorjeva, 2016)
-For the wind energy: energy has entered into use as of 2014. Following the five-year plan (2010-2014), focusing on supporting the activities of local wind power units.

A 50% integration rate is the objective to attain for the 2014-2020 periods. This period will be marked by the following action(Stambouli et al., 2012):
-Development of a wind tower and turbine rotors production plant;
-Promotion of a national subtracting network for the manufacturing of the nacelle equipment;
-Development of engineering activities and design, procurement and construction capabilities to enable Algerian companies to achieve an industrial capacity rate of at least 50%.

III.2.2 RE Production in Algeria in 2017 and Installed Capacity

III.2.2.1 RE production in 2017

Figure 10 showed that during the year 2017 Algeria installed about 435.2 MW RE capacities with an increase of 37.55% compared to the year 2016, distributed as follows:

-425 MW generated from solar energy representing 64.10% of the total RE, where 400MW generated by PV solar capacity and 25 MW generated by concentrated solar power capacity (CSP);
-10.2 MW wind power capacity, representing 1.5% of the total RE.

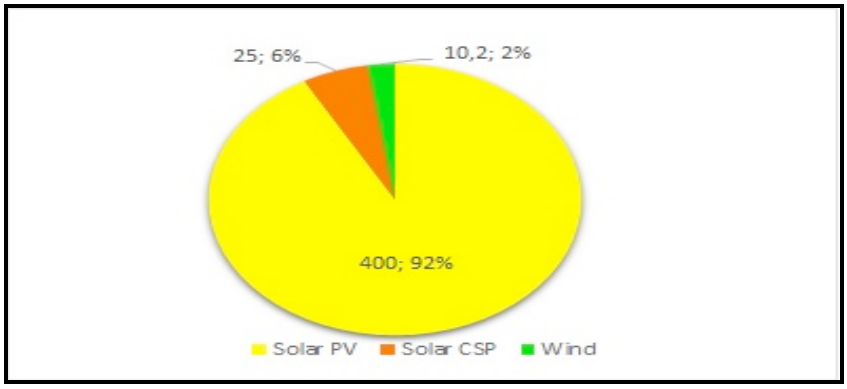

Figure 7 renewable energy production estimates in year 2017.

III.2.2.2 Installed Capacity

These capabilities distributed throughout the national territory. As showed figure 8, Algeria has used all of its territories for the installation of RE projects, whether to the north, south, east or west. Although Algeria was suffering from an economic crisis due to mow oil prices, during the period 2014-2015, who reached in the $40.68 (Boudia et al., 2017). This has led Algeria to apply economic austerity and political freeze leading the delay and the abolition of some projects programmed into RE.

This explains the delay in 2015 in the realization of 652 MW of RE projects, by the achievement; only of 435.2 MW in 2017 is a delay of 214.8 MW such as Guelma's projects geothermal power, Khenchela's wind power. Other projects have been delayed in the application such as SPP II in Elmeghier & SPP III in Namaa, SPP IV in Hassi Raml and others have been totally canceled like the Desertec project as mentioned in table n 5

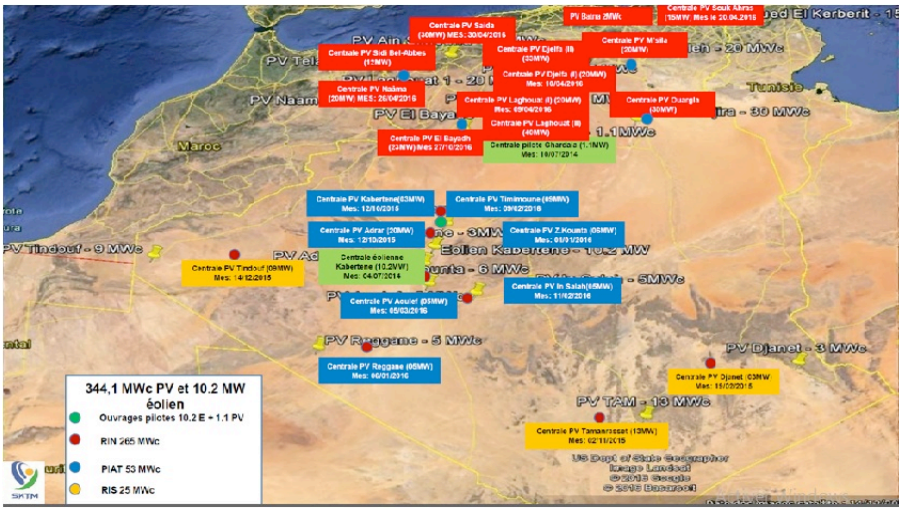

Figure 8 all RE Capacity Installed in Algeria in 2017.

III.3 Cancelled RE projects

We expose the projects launched but cancelled afterwards. This explains the main cause of the delay of the objectives announced by the Algerian government, to generate 650 MW of RE projects in 2015. Table 5 summarizes these projects. The table below clearly shows the many projects that are beings completed, but with a delay in implementation, this has led to the interruption of the Algerian state's objectives in this energy field. In addition, there are projects that have been cancelled in this area including the Desertec project that could have brought Algeria a very important economic wealth with a solar energy production capacity of 20 GW in the year 2020 and 100 MW for the year 2050. The reason for the abandonment of this project is due to its high cost, which coincides with the austerity policy imposed by the Algerian government. This termination allowed Morocco to adopt this project.

	Projects under construction & planned for construction & which were canceled			
	RE Technology – Projects	Places	MW	Established by
planned for construction				
2012	SPPII	Elmeghier (eloued)	80 MW	Public sector
	SPPIII	Nama	70 MW	
	SPP IV	Hassi Raml	70 MW	
	Eloued	Eloued	150 MW	
Projects under construction				
15/10/2012	Construction of a renewable plant one station for the solar PV.		7 MW 2 MW	Signed between Algeria signed between Algeria and Germany

2014	4 stations for the production of solar electricity	Saida	30 MW	German company & NERA
		Naima	20MW	
		Elbaid	23MW	
		Sidi Bellabs	12MW	
2016	Series of 6 projects Algerian solar thermal plant	Sahar & south west & Great Algerian south	1350MW	-
2020	27 new projects of the PV sector	most important plant in Dejlfa	638 MW	German & NERA
	Geothermal Wind	Guelma Khenchela	5MW 20 MW	-
Project which were canceled				
13/04/2009	Desertec project	Sahara Desert	20 GW in 2020 100GW in2050	Algeria by Siemens Garman-canceled -

Table 5 RE projects under Construction & cancelled project

Conclusion

The article entitled electricity generation from renewable sources, Algeria cases (situation and prospect), has meant to answer the main question "**what is the current and future RE policy in Algeria and what are its capabilities?** The data of this research shows clearly the political will of Algeria to the encouragement of their own energy production supported by publication of several laws and legal decrees started by the law carrying the control of energy under n°99.99 of July 1999 followed by other laws until this day. This new energy policy has also allowed the creation of several institutions operating in the field of RE such as (CREAD, URAER, NEA) in order to implement the national program of RE- launched in 2011 outlook to 2030.

It reveals from this study that Algeria benefits thanks to its geographical location, from the climate point of view and territory, of great potential in RE focused on solar and wind energy. This advantage allowed it to be in 3rd place in renewable power capacities in Arab world after Morocco and Egypt. This observation makes it possible to respond negatively to the first secondary question, which states, "**effectively owning potential renewable resources will allow for the development of RE production".** In the case of Algeria, despite its RE potential; this advantage does not allow it to develop this field properly. RE production in Algeria, remain very modest, due to several reasons. A deficiency of mastery in RE technology. A lack of appropriate support for projects programmed in RE such as (SPPII, SPPIII, and SPPIV). a lack of political discernment to lead RE projects, a marginalization of human experiences in energy economy due to a gap of awareness of the economic and

financial benefits in this field, as well as a limitation of the RE sector in a secondary branch at the level of the Ministry of environment and renewable energies.

The reasons cited above also makes it possible to respond negatively to the second question, that **"Owning RE technologies will allow the evolution of cleans energy production?".** In the case of Algeria, its late master degree in RE technology did not allow it's, to promote and develop this field such as developing countries, preferring to remain dominant in fossil fuel technology. As a result, this leads to negative answers to the third question that "**Owning fossil energy and mastering its technology can promote its own production of clean energy**". Algeria is a country based economically on oil revenue, mastering the fossil fuel technology perfectly since more than 50 years of activity, it did not knew to exploit this advantage for the benefit of investment development in RE especially in the boom oil price's period recoding more than $120/barrel. On the contrary, this advantage has weakened the political will in the investment of the projects in RE that needed an appropriate budget.

Despite the blatant delay of Algeria in the clean energy production dominated by fossil production, it nevertheless records a significant evolution of 187% in RE production with hydropower in 2017 compared to the year 2008, following the statistics of IRENA 2018. Notwithstanding for what has been developed, Algeria aims in the future by its geographical advantages and their potential in renewable energy in order to reach the objectives of the national energy program 2030, which aims realize 22 GW generated by RE representing so 40% of energy production.

References

Abderrahmane, Mghazi, S. M. (2018). Strategy for the Promotion of Renewable Energies in

Algeria as an Imperative to Meet the Limits of Fossil Energy and Achieve Sustainable Development, 1–24. https://doi.org//llal/wp-content/uploads/sites/23 April 2018

Bakli, M., & Tell Group. (2016). Algeria Energy Transition, (November).

Boudia, Mounya. Fakhari, Farouk. Zebiri, N. (2017). The current economic crisis in Algeria between the fluctuations of oil prices and the exploitation of the potentialities available for the realization of the economic take-off - analytical study -. *Journal of Economic & Financial Research*, *4*(2), 882–904.

Buckley, T., & Nicholas, S. (2017). China's global renewable energy expansion: How the world's second biggest national economy is positioned to lead the world in cleanpower investment.
Institute for Energy Economics and Financial Analysis (IEEFA).
https://doi.org/http://ieefa.org/wp-content/uploads/2017/01/Chinas-Global-Renewable-Energy-Expansion_January-2017.pdf.

CDER(Centre de développement des énergies renouvelables). 1990, unité de développement des équipements, électro-Solaire, Bouzereah, Alger ,.
https://www.cder.dz/spip.php?rubrique87

CDER .(2017) : https://www.cder.dz/spip.php?rubrique87

CDER .(2017):https://www.cder.dz/spip.php?article1331

CDER .(2017): https://www.cder.dz/spip.php?article1329

CDER .(2017) : https://portail.cder.dz/spip.php?rubrique57

Global.B.P. (2017). BP Statistical Review of World Energy 2017. *British Petroleum*, (66), 1–52.
https://doi.org/http://www.bp.com/content/dam/bp/en/corporate/pdf/energy-economics/statistical-review-2017/bp-statistical-review-of-world-energy-2017-full-report.pdf

Grigorjeva, J. (2016). Starting a new Chaoeter In EU-ALGERIA Energy Relations, A Proposal For A Targeted Cooperation. *Affiliate Fellow at the Jacques Delors Institut-Berlin, Policy Paper*, (173), 1–18.

Guerri, O. (2008). Recherche et Développement L'Energie éolienne en Algérie : Un bref aperçu, (5), 6–7.
https://doi.org/https://www.cder.dz/vlib/bulletin/pdf/ber37_6_7.pdf.

Hirst, E. A. & D. (2015). Paris climate change conference, (December). Retrieved from http://unfccc.int/meetings/paris_nov_2015/meeting/8926.php

League of Arab states, A. U. of E. (2010). Arab Strategy for the Development of Renewable Energy Uses 2010-2030, 1–91.

Maged Mahmoud, Nurzat Myrsalieva, Mariam El Forgani, Hamza Bouadane, L. S. (2016). Arab Future Energy Index™(AFEX) Renewable Energy 2016. *Regional Center for Renewable Energy and Energy Efficiency (RCREEE)*. Retrieved from http://www.arabstates.undp.org/content/dam/rbas/doc/Energy and Environment/UNDP 2016 AFEX Energy Report (draft-7Oct).pdf

ME. (2016). Energies Nouvelles, Renouvelables et Maitrise de l'Energie. *Ministère de l'énegie*, 1–25. Retrieved from www.energy.gov.dz/francais/uploads/.../energie-renouvelable.pdf

MEM. (2012). Le Programme des Energies Renouvelables et de l'Efficacité Énergétique. Retrieved from http://www.memalgeria.org/francais/index.php?page=le-programme-des-energies-renouvelables-et-de-l-efficacite-energetique

Missoum, M. (2015). Contribution of high-energy performance housing using solar energy in the sustainable development: case of Chlef district (Doctoral dissertation, Hadj-arab Amar). Retrieved from http://www.memalgeria.org/larevue/the_mag/energie_2-eng.pdf

Mouissi, M. (2016). Afrique: Classement des pays producteurs de pétrole. Retrieved from https://www.mays-mouissi.com/2016/02/23/afrique-classements-des-pays-producteurs-de-matieres-premieres/

Pescia, D., & Energiewende, A. (2016). New renewable energy policies in Germany and their perspectives. *Revision 2016 Conference (JREF)*.

Sawin, J. (2017). *Renewable Energy Policy Network for the 21st Century Renewables 2017 Global Status Report*. *REN21 Secretariat: Paris, France, 1-302* (Vol. 72). REN21 Secretariat: Paris, France, 1-302. https://doi.org/10.1016/j.rser.2016.09.082 Sawin, J. L., Bhattacharya, S. C., Galan, E. M., McCrone, A., Moomaw, W. R., Sims, R., …

Sverrisson, F. (2012). Renewables 2012 Global Status Report. REN21 Secretariat, Paris. *Ren21*, 1–172. Retrieved from http://www.ren21.net/REN21Activities/GlobalStatusReport.aspx

Semrouni, G. (2007). les énergies renouvelables les filières développées en Algérie. *Ministère de l'Energie et Des Mines*, 1–23. Retrieved from https://www.solarwirtschaft.de/fileadmin/media/pdf/algerien_2007/Ministre_de_lEnergie_et_des_Mines_G._Semrouni.pdf.

Stambouli, A. B., Khiat, Z., Flazi, S., & Kitamura, Y. (2012). A review on the renewable energy development in Algeria : Current perspective , energy scenario and sustainability issues. *Renewable and Sustainable Energy Reviews*, *16*(7), 4445–4460. https://doi.org/10.1016/j.rser.2012.04.031.

Contact email: amekhelfi@gmail.com