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Actual case of energy strategy In Algeria and Tunisia

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Abstract

At the dawn of the twenty-first century, one of the major problems of humanity is to combine energy and the respect for environment. A problem of sustainable development has been clearly demonstrated in the Earth Summit in RIO (2012). Among the major battles to be fought in this century for the survival of the planet is to include energy efficiency as an international political priority with the reduction of emissions of greenhouse gases. Renewable energy, inexhaustible, clean, are needed in these conditions as a priority.

The Algerian energy strategy is decidedly towards sustainable development by integrating the promotion of renewable energy. The legislative and regulatory framework adopted in recent years testifies to this irreversible commitment. A national program for renewable energy and energy efficiency in Algeria allows at the horizon 2030 the production from renewable energies of 40% of the needs of Algeria in electricity. Since twenty years, Tunisia has established the institutional and regulatory framework of energy management in general. A Tunisian Solar Plan (TSP) with 40 projects was launched in December 2009. Its objective is to provide Tunisia a capacity of renewable energy production of about 1000 MW in 2016 and 4700 MW in 2030.

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1. Introduction

Today, large battles are to be undertaken during the century for the survival of the planet: including energy efficiency as a priority in international politics, by reducing emissions of greenhouse gases, saving energy for economic development, reducing inequalities, empower stakeholders and strengthening global regulation [1].

The main debates at the World Summit on Sustainable Development in Johannesburg in 2002 , concerns incentive measures, the role of energy from sustainable resources and environmentally rational and bio energies , and the impact of new technologies and new ways of construction or transport on sustainable energy savings[2].

The Kyoto Protocol specifies the elements of the process of fighting against global warming and establishes the use of new strategies to reduce emissions of greenhouse gases. [3]

Algeria is firmly committed to the promotion of renewable energy in order to provide comprehensive and sustainable solutions to environmental challenges and to the problems regarding the conservation of the energy resources of fossil origin. In addition, a favorable legal framework for renewable energy development has been adopted.

Executive Decree n ° 13-218 of 18 June 2013 lays down the conditions for granting premiums for the costs of diversification of electricity production from renewable energies

Algeria holds one of the largest solar potential in the world. It is valued at more than 3,000 hours of sunshine per year and 5 KWh of daily energy received on a horizontal surface on most part of the country [4].

The national program for renewable energy and energy efficiency in Algeria includes the realization of 67 projects, 27 solar power plants, 27 diesel hybrid power plants and TG, six solar thermal power plants and seven wind farms which will allow by 2030 to produce, from renewable energies, 40% of the needs of Algeria in electricity.

In France, the principles of the obligation of purchase electricity produced from renewable sources are contained in the Article 10 of Law No. 2000-108 of 10 February 2000. It specifies that the purchase tariffs are intended to ensure a normal profitability to investments of production of electricity produced from renewable sources [5].

The German law on renewable energy, called EEG, sets ambitious targets for the share of renewable sources in the electricity supply. It confirms the choice of the guaranteed purchase prices for 20 years to promote their production, the corresponding overload remaining essentially supported by domestic consumers [6].

Since twenty years, Tunisia has established the institutional and regulatory framework of energy management in general and has launched a national program in this area focused on the rational use of energy but also on promotion of renewable energy.

Initially it was proceeded to update the regulatory and institutional framework and this by enacting a new law on energy management (Law No. 2004-72 of August 2, 2004) amended by law n° 200 9-7 of February 9, 2009.

Also, a system of energy management with the aim of supporting actions aimed at rationalizing of energy consumption, promoting renewable energy and alternative energy has been created by law n ° 2005-82 of August 15, 2005. Rates and premium amounts relating to the shares covered by this system are established by Decree N° 2005-2234 of 22 August 2005 amended by Decree 2009-362 of February 9, 2009.

A Tunisian Solar Plan (TSP) with 40 projects was launched in December 2009. Its objective is to provide Tunisia a capacity of renewable energy production of about 1000 MW in 2016 and 4700 MW in 2030.

Nomenclature

AIRE	Algerian Institute of Renewable Energy
APRUE	Agency for the promotion and rational use of energy
CDM	Clean Development Mechanism
CSP	Concentrated solar power
GW	Gigawatt
GWh	Gigawatt-hour
MW	Mégawatt
STEG	Tunisian Company of Electricity and Gas
SWH	Solar water heater
TSP	Tunisian solar plan
UNPD	United Nations program for the development

2. Algerian energy strategy in the context of sustainable development

2.1 Executive Decree No. 13-218 of 18 June 2013 laying down the conditions for granting premiums for the costs of diversification of electricity production.

By this decree, Algeria wants to encourage the production of renewable electricity or cogeneration

Indeed, the producer of electricity, from installations cited below, may benefit premiums through the sale of its electricity at a guaranteed purchase rate. It is understood by premiums for diversification costs, of electricity production, the income which can cover the additional costs generated by the production of the renewable electricity or cogeneration, while ensuring a financial profitability of the installation of production, thanks of the guaranteed purchase rate which is applicable to this latter.

Is concerned by the provisions of this Decree, the electricity produced from:
every installation using the following sources :

- Solar photovoltaic and thermal ;
- Wind energy ;
- Geothermal ;
- Waste recovery ;
- Small hydraulic;
- Biomass.

- Any existing hybrid installation on the date of publication of this decree in the Official Journal and whose the production annual of electricity from sources of renewable energy is at least 5% of its total annual production.

- Any cogeneration installation whose installed power at ISO conditions shall not exceed 50 MW.

To benefit of guaranteed purchase price under the special regime provided for in this Decree, the producer of electricity from facilities mentioned above, must connect the installation to the network of transport or to the network of distribution of electricity.

The producer wishing to benefit from the guaranteed purchase price must lodge a demand with the Regulatory Commission for electricity and gas. The electricity producer lodges the demand at the same time as the demand for authorization to exploit.

The Electricity Regulatory Commission and Gas (CREG) reviews the demand. The decision of granting of benefits is notified to the applicant by the Minister of Energy . It allows the applicant to enter into a purchase contract with a distributor of electricity to guaranteed purchase price in effect on the date of its notification [7].

2.2 Ministerial Order of February 2, 2014 fixing guaranteed purchase prices for electricity produced from installations using the photovoltaic solar energy and the conditions of their application.

In application to the provisions of Article 8 of executive decree n° 13-218 of 18 June 2013, this order fixes the guaranteed purchase prices and the conditions of their application for electricity produced from installations using the photovoltaic solar energy.

Indeed, purchase contract of electricity concluded between the producer of electricity, which is holder of a decision of granting the benefit of the guaranteed purchase price and the concerned distributor.

The guaranteed purchase prices for the sale of electricity produced by installations using the photovoltaic solar energy are fixed per share of capacity and depending of solar potential. The solar potential is expressed in number of hours equivalent of full load operation of the installation per year.

The purchase contract is concluded for a period of twenty (20) years from the date of commissioning of the connection. During this period, the producer receives, in a first phase, which corresponds to the five first years of this period, the single purchase price fixed and calculated on the basis of a reference potential estimated to 1500 hours of operating at full load.

In a second phase, and for the remaining term of the contract, this single price may be readjusted, depending of the real potential of the site [8].

2.3 Order of February 2, 2014 fixing guaranteed purchase prices and the conditions of their application for electricity produced from installations using wind energy.

In application to the provisions of Article 8 of executive decree n° 13-218 of 18 June 2013, this order fixes the guaranteed purchase prices and the conditions of their application for electricity produced from installations using wind energy.

Indeed, the guaranteed purchase prices for the sale of electricity produced by wind installations are fixed per share of capacity and depending of wind potential. The wind potential is expressed in number of hours equivalent of full load operation of the installation per year. A wind installation is defined as a device that converts wind energy into mechanical energy, this energy is then transformed itself into electrical energy.

The electricity purchase contract is concluded between the electricity producer which is holder of a decision of granting of profit of the guaranteed purchase price and the concerned distributor.

The purchase contract is concluded for a period of twenty (20) years from the date of commissioning of the connection. During this period, the producer receives, in a first phase, which corresponds to the five first years of this period, the single purchase price fixed and calculated on the basis of a reference potential estimated to 1900 hours of operating at full load.

In a second phase, and for the remaining term of the contract, this single price may be readjusted, depending of the real potential of the site [9].

By adopting these ministerial orders, setting the guaranteed purchase prices for electricity produced from installations using PV and wind energy, Algeria marked his willingness to encourage the production of renewable electricity and to fight against the problem of global warming.

3. Some projects

Algeria has created a green momentum by launching an ambitious program to develop renewable energies. The program consists of installing up to 22 000 MW of power generating capacity from renewable sources between 2011 and 2030, of which 12 000 MW will be intended to meet the domestic electricity demand and 10 000 MW destined for export.

In this program, renewable energies are at the heart of Algeria's energy and economic policies: It is expected that about 40% of electricity produced for domestic consumption will be from renewable energy sources by 2030.

Solar should achieve by 2030 more than 37% of national electricity production. Despite its relatively low potential, wind energy is not excluded from the program, as it constitutes the second axis of development with a share in electricity production expected to reach about 3% in 2030.

Algeria also plans to install some experimental size units to test the various technologies in renewable energies such as biomass, geothermal energy and desalination of brackish water [10].

The national program adopted by the government includes the realization of 27 photovoltaic power plants, 27 diesel hybrid power plants and TG, six solar thermal power plants and seven wind farms.

The larger power plants that Algeria will achieve will be solar thermal type and be installed in the southern regions. Three power plants with a capacity of 150 MW each will be built in El Oued and Bechar.

As for the 27 photovoltaic power plants they will be connected to the interconnected northern network, the most important (48 MW) will be located in the Wilaya of Djelfa, followed by that of M'sila, which will have a capacity of 44 MW. Other photovoltaic power plants will be realized in Ouargla, Tolga, El-Bayadh, Mghair, Ain Beida, Naama and Saida.

The diesel power plants and TG will supply the isolated southern networks. These are small power plants that will provide electricity to poorly supplied localities such Tin Alkoum, Tin Zaouatine, M'Guiden, Idless Deb-Deb. The more powerful will be located in Adrar (20MW). Finally, for the seven wind turbines included in the program, they will be with a capacity of 50 MW and 20 MW for each of them [11].

As part of this program, a photovoltaic station was commissioned at Ghardaia :

On a surface of 10 hectares, this project hosts 6032 solar panels (fixed and orientable) for the recuperation and the transformation of sunlight into electricity, which will enable to provide electrical energy to alternating current in medium voltage 30 KVA .

At a total cost of 744 million dinars, this power plant, which was relocated from Tindouf to Ghardaia in the interests of approximation with the research center for renewable energies of Ghardaia, is a pilot project divided into 8 sub-fields containing 4 photovoltaic modules of different technologies and two types of structures.

With photovoltaic panels with a power of 1100 KVC, this structure must therefore provide a production of 1 MW of electrical energy for the experimental work carried out by researchers of the annex of Ghardaia.

The initial time frame for realization of this power plant was 12 months, the works began in March 2012, with a partial commissioning in December 2013, but the actual start-up scheduled for December 2013 underwent a technical delay and took place July 10, 2014 [12].

Moreover , a wind farm was put into service at Adrar in July 2014 which has a capacity of 10 MW. First of its kind nationwide, this new power plant of production of electricity is established on an area of 30 hectares in the Kabertène area located at 72 km at north of the wilaya of Adrar .

This pilot farm is constituted from 12 wind turbines with an unit power of 0.85MW each one and whose energy produced will be discharged to the post 220 / 30KV located in the same locality [13].

Despite there is a real desire to Algeria to develop renewable energy in general through the national program of development of renewable energies to reach the 40% of renewable electricity by 2030, however, it is appropriate to make the following improvements:

Respecting orders fixing the guaranteed purchase prices applying only to installations greater than 1MW it would be appropriate to apply these guaranteed purchase prices for small installations much less than 1MW in order to involve Algerian citizens through small installations such as installations connectors to the network on the roofs and terraces of houses etc...

Furthermore, it is necessary that the Algerian government reduce gradually subsidies of electricity from fossil origin to try to reach parity such as some countries in the world.

The executive Decree No. 13-218 of 18 June 2013 provides the granting of premiums to the producer of electricity for installations based in biomass, it must be accompanied by an application text to enforce this one.

4. Tunisian energy policy in the context of sustainable development

4.1 Law on energy management

Pursuant to Law No. 2004-72 of 2 August 2004 on energy management and amended by Law No. 2009-7 of February 9, 2009, the energy management is considered a national priority insofar as it constitutes a key element of sustainable development and has a close relationship with the economic and social development and the protection of the environment.

The energy management includes all actions taken for the rational use of energy, promoting renewable energy and alternative energy.

Shares of energy management cover all programs and projects that aim to improve the energy efficiency and diversifying energy sources under the state policy in terms of energy and this in particular through the promotion of renewable energy.

The national program to promote renewable energy consists of the development of wind energy use for electricity production, encouraging the use of solar thermal energy, the exploitation of solar energy in the field of rural electrification and pumping.

A National Agency for Energy Management is created to propose incentives, encouragement and procedures likely to develop the field of energy management and to develop demonstration projects in the field of energy management and monitor their achievements [14].

Also, a system of energy management with the aim of supporting actions aimed at rationalizing of energy consumption, promoting renewable energy and alternative energy has been created by law n ° 2005-82 of August 15, 2005.

Under this Act, grants are awarded under this system for the production of electricity from renewable energy and for heating water by solar energy in homes and private businesses [15].

Rates and premium amounts relating to the shares covered by this system are established by Decree N° 2005-2234 of 22 August 2005 amended by Decree 2009- 362 of February 9, 2009.

Under that decree, the actions aimed at the development of renewable energies are eligible to receive the following bonuses:

- For the use of renewable energies.
- For solar water heating: In the residential sectors and small business, a premium of two hundred dinars (200TND) for the solar water heater with a collector area of between one meter (1m²) and three square meters (3m²), a premium

of four hundred dinars (400TND) for the solar water heater with a collector area of between three (3m) and seven square meters (7m²).

In the industrial and tertiary sectors: A premium of 30% of the cost of the investment with a maximum of one hundred and fifty dinars (150TND) per square meter.

For the production of electricity in the agricultural sector: A premium of 40% of the cost of investment, with a maximum of twenty thousand dinars (20 000TND) for projects of rural lighting and pumping water by solar energy and wind energy for farms and rural projects.

For biogas production: A premium of 40% of the cost of the investment with a maximum of twenty thousand dinars (20 000TND) for the production of biogas.

A premium of 20% of investment cost with a maximum of one hundred thousand dinars (100 000TND) for the production of biogas to produce electricity.

For the production of electricity in solar buildings: A premium of 30% of the cost of the investment with a maximum of three thousand dinars (3 000TND) for a kilowatt peak and fifteen thousand dinars (15 000TND) for a solar building.

For cogeneration: A premium of 20% of the cost of the investment with a maximum of five hundred thousand dinars (500 000TND) [16].

5. Achievements in the field of renewable energies

The Tunisian Solar Plan, estimated at 3600 MD, has 40 projects implemented in the context of public-private partnerships during the period 2010-2016, the private sector will realize 29 projects, while 5 other projects will be under the responsibility of public sector, especially the STEG (Tunisian Company of Electricity and Gas). 5 projects concern, in addition, the realization of studies and the implementation of the plan. The latest project aims to create the «STEG Renewable Energies ».

The energy economy expected when all the projects will be realized would be of the order of 660 ktoe per year, which corresponds to 22% of the global reduction of the national energy consumption in 2016.

The amount of CO₂ emissions avoided by these projects is estimated at 1.3 million tonnes per year allowing CDM revenues (Clean Development Mechanism) of the order of 260 MD for 10 years (based on € 10 per tonne).

The TSP aims to make Tunisia a regional center for industrial production and export in the field of solar energy. Several cooperation projects are already underway, including with GTZ (Germany), MEDREC (Italy), JAICA (Japan), the European Union and the United Nations program for the development (UNPD).

a - water heating by solar thermal energy:

- Project No. 1: PROSOL residential and individual,
- Project No. 2: PROSOL residential collective,
- Project 3 : PROSOL tertiary and industrial,
- Project 4 : Solarization of indoor municipal swimming pools ,

b– Solar cold

Project 5 : Realization of 10 pilot projects for the application of technologies of solar cold in the agroalimentary industry (conditioning.....)

c– Solar drying:

Project 6 : Realization of a pilot project for the application of solar drying technologies in the agroalimentary industry.

d- Decentralized Production

- Project 7: Installation of 15 MW of solar roofs (6000 individual houses and 1000 public and private buildings).
- Project 8: Equipment of 200 agricol farms by photovoltaic pumping systems for water destined to irrigation.
- Project 9: Electrification of 1000 homes and 100 farms and small rural projects by solar and wind energy.
- Project 10: Installation of a total power of 0.5 MW of photovoltaic systems for public lighting.
- Project 11: Installation of 100 photovoltaic systems connected to the network in the service stations.

e- Centralized Production

- Project 12: Realization of a power plant PSP of 25 MW integrated to a combined cycle of 150 MW by the STEG.
- Project No. 13: Realization of power plants PSP of 75 MW whose production is intended in whole or in part for export by private sector.
- Project 14: Realization of a combined power plant PSP Solar / Gas at El Borma.
- Project No. 15: Photovoltaic power plants 10 MW.
- Project No. 16: Photovoltaic power plant 10 MW.

f- Manufacturing of photovoltaic panels:

- Project 17: Realization of a manufacturing unit of photovoltaic panels of a minimum capacity of production of 14 MW.

g – Wind energy:

- Project No. 18: Self-production of electricity (60 MW) from wind energy for the alimentation of establishments large consumers of electricity.
- Project No. 19: Production of electricity (120 MW) from wind energy.
- Project No. 20: Production of electricity (100 MW) from wind energy whose production is intended in whole or in part for export.

h- Energy Efficiency

- Project 21: Replacement of 400 000 old refrigerators over 10 years by refrigerators performants energetically of Class 1 and 2.
- Project No. 22: Realization of buildings of positive energy.
- Project No. 23: Thermal isolation of terraces of housing.
- Project No. 24: Diffusion of CLH among the households.
- Project No. 25: Energy Efficiency in the industrial sector.
- Project No. 26: Formation at the economic driving.
- Project No. 27: Establishment of systems of monitoring of the fleet of vehicles of public enterprises.

I- Projects of energetic valorization of Wastes:

- Project No. 28: Production of Electricity (14.5 MW) by the valorization of droppings of poultries.
- Project No. 29: Production of electricity (10 MW) by the valorization of discharge gases.
- Project No. 30: Auto production of electricity (1 MW) from the valorization of organic wastes.

j- Projects of Electrical interconnection:

- Project No. 31: ELMED Project, electrical interconnection between Tunisia and Italy with submarine cable in direct current 400 kV.

k-Projects pilots

- Project No. 32: Project "Sun of Nefta," Renewable Energy for the oasis of Nefta.
- Project No. 33: Project «Eco village of zarzis –Jerba ».
- Project No. 34: Energy optimization of the development project of the station of Sousse.

l. Establishment of support structures:

Project No. 35: International Center for superior formation of renewable energy and Energy Efficiency and International Laboratory of Technologies of solar energy.

Project No. 36: photovoltaic pilot power plant in Borj - Cedria.

Project No. 37: Creation of the company STEG of Renewable Energies.

m. Study and implementation of the plan:

Project No. 38: Strategic Study of the energy mix for electricity production in Tunisia in 2030.

Project No. 39: Strategic Study on electrical production of solar and wind origin.

Project No. 40: Establishment of a management unit of the Tunisian Solar Plan. [17]

6. Conclusion

A Study of the APRUE indicates that energy demand will explode in Algeria in 2020. The needs of the residential sector will be multiplied by 2.7 while the tertiary sector will increase its electricity consumption by 3.2, an increase of 40% compared to current consumption.

The rise of renewable energies in Algeria cannot be conceived without the completion of a phased program more important of projects to produce electricity.

Algeria intends to take position as a major player in the production of electricity from solar photovoltaic and solar thermal that will be the engines of a sustainable economic development.

Taking advantage of rising energy prices and the need to limit the independence of external energy, combined with the growing sensitivity in relation to environmental problems, renewable energies prove a necessity for sustainable development of Tunisia.

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