



**TECHNOLOGIES OF RENEWABLE ENERGY IN THE ARAB WORLD BETWEEN THEORY AND PRACTICE THE ALGERIAN FACT ANALYSIS.**

**Dr. Kafi Farida<sup>1</sup> and Dr. Benkaddour Ali<sup>2</sup>**

<sup>1</sup>Mila University Center, Algeria

<sup>2</sup>University of Saida, Algeria

**Abstract:** - Technological and scientific progress imposed the world economies, and particularly the Arab ones including the petroleum countries which rely on Fossil energy in the production, to tend towards new resources of renewable energy. This is mainly because it is, nowadays, the best choice due the high prices of fossil fuel, and its depletion over time because of the increasing demand. In addition to its resulting environmental effects, the world countries, including Arab ones are asked to use renewable energy more broadly in various fields as it is a futuristic durable, clean and unpolluted source of energy.

Being the main factor of Sustainable development, renewable energies put the Arab countries under the pressure of studying and discussing them from many points of view to come to the best solutions to provide renewable energy from different available sources, and remove all obstacles that prevent their success in these countries. This study aims at exposing the reality and facts of renewable energy industry in Algeria; this rich country of resources mainly the solar energy.

**Keywords:** fossil fuel, renewable energies, the Arab countries, Algeria.

**Introduction:** Energy is an everlasting essential issue needed in human activities especially when seeking for new resources to face the growing needs and ambitious plans of development. Many countries including Arab ones used fossil fuel during the last few years to produce energy, which has created a lot of related issues and

problems such as the fluctuation of energy prices, exhaustibility and environmental problems among which are global warming, the ozone hole, the acid rains and the environmental pollution. Consequently, all the countries including Arab ones are concerned to work seriously to find substitute, sustainable and echo-friendly resources. These features are found in renewable energies; they would decrease the use of classic energies and alleviate the pressure on environment.

For that, all Arab countries including Algeria are concerned by the exploitation of renewable

**For Correspondence:**

farida.doctora@hotmail.fr.

Received on: July 2017

Accepted after revision: September 2017

Downloaded from: [www.johronline.com](http://www.johronline.com)

energies as long as they are resource-enriched countries to maintain a sustainable development. In this paper, we discuss the possibility and the importance of adopting the industry of renewable energies as well as the associated technologies in the Arab countries. As an attempt to present an overview of the facts and perspectives of renewable energies in Algeria, this research paper deals with the following problematic: to what extent the industry of renewable energies is developed in Arab countries? And to what extent Algeria is exploiting this industry?

**The Importance of the Study :** This study aims at answering the raised problematic which come to shed some light on the dimensions of renewable energies in Arab countries as well as the added value that Algeria will gain by developing these renewable energy resources, in accordance with objectives of sustainable development. The study will also show the advantages of renewable energies like being inexhaustible, clean and eco-friendly. They lessen the dependence on classic sources of energies and preserve them to the upcoming generations.

### **First: The Economies of Renewable Energies Resources in Arab World**

**1- The definition of renewable energies :** The world concern, nowadays, aims at diversifying and renovating energy resources especially the renewable ones (such as sun, wind and water resources), in order to reduce dependence on classic energy resources that are supposed to be exhausted, and to face environmental threats. Renewable energy resources are exploitable continually and repeatedly without being depleted. It is what we gain from energy flows that exist automatically and periodically in nature.<sup>(1)</sup>

It's meant by renewable energy the electricity produced from the sun, the wind, the biomass, the water and the geothermal heat as well as biofuels extracted from renewable sources<sup>(2)</sup>. Or it can be defined as natural inexhaustible resources available in nature whether limited or

unlimited, but renewable and clean and causes no environmental pollution<sup>(3)</sup>. Renewable energy means the energy that comes from the nature activities that occur repeatedly<sup>(4)</sup>. So, its sources are sustainable, inexhaustible, and moreover clean and environmental friendly like the sun energy which is the principal one besides wind, tide and wave<sup>(5)</sup>.

### **2 - The Resources of Renewable Energies in the Energy Balance of Arab Countries:**

**a) Water Energy:** Water energy generating is limited in using some water falls in few Arab countries, that's why it contributes in a limited way in the production of power energy. The water power is estimated by 9581 Megawatt, and produced mainly in Egypt, Iraq, Morocco and Syria with about 7% of power producing capacities in Arab world. Since water resources are scarce and limited, except for Marwa dam project in Soudan (1250 Mw), the water energy in Arab countries is decreasing more and more.

**B) Wind Energy:** Wind power in the Arab world is concentrated mostly in North African countries. According to wind power plants map of 2008, Egypt, Morocco and Tunisia are leading the Arab countries with a total of 430 Mw, 124 Mw and 20 Mw respectively. The contribution of wind power is estimated by 0.35 % of the total power producing capacities in Arab countries which is really a small and limited contribution. Many countries have taken positive measures by adopting ambitious plans to increase reliance on wind energy. In February 2008, the High Council of Energy in Egypt approved a new strategy of energy relying mainly on the participation of the private sector's investments in the sector by creating wind power farms to boost total capacities to 7200 Mw producing nearly 12 % of total energy power by 2020.

In Morocco, the government targets to implement 600 Mw of wind turbines by the year 2015; while the government in Jordan plans to install 600 Mw of wind energy farms before 2020.

Moreover, the United Arab Emirates is tending towards huge and concentrated investments in many Arab and foreign countries. Libya has signed two contracts to import 240 Mw to reach a total power of 1000 Mw by the year of 2020. Saudi Arabia as well is preparing an important study about the establishment of two wind power farms; the first in YANBAA city with a capacity of 20 to 40 Mw, and the second in ZALIM city with a capacity of 10 Mw. Many other Arab countries like Soudan, Yemen and Syria are studying their sources of wind power in order to set objectives that matches their potential. A lot of Arab countries have natural potential that allow them to use wind power on a commercial scale.

**c) Solar Energy :**All Arab countries have a great rate of sunlight availability that reaches 4 to 8 Kw-h/m<sup>2</sup>/day. Moreover, the intensity of direct sunlight is between 1700 to 2800 Kw-h/m<sup>2</sup>/year, which explains the spread of solar energy use in house water heating, and some leading projects of water desalting in Syria, Lebanon, Palestine, Jordan and Egypt. Likewise, there are many companies producing solar water heating systems; In Jordan, there are more than 25 companies producing 4000 solar heating systems each year and in Palestine, solar heating systems are used in 70% of the house, while Egypt has launched some leading projects in solar heating systems of average degrees varying between 80 to 150° and try to recover some missing heat with the help of some foreign companies. Tunisian experience in solar heating is unique. It's one of the leading experiences in Arab countries since it launched with the Global Environment Facility and the Belgian government a program to support the use of solar heaters in 2003. Since then, it had been widely spread in many sectors which helped adopting this industry there. The Jordan Kingdom intends to increase the use of solar water heaters in houses to 50 % by the year 2020.

The most important progress in using the solar system in Arab countries is putting the systems

of solar thermal electricity generation in action. Egypt started assembling a solar thermal station with a capacity of 140 Mw and intends to link it with the local electricity network by the end of 2010. And in Morocco, they are installing a similar station with a capacity of 470 Mw including 20 Mw of solar energy. while in Algeria a 100 Mw station is being installed, similarly in Kuwait where a techno economic study was carried out to set up a Solar thermal station with a capacity of 280 Mw in which the solar component capacity is about 60 Mw. in UAE, Abu Dhabi company for Futuristic Energy known as "Masdar" is discussing the possibility of establishing a techno-economic study to build solar stations to produce power with a capacity of 500 Mw within or outside the Arab countries. In Libya, a plan for a 60 Mw solar thermal station has been carried out. Similarly, Egypt is intending to build solar stations with a capacity of 50 Mw in the south of the country .

**D) The Biomass :**The biomass is considered as one of the energy resources that have been used during the last few centuries, especially before discovering oil. The biomass is composed of plant material (Such as crop residues, wood, animal dung ... etc.). In the Arab countries, the use of the biomass is concentrated mainly in Morocco in which biomass represents the third of primary energy demand. It is widely used in villages and isolated areas, knowing that morocco makes nearly 8000 tons daily of waste and about 1.1 million cubic meter of Wastewater, most of it is being treated and filtered intensely to be reused in those areas.

Egypt's New & Renewable Energy Authority owns many plants of biomass. It's conducting many research projects with the Scientific Research Academy to develop the biomass industry and to use it safely and rationally. <sup>(6)</sup>

**3- Investment in Renewable Energy in Arab World :**Investment in renewable energy in the Arab countries is still modest, knowing that Arab countries are resource-rich countries. A report of the Arab Forum for Environment and Development (AFED) in 2011, confirmed that

the Arab world has a total hydro electric capacity Of 10.7 Mw. there are now hydroelectric stations in Egypt and Iraq and stations of different capacities in Algeria, Jordan, Lebanon, Mauritania, Morocco, Soudan, Syria and Tunisia. Many Arab countries are qualified to benefit from wind power that has an average speed of 11.8 m/s in Suez bay in Egypt, and 7.5 M/S in Jordan which makes these two sites suitable to produce electricity power from wind. This is also true for other areas in Morocco, Syria and other Arab countries. Concerning benefiting from solar energy, a great part of the Arab world is situated in what is called Sun Belt which captures mainly intensified energy sunlight on the planet surface (concentration of light and heat). The sun energy resources vary between 1460 and 3000 Kw/h/m2/year in Arab countries.

Currently, the biggest photovoltaic project in Arab world is implemented in Morocco where about 160 000 solar energy systems were installed in 8 % of countryside houses with a total capacity of 16 Mw. In Tunisia the Photovoltaic pump applications have been relatively developed to reach a maximum capacity of 255 Kw. Meanwhile solar water heaters have become market-penetrating products mainly in housing and business sectors in Egypt, Jordan, Syria, Lebanon, Morocco and Palestine. What is worth mentioning is that solar water heaters are used the most in Arab countries. Some Gulf and North African countries are occupying large surfaces of desert lands, which are continuously exposed to sunlight. However, Saudi Arabia for example produces less than 3 Mw of photovoltaic energy, and a total capacity of 10 Mw in UAE due to limited exploitation.

The use of solar energy by consumers in Arab countries is limited for water heating and public gardens lighting. But some big future plans and projects are being drawn by governments to produce electricity from solar energy for commercial use like in Egypt, UAE and Bahrain. Saudi Arabia is currently the only Arab

country to use solar energy in sea water desalting<sup>(7)</sup>.

**Second: The cost of Fuel Energy production compared to fossil energy in Arab countries and their industry future in Arab countries.**

**1- The cost of Fuel Energy production compared to fossil energy:** The cost of renewable energy production through different technologies is illustrated in the following figure. It is necessary, before evaluating the costs, to comprehend the use of this renewable energy, as well as areas in which it is supposed to be used. Is it a distant and an isolated place, or an area within a city? The daily operating time should also be known, besides the need to save energy, and the necessity for maintenance. It is well known that most Arab countries subsidize prices of electricity produced from oil sources. So, these subsidies should be taken into account when comparing the cost of electricity generation and the use of renewable energy.



**Figure 01: Electricity-Generating Costs of Renewable Energy Technologies, 2002 and 2030**  
**Source:** World Economic Outlook (WEO), 2004.

When all these factors are taken into account, comparisons may take place and the most suitable energy resource could be chosen. The cost may, then, decrease significantly. According to this figure, an important decrease of costs is noticed by the year 2030 compared to 2002. However, with all the progress, operation costs, in the case of renewable energy, become relatively small. This is due to the absence of a fuel cost. The cost is, however, still high when compared to the traditional ways of electricity

generation. The cost of energy generation from the wind (the lowest costs of renewable energy generation varies between 4 and 5 cents to the Kilowatt/hour, while its cost with gas turbines doesn't exceed 3 cents, and 2 cents. The costs of 1 Kilowatt/hour can reach high levels about 30 cents when the light cells are used. The following table illustrates the cost differences between different renewable energy techniques, taking into account the cost of traditional and nuclear energy.

**Table 01: Comparison between the costs of renewable energy, fossil fuel and nuclear energy.**

Technology	Current cost (U.S. cents/kWh)
<b>Biomass Energy:</b>	
Electricity	5-15
Heat	1-5
<b>Wind Electricity:</b>	
On shore	3 - 5
Off shore	6 - 10
<b>Solar Thermal Electricity (insolation of 2500kWh/m<sup>2</sup>per year)</b>	12-18
<b>Hydro-electricity:</b>	
Large scale	2-8
Small scale	4-10
<b>Geothermal Energy:</b>	
Electricity	2-10
Heat	0.5-5.0
<b>Marine Energy:</b>	
Tidal Barrage (e.g. the proposed Severn Barrage)	12
Tidal Stream	8-15
Wave	8-20
<b>Electricity grid supplies from fossil fuels (incl. T&amp;D)</b>	
Off-peak	2-3
Peak	15-25
Average	8-10
Rural electrification	25-80
<b>Natural Gas</b>	2-4
<b>Coal</b>	3-5
<b>Nuclear Power</b>	4-6

source: [http://www.imc.egypt.org/studies/FullReport/Renewable20Energy%20Development%20Strategy\\_AR.pdf](http://www.imc.egypt.org/studies/FullReport/Renewable20Energy%20Development%20Strategy_AR.pdf)

According to this table, the cost of renewable energy is still high compared to fossil fuel

energy. Thus, the use of renewable energy technology faces many obstacles that appear in the operating cost besides the important investments required to cover these costs. Regarding costs, Arab countries, mainly those rich in oil ones, are not ready to switch to renewable energies. The decrease in the traditional fuel prices compared to the high cost of renewable energy does not encourage its use. Moreover, the lack of supporting policies and legislations, and the lack of infrastructure to use it represent the most important obstacles that face investments in this field. For this reason, oil remains the main natural resource in the Arab world, due to the massive reserve capacity.

## 2- The Future of Renewable Energy Usage in the Arab Countries:

Expectations of the Arab Union of Electricity indicate an annual rate of the electricity energy growth of about 6% for the period of time between 2010 and 2020. The same expectations refer to an average demand of 4.5% between 2020 and 2030.

Some Arab countries have set their future goals to share the renewable energy in the electrical energy networks. These shares range between 1% and 25 % as a portion of the electrical energy produced in these countries or as a proportion of the primary energy as shown in the following chart:

**Table 02: futuristic goals to integrate the renewable energy into electricity networks in the Arab countries.**

Country	The scope and objectives	The objectives
Jordan	2020	10% of the primary energy
Emirates (Abu Dhabi)	2030	7% Of electrical energy
Tunisia	2014	4% of the primary energy
Algeria	2030	10% Of electrical energy
Sudan	2011	1% Of electrical energy

Syria	2030	4% of the primary energy
Kuwait	2020	5% of electrical energy
Lebanon	2020	12% of the electrical and thermal needs
Libya	2020 2030	10% of the electrical energy 25% of the electrical energy
Egypt	2020	20% of the electrical energy
Morocco	2020	42% of the electrical energy

**Source:** <http://www.arabmonetaryfund.org>: browsed on 18/12/2012.

**Phase one:** The Renewable energy system for the period between 2010 and 2020: the participation of the renewable energies in the production of electrical energy is estimated to reach 5.1%. The majority of this rate will be from wind energy followed by water energy then small rates of Sun energy and biomass.

**Phase two:** The Renewable energy system for the period between 2020 and 2030:

The participation of the renewable energies in the production of electrical energy is estimated to reach 2.3% only in this second phase. Except for three Arab countries (Libya, Syria and Emirates), there is no strategic objectives in the Arab world until 2030. These countries, who revealed their objectives until 2020, should set up further objectives until at least 2030.

**Third: An analysis of the renewable energy industry in Algeria.**

### 1- Why Algeria should develop renewable energy despite its richness of fossil fuel?

There are several reasons to start caring about this issue:

- To protect the national economy from crises caused by Fluctuations in the prices of traditional fuels.
- Algeria enjoys adequate geographical and weather features. It has a huge capacity of solar energy production since it possesses the highest solarization rates with over 3000 hours a year, in addition to the possibility of

traditional energies depletion under the rapid demographic growth.

- The amount of generated power produced till now does not satisfy the futuristic demand. For that, renewable energy can play a crucial role to meet the growing need which causes frequent power outages during summer due to the high demand on electricity.
- Renewable energy contributes to the reduction of greenhouse gases and that causes climate change. It can help solve many other environmental problems such as pollution and deterioration of the quality of life;
- Energy sources can reduce the quantity of oil and gas used for the production of electrical energy, which can be used in other fields that can be more profitable. Thus, Surpluses may be provided for export since gas and oil are depleted through time.
- Renewable energy projects can help make the amount of exported gas and oil bigger. This can fix Algeria's position between the energy exporting countries.
- Renewable energy can contribute to economic diversity, by providing new job opportunities and a clean and technologically developed environment.
- The importance of the Algerian market in this field is the main reason why the European countries are racing each other to win some partnership opportunities in the investment and the development of renewable energy.<sup>(8)</sup>

## 2- The Fact of Renewable Energy in Algeria.

### 2.1. National capacities of renewable energies.

Among the features that distinguish Algeria are its location and its energetic capacities. This country which is an important producer of energy resources is moving towards a new phase of producing and exploiting renewable energies for export to Europe in the next few years. This step may reinforce Algerian position as an important producer of energy. It is benefiting from the strategic location that enjoys important amounts of sun that constitutes a huge source of energy that exceeds 5 billion

megawatts-hours a year illustrated in the following chart:

**Table 03: The distribution of the solar capacities in Algeria.**

Region	Coastal places	highlands	The Sahara
Surface %	04	10	86
Rates of Day light hours (hour/year)	2650	3000	3500
Rates of the obtained power (kilowatt/M <sup>2</sup> /year)	1700	1900	2650

**Source:** ministry of energy and mines. A guide to renewable energy. Algiers, 2007, p39.

The solar capacity is the biggest in Algeria and the most important in the Mediterranean basin.

169440 terawatt-hours/year.

5000 times the Algerian consumption of electricity.

60 times the consumption of the European Union countries estimated at about 3000 terawatts-hours a year.

**Future energy rates in kilowatts-hours/M2/year:**

The coastal regions: 1700.

The highlands: 1900.

The Sahara: 2650.

**Wind Energy:** The wind in Algeria is variable from one region to another due to the topography and the climate variety. In fact, Algeria is divided into two geographic regions: a northern region and a southern one; this latter is characterized by a high wind speed mainly in the south west, with a velocity of more than 4m/s and exceed 6m/s in the region of Adrar.

**Groundwater Energy:** Algeria contains more than 200 sources of mineral spring water. The temperature of such sources exceeds 40°, and the hottest one is Hammam El Meskhoutine with more than 96° Celsius.

**Hydroelectric energy:** The irrigation capacity of the total production of electricity is only 5%, i.e. 286 megawatts. The cause of this weak capacity is the few number of irrigation sites that are not well exploited.

**2.2. The Outcome of the renewable energy’s technology exploitation:**

Within the framework of cooperation, research and realization is carried out by a team of engineers specialized in renewable energy, characterized by durability and effective contribution in the futuristic national energy budget which can substitute by traditional energy. This policy must cover all the economic and social needs of the inhabitants from using solar as well as wind energy.

The following table illustrates the distribution of energy in Algeria according to the zones and resources.

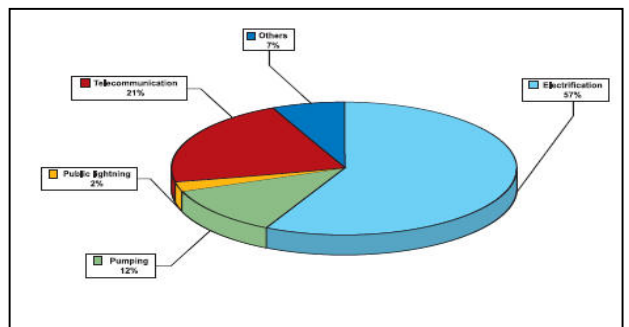
**Table 04: Distribution of renewable energy capacity in Algeria according to its usage.**

Field of Application	Power (kilowatt peak)	
Electricity supply	1353	
Pumping	288	
Street lighting	48	
Communication	498	
Others	100	
<b>Total</b>	Solar source 2280	Wind source 73
	2353	

**Source:** ministry of Energy and mines. Op.cit. pp 53-54.

According to the table, we notice that a rate of 57% of the energy was used in electricity supply and 21% to communication, while it reached 288 kilowatt-hours; 12% for water pumping operations. The proportion Allocated to street lighting projects was limited to 09% of the total power production.<sup>(9)</sup>

**Figure 02: Distribution of the existing Power according to the application/usage**



**Source:** ministry of Energy and mines. Op. cit. pp 53-54.

### 3- Plans for the development of renewable energy Usage in Algeria:

Algeria has paved the way for dynamism of clean energy by launching an ambitious program to develop renewable energy and energetic efficiency. The vision of the Algerian government is based on a strategy of valorizing the Inexhaustible resources of energy such as solar ones, and diversifying them in the future. Thanks to the integration between initiatives and skills, Algeria intends to be part of the new world of sustainable energy.

The core of this program is the establishment of renewable assets of about 22.000 megawatt during the period from 2011 until 2030, including 12.000 megawatt to cover the national demand of electricity and 10.000 megawatt for exportation.

The program of renewable energy in this period includes the implementation of (60) Solar photovoltaic and Solar thermal Stations, wind energy fields, and hybrid stations.

The completion of renewable energy projects to produce electricity for the internal market will be on three phases:

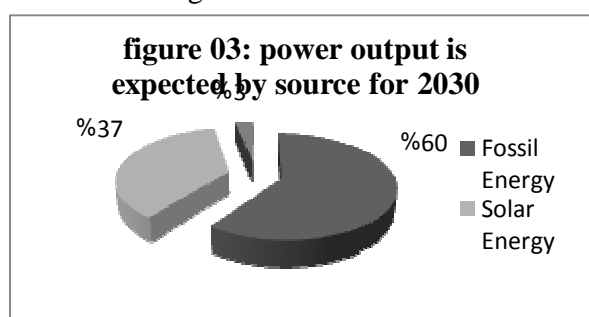
✓ **Phase one:** between 2011 and 2013. It is devoted to the pilot projects to choose the different available technologies.

✓ **Phase two:** between 2014 and 2015, and will be for the proceeding in the program's implementation.

✓ **Phase three:** between 2016 and 2020, and will be for wide deployment of the program. The aforementioned phases represent the Algerian strategy that aims at a real development of the industry of solar energy, alongside with a training program and knowledge compilation to allow benefiting from the local Algerian skills and the Consolidation of real efficiency, particularly in the field of engineering and projects management. The program of renewable energies intended to fulfill the needs of the national market, allow creating thousands of direct and indirect employment opportunities. In fact, Algeria intends to opt for the renewable energy in order to find total and permanent solutions to the

environmental challenges and problems in maintaining the energy resources from fossil assets.

This strategy is encouraged by the overall potential for solar energy, which is the main focus of the program devoted to solar, thermal and photovoltaic energy as a considerable share. The production of solar energy in 2030 will be more than 37% of the total national production of electricity. Despite the fact that wind energy is weak, the program doesn't exclude it, it rather represents the second axis of the development. Its share must be about 03% of the total nation production of electricity in 2030 as illustrated bellow in the figure:



**Source:** this is the research of the author based on the program of renewable energy and energy efficiency, Mach 2011, ministry of energy and mines.

According to the figure, the rate of energy derived from renewable resources by the year 2030 will be mostly solar. This is mainly due to the interest of the country about this resource and being a country that enjoys the most important solar capacity in the Mediterranean region.

The Algerian renewable energy program is defined as follows:

**In 2013:** The expected capacity is estimated at 110 megawatt.

**In 2015:** the expected capacity is estimated at 650 megawatt.

**Towards 2020:** A capacity of 2.600 megawatt is expected. 2.000 megawatt will be provided for exportation.



**In 2030:** An expected capacity of 12.000 megawatt is estimated for the national market, and 10.000 megawatt for exportation.<sup>(10)</sup>

The renewable energy program is focusing on the development of both kinds of solar energy: photovoltaic and thermal, as well as the wind energy as illustrated bellow.

**Table 05: Wind and Solar Energy in the light of renewable Energy program in Algeria.**

Kind of energy	Years from 2011 to 2020		Years from 2021 to 2030	
<b>Photovoltaic solar energy</b>	Realization of Projects with a capacity of:	800MW/ year	Realization of Projects with a capacity of:	200 MW/ year
<b>Thermal solar energy</b>	<b>2011-2015</b>		<b>2021 to 2023</b>	
	Realization of two projects	150 MW is the capacity each one	Realization of some projects	500 MW/ year
	Realization of a hybrid gas/solar plant	150 MW from which 25 MW are solar energy		
	<b>2016-2020</b>		<b>2021 to 2023</b>	
	Realization of four projects with storage	1.200 MW	Realization of projects with a capacity of:	600 MW/ year
<b>Wind energy</b>	<b>2011-2013</b>		<b>2016 to 2030</b>	
	Realization of the first wind plant	10 MW	Realization of projects with a capacity of:	1.700 MW
	<b>2014-2015</b>			
Realization of the two wind plants	20MW			

**Source:** this is the research of the author based on the program of renewable energy and energy efficiency, Mach 2011, ministry of energy and mines.

**4- The national policy for the development of renewable energy and its technologies:**

**4.1. Research and development:** Algeria has opted for the path of scientific research to develop the renewable energy program, and make it a real incentive to promote national industry and valorize other resources (human, material, scientific, etc...). Scientific research is an essential element of technologies acquisition, knowledge development and energy efficiency improvement.

- Centre for Development of Renewable Energy (CDER)
- Solar Equipment Development Unit (UDES)
- Unit of Selenium Technology Development (USTD)
- Unit of Applied Research in the field of renewable energy (URAER)

- Algerian government created also the “Algerian institute of renewable energy” (IARE)

**4.2. The legal framework:**

Algeria is aware of the growing importance of renewable energies and their issues, that’s why development of these energies has been integrated in its energy policy, by ratifying the legal framework that promotes it and the implementation of the necessary structures.

- Law n° 09-99 dated on 28 July 1999, on the control of energy,
- Law n° 01-02 of 05 February 2002, concerning electricity, public pipeline distribution of natural gas,
- Law n° 09-04 of 14 August 2004, related to the promotion of renewable energies within the framework of Sustainable development.

**4.3. Fiscal Incentive Measures:** - The owners of Projects in the field of renewable energy can benefit from the privileges given to according to the decree 03-01 of 20 August 2001, related to the development of investment.

- Financial, fiscal and customs Privileges can be granted to the activities and projects that can contribute in promoting Energetic efficiency and upgrade renewable energies.

- Moreover, these activities and projects benefit from the privileges set forth in the framework of legislation and regulation related to investment improving as well as priority projects (according to the law 09-99).

**4.4. Other Incentives:** Algerian political will about the establishment of the renewable energies program will be obvious through helping to cover the Costs resulting from the applicable pricing system on electricity for investors in this field.

- The establishment of the national fund for energy control was In order to finance these projects and to grant interest-free loans and guarantees by the banks and financial institutions, (according to the law 09-99) <sup>(11)</sup>

**5- Some of the projects completed or in progress in the field of renewable energy:** The first Naftal service station working only on solar energy has been launched in 2004 in a place called “Elbrija” in Staouali, by the ex-minister of energy and mines Chakib Khalil, and in the presence of the minister of higher education and scientific research Rachid Hraoubia. The study and realization of the project were given to Unit of Solar Equipment’s development In Bouzereah. This project took 13 weeks and includes peripheral lighting. The total power of this project was 6.6kW peak.

- The project of developing Algerian solar energy market of sanitary hot water was launched on January 2007. This project which was in financed by the UN development plan and allow to support the program given within the national energy control program, and soon will provide a Solar water heater to 5000 houses, and will provide about 16000 M<sup>3</sup> in the third sector.

- On 14 January 2011, Algeria has launched an electricity production station that works on gas and solar energy in the zone of (Hassi R’mal) Southern Algeria in a cooperation between the Algerian company (NEAL) and the Spanish one (Abineer), to invest about 350 million Euros. This gas well is the biggest in Africa, and this station’s production reaches 150 megawatt, 120 of which is produced by gas, and 30 megawatt by solar energy.

- The implementation of a plant to produce the photovoltaic energy units, and the construction of solar panels in the industrial zone of Rouiba, by Rouiba lighting; a branch of SONELGAZ, with a cost of 42000 million Dinars, and with a production of about 41800 photovoltaic energy Unit/year. This plant can create about 200,000 job opportunities (100.000 in the field of national production, and another 100.000 in the field of exportation). This project is expected to be finished by the end of 2013.

- The construction of the first wind park, with a capacity of 10 megawatt was decided to start in Adrar. This mission was given to the Franco-Algerian group CEGELEC which proposed the best offer in the open tender <sup>(12)</sup>

**Conclusion:** The reliance on renewable energy is in first place an expression of a thought and policy that respect the Human and his environment, and characterized by a far-sighted feature and belief in real development. After being just a source to supply with traditional energy, everybody now is waiting for Arab countries to be a real source of renewable energy, mainly solar energy. The Arab world, however, is rich of an enormous potential power that can provide its peripherals with energy, and every kilometer of its vast area receives a huge amount of sun rays equal to 1.5 million oil barrels, this sector is still taking its first steps. For this, if Arab countries know the best way to exploit this wealth, it will be a great element in solving all the challenges that occur in these countries.

**The results:**

- ✓ The Arab countries, however, are rich of different resources of renewable energy (sun, wind, and Biomass), their application is still limited due to the availability of fossil fuels (oil and gas) in big amounts and price subsidy. This can hinder the widespread use of renewable energy.
- ✓ The Arab world is full of renewable energy resources that can satisfy, or at least help in facing the increasing demand on energy in such countries.
- ✓ The procedures followed nowadays in the Arab world in order to subsidy the renewable energy need more efforts. Algeria must pay a great interest in improving the exploitation of the available renewable resources, especially solar energy.

**Recommendations and Perspectives:**

- ✓ The Arab countries must reduce the dominance of oil in their economies, and to head towards the integration of renewable energy as sources of energy production.
- ✓ Working on the spread of the economically proven renewable energy technologies.
- ✓ Giving priority to the renewable energy in the investment and government expenditure in all the Arab countries.
- ✓ The creation of an Arab fund to finance renewable energy projects, capable to finance such projects in all the Arab countries.
- ✓ Using different resources of renewable energy will help in the social, economic and environmental stability.
- ✓ Carrying out sensitization campaigns through mass media in all Arab countries to show the importance of renewable energy.
- ✓ Encouraging cooperation between Arab countries to benefit from each other's experiences.
- ✓ Encouraging the renewable energy technology through relieving the burden of

the costs and reduce the problems of poverty.

- ✓ Accelerating the transition to a low emissions economy.

**Reference:**

- 1- Zerzour, Ibrahim. The environmental case and sustainable development. National conference on the environment economy and sustainable development. Institute of management. Media University center,17-07-2006, P6.
- 2- Hani, Abeid. Man and Environment: energy systems, environment and inhabitants. Echourouk edition, Oman,2000, p205.
- 3- Mostafa Elkhayat, Mohammed and Iness Mohammed Ibrahim Chiti. The Use of Geographic Information Systems in developing Renewable Energy Projects. The 17<sup>th</sup> conference on information systems and computing technologies. Cairo, February 2010, p4.
- 4- Organization for Economic Cooperation and Development. Energy Agency. The Arabic translation of international Energy statistics. Mach 2009, p121.
- 5- Institute of Applied Researches (Jerusalem). Project of Lighting via Solar Energy. With the contribution of the UNDP, International environment facility, 2010, p03.
- 6- <http://digital.ahram.org.eg/articles.aspx?Serial=95985&eid=325>. Browsed on 2013/02/22.
- 7- <http://green-studies.com> browsed on/2012/12/11/.
- 8- <http://iefpedia.com/arab>. Browsed on 14/02/2013.
- 9- Ministry of Energy and Mines. The Guide of Renewable Energy, Algiers, Edition 2007, from the website: <http://www.mem-algeria.org/francais/index.php>. Browsed on 22/02/2013.
- 10- Ministry of Energy and Mines. Renewable Energy program and Energetic efficiency, Algiers, March 2011, from the website: <http://www.mem-algeria.org/francais/index.php>. Browsed on 22/02/2013.
- 11- <http://www.andi.dz/index.php/ar/les-energies-renouvelables>. Browsed On 25/02/2013.
- 12- The Algerian Portal of Renewable Energy. From the website: <http://portail.cder.dz/ar>. Browsed on 21/01/2013.