RENEWABLE ENERGY MANAGEMENT IN URBAN PROJECTS IN ALGERIA

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Abstract

Any urban project cannot be separated from its environmental context; in fact, the development of the constructions and the various operations on a territory involves obligatorily impacts on the environment.

The goal of an energy efficiency management system is to promote quality, protect the environment and meet socio-economic needs.

The objective of this work is to set up an energy management, which must be a administering & running tool that allows the control of the decentralized production and energy consumption in the life cycle of the urban project.

Keywords: energy management, renewable energies, cities, urban projects.

1. INTRODUCTION & PROBLEMATIC

Today is the energy consumed in urban areas, mainly in buildings and transport. Urban development is therefore one of the major challenges of current energy and climate policies. While the latest report of the Intergovernmental Panel on Climate Change (IPCC) warns of accelerating global warming and the role of cities in combating this destructive process, new ways of producing, distributing and to consume energy in the world[1].

Despite the savings efforts in this area and the growing awareness of the public and specialists, the rise in energy demand is confirmed worldwide for different reasons (leaving homes, heavier

[1] Summary report. (2014). *Rapport du groupe d'experts intergouvernemental Sur l'évolution du climat.* [Under the direction of the main editorial team, R.K. Pachauri and L.A. Meyer].IPCC. Geneva. Switzerland.

equipment, very consumer appliances, global population growth ...). Faced with this growing, predictable demand, in 2050, only 50% of needs will be met; cities and territories are certainly the key to the ecological transition.

While they occupy only 3% of the surface of the earth, the urbanized territories alone consume three quarters of the resources of this one and are responsible for 75% of greenhouse gas emissions. While the latest report of the Intergovernmental Panel on Climate Change (IPCC) warns of the acceleration of global warming and the role of cities to combat this destructive process, new way to producing, distributing and consuming energy in the world suggest a potential disruption of the territorial organization, at the heart of tomorrow's energy strategy. In this very evolving context, the urban approach remains the poor relation of the energy policies and the diagnosis such action efforts are mainly oriented towards the building and mainly the new building[2].

For this, energy becomes a new sectoral logic that takes precedence over all the project's issues energy to enter into joint and in collusion with urban and territorial project, it must also interrogate the urban model raises awareness not at work - that of spreading and territorial specializations, which are detrimental logical proximity that is more and more desirable and likeable in terms of both urban functioning and quality of life.

This new dimension of development is also likely to reduce the final user costs and fight against the growing scourge of energy poverty, which is. For the less fortunate, a double or a triple pain in their daily life.

Faced with this observation, three paths must be taken together: the control of energy demand, the improvement of the efficiency of the system (production, distribution, and consumption)

[2]Ariella Masboungi & Al. (2015). The energy at the heart of the urban project. Release date: March. Publisher: ED. MONITOR.

and the introduction, in a more significant way. Renewable and low-carbon energy sources in the energy mix.

The topics affect the urban in a structural and complex manner, large-scale (the organization and planning, urban planning, freight transport, mobility, activation of economic sectors) on the small scale - the building in particular - passing by that of the urban projects of variable dimensions, with regard to both the physical environment and the socio-economic aspects. The evolution of network management constraints leads to bring the production of consumer places. So to regionalize energy management. Especially since communities are being given increasing responsibility for energy planning and the implementation of a local energy policy.

Effective energy management enables the energy control policy to achieve the stated objectives and commitments set by international standards and to take the necessary measures for continuous improvement. Thus, the goal of an energy efficiency management system is to promote quality, environmental protection and meet socio-economic needs[3].

Any development is inevitably correlated with energy consumption, that latter growing steadily is a source of considerable pollution of the environment. The challenge is to see how to reconcile economic and social progress without jeopardizing the natural balance of the planet? The triptych: (energy - development - environment) must be respected. All development must be economically efficient, socially equitable and ecologically tolerable.

The necessity for Renewable Energies

Countries around the world are increasingly aware of the crucial role of renewable energy and energy efficiency in the fight against climate change; the creation of new economic opportunities; and expanding access to energy for the billions of people still deprived of any

[3] Bouamama Wahiba. (2011). Magisterium memory *Au sujet de la politique d'efficacité énergétique en Algérie*: systemic approach for sustainable development case of: Eco-bat program building and energy management.

modern energy services . moreover, the development could condition tomorrow the management of the energy, if the new modes of production were integrated with the buildings, if the network management constraints that lead to bringing production closer to the places of consumption favoured a more local action on the energy-city link, or the implementation of smart grids on a good scale and wisely allowed to optimize distribution and consumption on all meshes of the network. These questions will have very important consequences on the organization of the territories as on the modes and the practices of development.

The development of renewable energies has become imperative in the face of the energy problems of the 21st century. Convinced of the need for sustainable development and diversification of the energy mix.

As the national potential for renewable energies is strongly dominated by solar energy, Algeria considers this energy as an opportunity and a lever for economic and social development, particularly through the establishment of industries that create wealth and jobs. Geo-strategically, potential in wind power, biomass, geothermal and hydropower are much less important.

2. STATE OF PLAY

2.1. The national potential in renewable energies

- **Solar**

Due to the geographical location, Algeria has one of the largest solar fields in the world.

The duration of sunstroke on almost the entire national territory exceeds the 2000 hours annually and holds the 3900 hours (highlands and Sahara). The energy received daily on a horizontal surface of 1 m2 is of the order of 5 kWh over most of the national territory is nearly 1700KWh / m2 / year in the north and 2263KWh / m2 / year in the south of the country[4].

[4] The renewable energy guide. (2007). Ministry of Energy and Mines, Algeria.

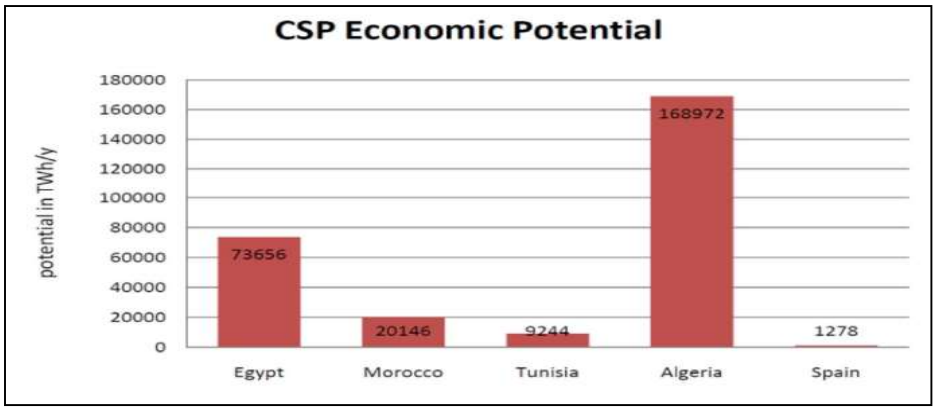


Figure 1. REDC source concentration Solar potential.

- **Eolien potential**

The wind resource in Algeria varies a lot from one place to another. This is mainly due to a very diverse topography and climate. Indeed, our vast country is subdivided into two distinct geographical areas.

The northern Mediterranean is characterized by a coastline of 1200 km and a mountainous terrain, represented by the two chains of the Tellien Atlas and the Saharan Atlas. Between them are interspersed plains and highlands of continental climate. The South, meanwhile, is characterized by a Saharan climate.

The map shown below shows that the South is characterized by higher speeds than the North, especially in the Southwest, with speeds exceeding 4 m / s and exceeding the 6 m / s value in Adrar region. Regarding the North, it is generally noted that the average speed is low. However, there are microclimates on the coastal sites of Oran, Bejaia and Annaba, in the highlands of Tiaret and in the region bounded by Bejaia in the North and Biskra in the South.

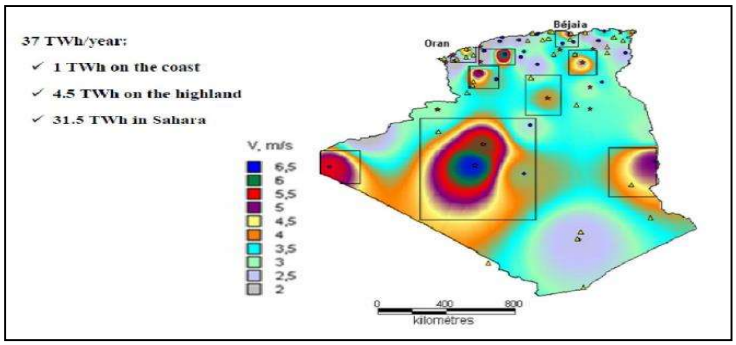


Figure 2. Wind energy source potential REDC.

- **Potential géothermique**

The Jurassic limestones of northern Algeria, which are important geothermal reservoirs, give birth to more than 200 hot springs located mainly in the northeast and northwest regions of the country. These sources are often in excess of 40 Cm warmest temperatures being that of Hammam Maskhoutine (960C).

These natural emergences, which is generally the leaks of existing reservoirs, alone generates more than 2 m3 / s of hot water. This is only a small part of the reservoir production possibilities. More to the south; the formation of the intercalary continental, constitutes a vast geothermal reservoir which is several 1,000 Km2. this reservoir, commonly called "Albian aquifer" is exploited through boreholes with more than 4 m3 / s. the water of this layer is at an average temperature of 57°C.[5]

[5] M'Hamed BOUGARA. (2005). Memory of magisterium in geophysics Geothermal study of southern Algeria. university Boumerdes.

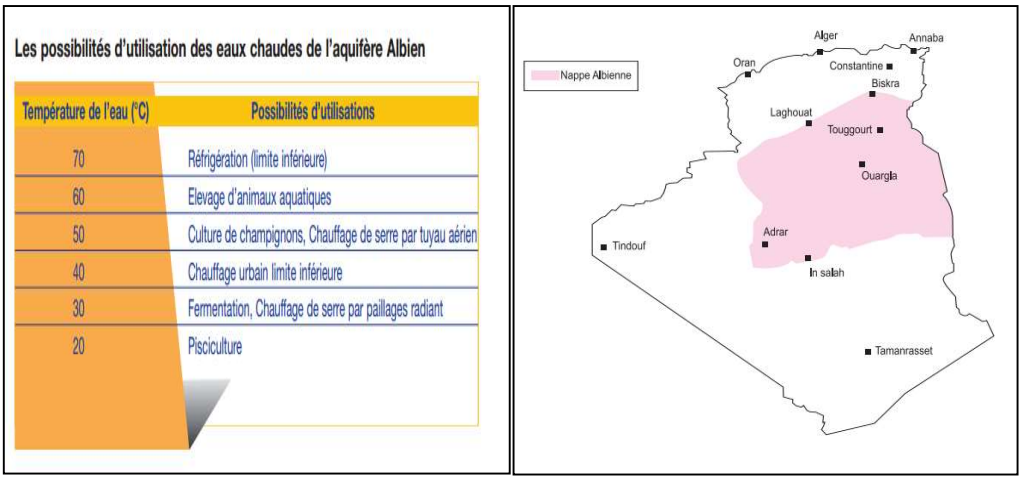


Figure 3. REDC source geothermal potential.

2.2. Renewable energies in Algeria

Algeria is starting a green energy dynamic by launching an ambitious renewable energy development (RE) and energy efficiency program. This vision of the Algerian government is based on a strategy focused on the development of inexhaustible resources such as solar and their use to diversify energy sources and prepare the Algeria of tomorrow. Thanks to the combination of initiatives and intelligence, Algeria is embarking on a new sustainable energy era.

Today, Algeria's energy needs are met, almost exclusively, by hydrocarbons, particularly natural gas, the most available energy. Other forms of energy are only used when the gas cannot be used.

In the long run, the renewal of the current national model of energy consumption can make the supply-demand balance problematic for this energy source.

The massive integration of renewable into the energy mix is, in this sense, a major challenge in order to preserve fossil resources, diversify the electricity production sectors and contribute to sustainable development.

All of these considerations justify the strong integration of renewable energies into the long-term energy supply strategy today, while giving an important role to energy savings and efficiency. This last component allows, through a good control of the rate of growth of the demand, a better planning of the investments necessary to the satisfaction of the energetic needs.

Current situation:

- Electrification with solar energy by Sonelgaz of 18 isolated villages of the great south of Algeria; spread over 4 wilayas of the great South, namely: Tamanrasset, Adrar, Illizi and Tindouf and this as part of the program of electrification (1995-2002) of isolated areas.

- Inauguration in 2011 of the solar / gas hybrid power plant of 150 MW of which 25 MW solar, located in Hassi-R'mel in the wilaya of Laghouat.

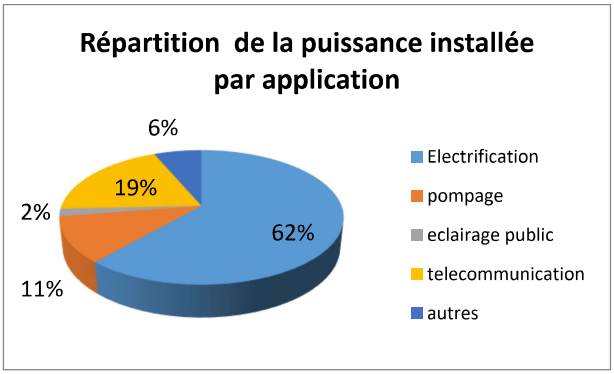
-Marking of the road Bordj Badji Mokhtar-Reggane in 1986 and supply of telecommunication relays by photovoltaic

- Pumping of water by wind energy.

- Below are some figures of the low renewable powers engaged in the various applications across the national territory [12].[6]

Table 1. Renewable powers installed.

Application	Puissance installée(KWatt)
électrification	1352.80
pompage	288.40
Eclairage public	48.43
télécommunication	498
autres	165.63
TOTAL	2353.26



[6] Ministry of Energy and Mines. (2018). www.mem-algeria.dz.

Future situation: [7]

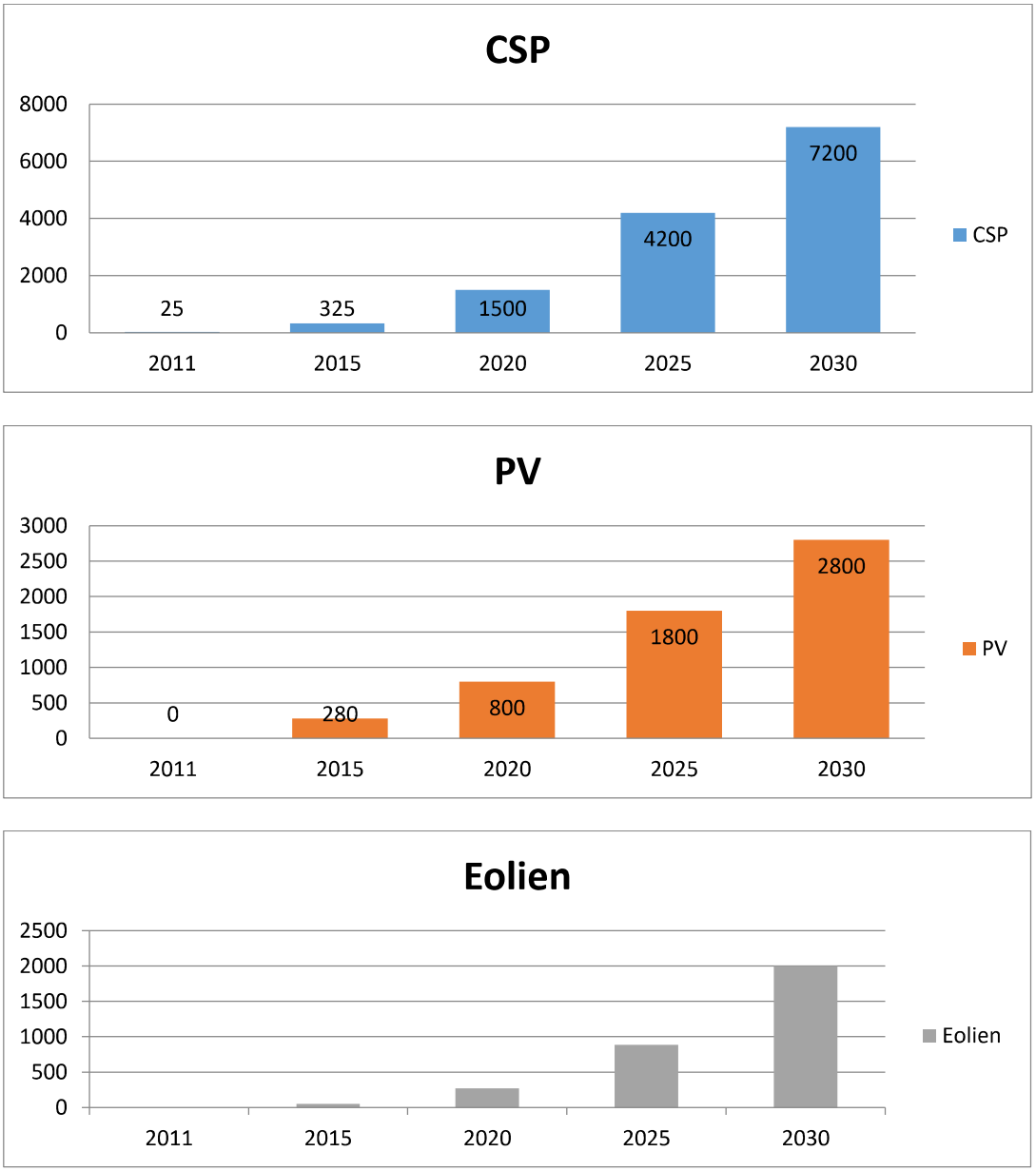


Figure 4. Cumulative power (MW) to be installed by the sector until 2030.

[7] Algerian Company of Electricity and Gas. (2011). *Programme national de développement des énergies renouvelables et stratégie de mise en œuvre*; conference on the Algero-German partnership in the field of renewable energies. hotel Sofitel. Algiers.

This renewable energy program provides for the installation of a total power of approximately 650 MW in 2015, 2600 MW in 2020, 6900 MW in 2025 and 12000 MW by 2030.

The ratification of the Kyoto Protocol (an international agreement, built on the United Nations Framework Convention on Climate Change, set targets and timelines for reducing greenhouse gas emissions) [8]and the law on the promotion of renewable energies in the context of sustainable development have confirmed the Algerian political will and the commitment of our country to exploit these renewable and non-polluting natural resources. An ambitious national program for the development of these clean energies has been drawn up for the period 2011-2030, in order to produce by 2030, 40% of national electricity consumption from solar and wind energy. these ambitious renewable energy projects will be conducted in three stages.

- 2011-2013: realization of pilot projects to test various technologies available.
- 2014-2015 : start of program deployment;
- 2016-2030: large-scale deployment.

PV (Photovoltaic):

Planned launch of several solar photovoltaic projects with a total capacity of about 800 MWp by 2020. From 2021 to 2030, other projects will be launched with a capacity of 200 MWp per year.

CSP (Concentrating Solar Power):

Launch in the 2011-2013 period of two pilot projects for a thermal power plant with a total capacity of 150 MW each. These projects will be added to the Hassi R'Mel hybrid power plant with a capacity of 150 MW, including 25 MW in solar, which is already operational from 2011.

- 2016-2020: four thermal power plants with a total capacity of about 1200 MW should be commissioned.

[8] Kyoto Protocol to the United Nations Framework Convention on Climate Change United Nations 1998

- 2021-2030: installation of 500 MW per year until 2023, then 600 MW per year until 2030.

Wind turbines:

- 2011-2013: installation of the first wind farm with a capacity of 10 MW in Adrar.
- 2014-2015: two wind farms of 20 MW each should be built.
- 2016-2030: other projects will be carried out for a power of about 1700 MW.

In support of this ambitious program, Sonelgaz is working on the development of a photovoltaic panel manufacturing industry, incorporating within it the company Rouiba Lighting, which will initially produce an average of 50 MW / year and will probably start operating during the first half of the year. The year 2013. It is also planned the creation of a silicon manufacturing complex.

2.3. National Renewable Energy (RE) Development Policy

The national policy of promotion and development of renewable energies is framed by laws and regulations. The main texts governing renewable energies are:

- The law of control of energy;
- The law on the promotion of renewable energies in the context of sustainable development
- The law on electricity and public gas distribution, with its corollary executive described the cost of diversification.[9]

This policy is based on a set of organizations and economic enterprises taking, each in its own, the development of renewable energy.

Three bodies in the higher education and scientific research sector have been active since 1998

- Renewable Energy Development Centre (REDC).

[9] Official Journal of the Algerian Republic No. 23. April 17. 2011.

- Solar Equipment Development Unit (UDES)
- Silicon Technology Development Unit (UDTS)

Within the energy sector, the Ministry of Energy and Mines and the Agency support the activity related to the promotion of renewable energies for Promotion and rationalization of the use of energy. (APRUE) which was founded in 1987 and which has a department dedicated to this activity. In addition, the research and development center for Electricity and Gas (CREDEG), a group subsidiary Sonelgaz, is involved in the construction and maintenance of solar installations carried out under the national program for rural electrification.

At the agricultural sector level, it is worth mentioning the existence of the High Commission for the Development of the Steppe (HCDC), which carries out important programs in the field of pumping water and electrification by energy. Solar energy for the benefit of the steppe regions.

In terms of economic operations, several companies are already more active in the field of renewable energies.

The Ministry of Energy is building a nucleus for this industry around which all research efforts can crystallize and an effective tool for implementing the national renewable energy policy. That the Ministry of Energy has set up a joint venture company between Sonstrach, Sonelgaz and the SIM group. This is the company new energy Algeria (NEAL) founded in 2002 whose mission is the development of renewable energies in Algeria on an industrial scale.

2.4. Establishments and organizations working on renewable energy

Public Institutions

- **Ministry of energy**
- **Algerian Institute for Renewable Energy and Energy Efficiency (IAER)**

Which will play a fundamental role in the training efforts that the country is deploying, thus making it possible to qualitatively ensure the development of renewable energies in Algeria.

The training provided by this institute covers in particular the areas of engineering, safety and security, energy audit and **project management**.

- **The National Agency for Promotion and Rationalization of Energy Use (APRUE)**

The National Agency for the Promotion and Rationalization of the Use of Energy (APRUE) is a public establishment of an industrial and commercial nature created by presidential decree in 1985, under the supervision of the Ministry of Energy and Mines . Its main mission is to implement the national energy management policy through the promotion of energy efficiency. Under Law n ° 99- 09 of July 28, 1999, relating to the control of the Energy, the agency has for missions:

- The coordination and facilitation of the national energy conservation policy;
- Implementation and monitoring of the National Program for Energy Management (PNME);
- Awareness and dissemination of information on energy management towards different targets (general public, professionals, school environment ...);
- The setting up of sectoral programs and projects in partnership with the sectors;
- Concerned (Industry, Building, Transport …)[10].

- **The Renewable Energy Development Centre (REDC)** is a Research Centre, resulting from the restructuring of the High Commission for Research, created on March 22, 1988. It is a Public Scientific and Technological Establishment (EPST) responsible for developing and implementing the (...) BP.62 Route of Bouzareah Observatory 16340 Algiers, Algeria

Public companies

- **NEAL New Energy Algeria**

[10]The National Agency for the Promotion and Rationalization of the Use of Energy (APRUE). (2018).www.aprue.org.dz.

New Energy Algeria, by abbreviation NEAL, is a joint-stock company created in 2002 by two major players in the Algerian energy sector, namely the Sonatrach and Sonelgaz Groups and the Mitidja (SIM) Industrial Semolina Group.

Missions

NEAL is a player dedicated to the promotion of new and renewable energies that builds its positioning through:

- The Promotion and development of new and renewable energies,
- The Identification and realization of high-value-added technological projects new and renewable energies,
- The creation of a center of excellence dedicated to research and development (R & D) and training in the field of renewable energies,
- The development of win-win partnership, as part of the technological collaboration,
- Consulting with national and international companies.

Priority axes

The electricity generation from new and renewable energy in particular via the solar and wind,

- The creation of an institute dedicated to training in the fields of new and renewable energies and energy efficiency,
- The creation of a technology park dedicated to new and renewable energies,
- The contribution to development of an oriented local industry solar concentrators powers (CSP) and photovoltaic (PV).

- **CREDEG : Centre for Research and Development of Electricity and Gas**

Set up on 1 January 2005 as a joint stock company, a subsidiary of the Sonelgaz group.

The main purpose of CREDEG is applied research, technological development, expertise in industrial equipment and equipment behavior analysis, and materials in operation

and manufacturing phase in the core businesses of the Group's companies. SONELGAZ to know[11]:

- Production, transmission and distribution of electricity,
- Pipeline transportation and distribution,
- Promotion of new and renewable energies,
- Approval of materials and equipment Electricity and gas.

The targeted objectives are:

- The safety of people and equipment goods,
- The environmental Protection,
- The 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..

Private Companies

2.5. Legal framework

Conscious of the growing interest of renewable energies and their stakes, Algeria has integrated their development into its energy policy by adopting a legal framework favorable to their promotion and the realization of related infrastructure. The development of renewable energies is governed by a set of legislative texts:

- Law No. 99-09 of 28 July 1999 on the control of energy;
- Law No. 02-01 of February, 2002, on Electricity and Public Distribution of Gas by Pipeline;
- Law No. 04-09 of 14 August 2004, on the promotion of renewable energies in the context of sustainable development.[12]

[11] The Center Of Development And Renewable Energy. (2018). https://www.cder.dz.
[12]Renewable Energy and Energy Efficiency Program. (2011).

2.6. Algeria's position in international organizations in the field of energy

Algeria has joined the Organization of Petroleum Exporting Countries (OPEC) in 1969. During the period from 1974 to 1975, Algeria has assured the Secretary General of OPEC. Through its commitment to OPEC, Algeria contributes to strengthening the mission of OPEC, which consists of:

- Reaffirmed the principle of sovereignty of producing countries over their natural resources.
- Coordinate and unify the oil policies of its member countries
- Ensure the stability of the oil markets in order to secure, in an efficient, economic and regular way, the supply of oil to consumers and a stable income for producers
- Upon accession, Algeria played an active and sometimes decisive role in OPEC's decisions and orientations.
- Algeria is also a member of:
  - International Energy Agency (IEA)
  - The International Atomic Energy Agency (IAEA)
  - The International Renewable Energy Agency (IRENA)
  - The International Association of Oil and Gas Producers (OGP) *

Algeria's commitments at COP 21

The goal of the COP 21 summit is to limit global warming to 2 ° C by 2100.

- Reduce greenhouse gas (GHG) emissions by 7% by 2030
- Reduce by 9% of global energy consumption by 2030 (energy efficiency).
- Increase the share of electricity from renewable energies to 40% in 2030.

3. Results and discussion

3.1. Synthesis of energy flows (M Tep) -Year 2016

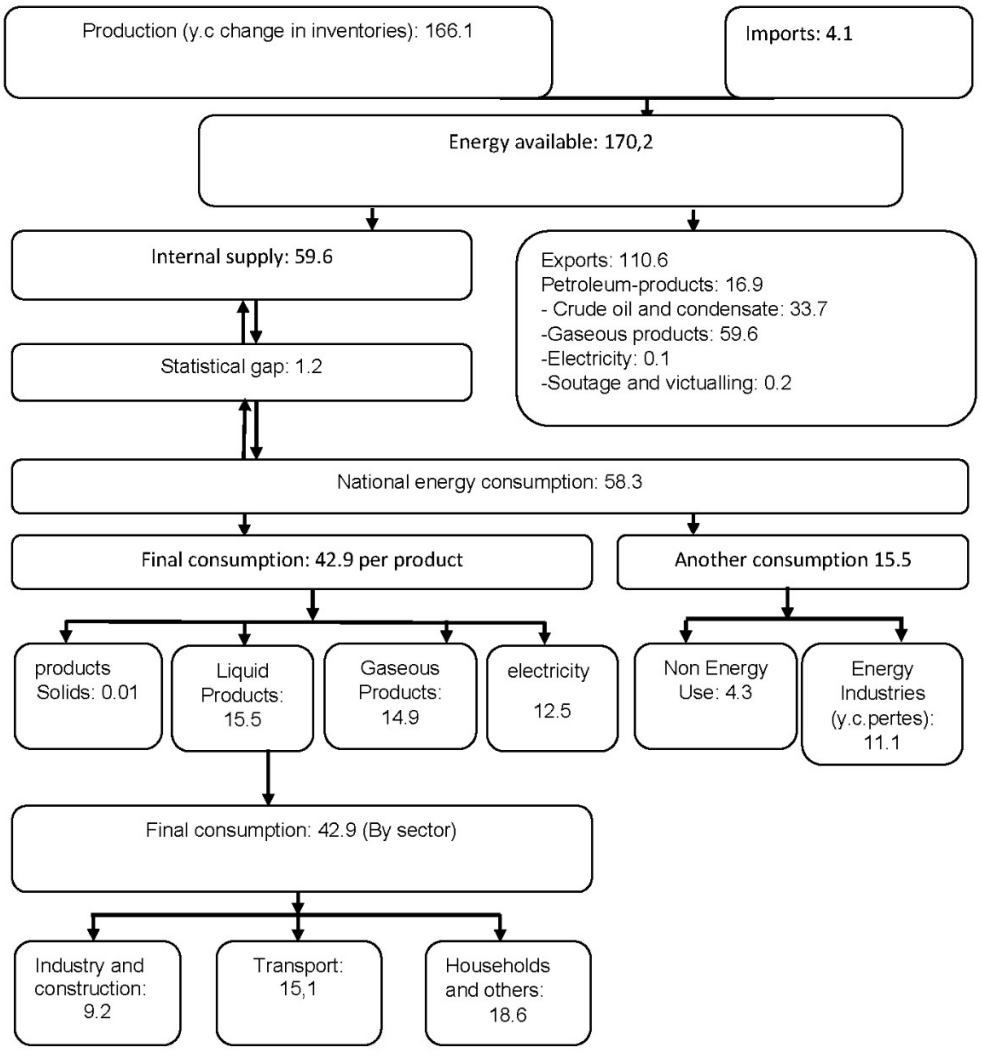


Figure5: Synthesis of energy flows (M Tep) -Year 2016

The main results of the 2016 national energy assessment highlight the following:

- Commercial production of primary energy reached 166.2 million toe, reflecting a strong growth of 11.3 million toe, or + 7.3% compared to the achievements of the year 2015;
- Available energy, sum of production, imports and inventories, reached 170.2MTep, up + 5.9% compared to 2015;

- Imports fell significantly by -13.0%, driven by a 16% drop in fuel prices;
- Exports reached 110.6 M toe, reflecting a strong increase (+ 10.4%) compared to the level recorded in 2015;
- The trade balance shows a net export balance of 106.5 Mtoe, a sharp increase over the year 2015, due to the combined effect of export growth and lower imports;
- National energy consumption reached 58.3 Mtoe in 2016, almost the same level (+ 0.1%) as in 2015. It represents more than one third (35.1%) of total production;
- Final energy consumption rose slightly (+ 1.0%) to reach 42.9 million toe, driven notably by electricity (+ 4.3%) and natural gas (+ 3.3%). By contrast, that of petroleum products experienced a significant decline (-2.8%).

However, Algeria begins to consider ecological solutions by investing in new and renewable energies → **Energetic transition**

The production of several photovoltaic power plants produced under the national renewable energy (RE) program. In 2016, 13 photovoltaic plants with a total capacity of nearly 180 MW were commissioned.; which has increased to increase the share of solar and wind power in the production of primary electricity to nearly of80% .By contrast, Production of hydroelectricity has dropped sharply (-50%) at 72 GWh, given the low rainfall, bringing its share to less of20% of primary electricity[13].

The energy transition is therefore preparing for major changes: Changing the way we produce and consume energy. Sobriety and energy efficiency help to avoid wastage and improve the use of energy. This is explained by:

Evolution of behaviors, avoiding unnecessary or irrational expenses

It's sobriety

[13] National Energy Balance 2016. (2017). Ministry of Energy.

Reducing the amount of energy needed for the same service rendered, by improving technical (energy production, eco-design apparatus)

It's energy efficiency (EE)

The energy transition is therefore preparing for major changes: Changing the way we produce and consume energy.

To control energy consumption. The ISO 50001 (an international standard on Energy Management Systems is available since June 2011. This is the ISO 50001) sets the framework for defining a suitable and effective energy policy. It is based in particular on the choice of indicators, their monitoring and their continuous improvement.

3.2. Energy management according to ISO 50001 standard

The structure of ISO 50001 has been aligned with that of ISO 14001. **An Energy Management System (EMS) must include the following elements[14]:**

1. Senior management commitment.

2. Definition of an energy efficiency policy for the installation by top management.

3. Planning and setting objectives and targets.

4. Implementation and conduct of procedures paying particular attention to the following aspects: organization and responsibilities of staff, training, awareness and competence, communication, staff participation, documentation, good process control, maintenance programs, preparation for emergencies and means of action, compliance with legislation and possible agreements on energy efficiency.

5. Comparative analysis: identification and evaluation of energy indicators over time, regular comparison with equivalent national standards.

6. Verification of performance and taking corrective measures.

[14] Céline Corréard. (2014). *Maîtrise d'Ouvrage et management de patrimoine BATi*. Master 2 University Joseph Fourier -Grenoble. France.

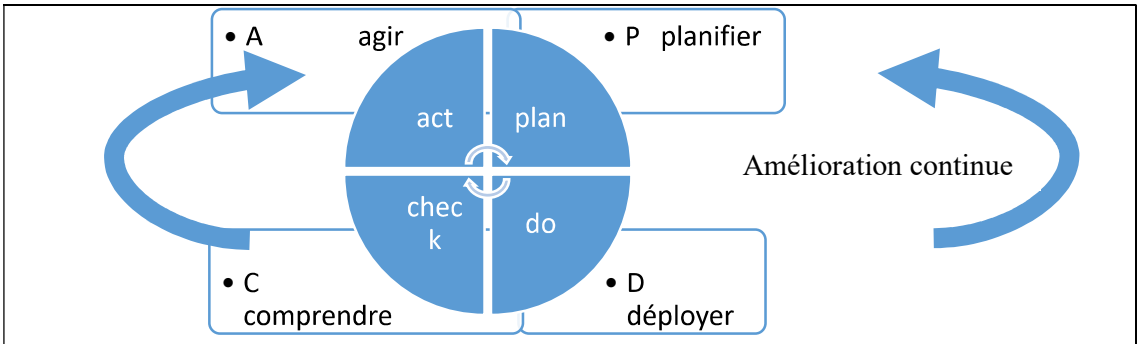
7. EMS Review by senior management to ensure that it remains suitable, adequate and efficient.

8. Taking into account, when designing a new unit, the environmental impact that could have its dismantling.

9. Development of energy-saving technologies and monitoring of progress in energy efficiency technologies.

The integration of "energy management" into urban operations is a recent phenomenon, but one that is becoming increasingly important.

3.3. Structure of the ISO standard



1 / PLAN Management's responsibility: Management representative Energy policy Energy planning Legal and other requirements Energy Review Reference consumption Energy performance indicators Objectives, targets and action plans	**2/ DO** Implementation and operation Competence, training and awareness Communication Documentation operational control Design Purchasing power ...
4/ Act Management Review	**3/ Check Verification** Monitoring, measurement and analysis Assessment of compliance with requirements Internal Audit NC, AC and AP Control of records

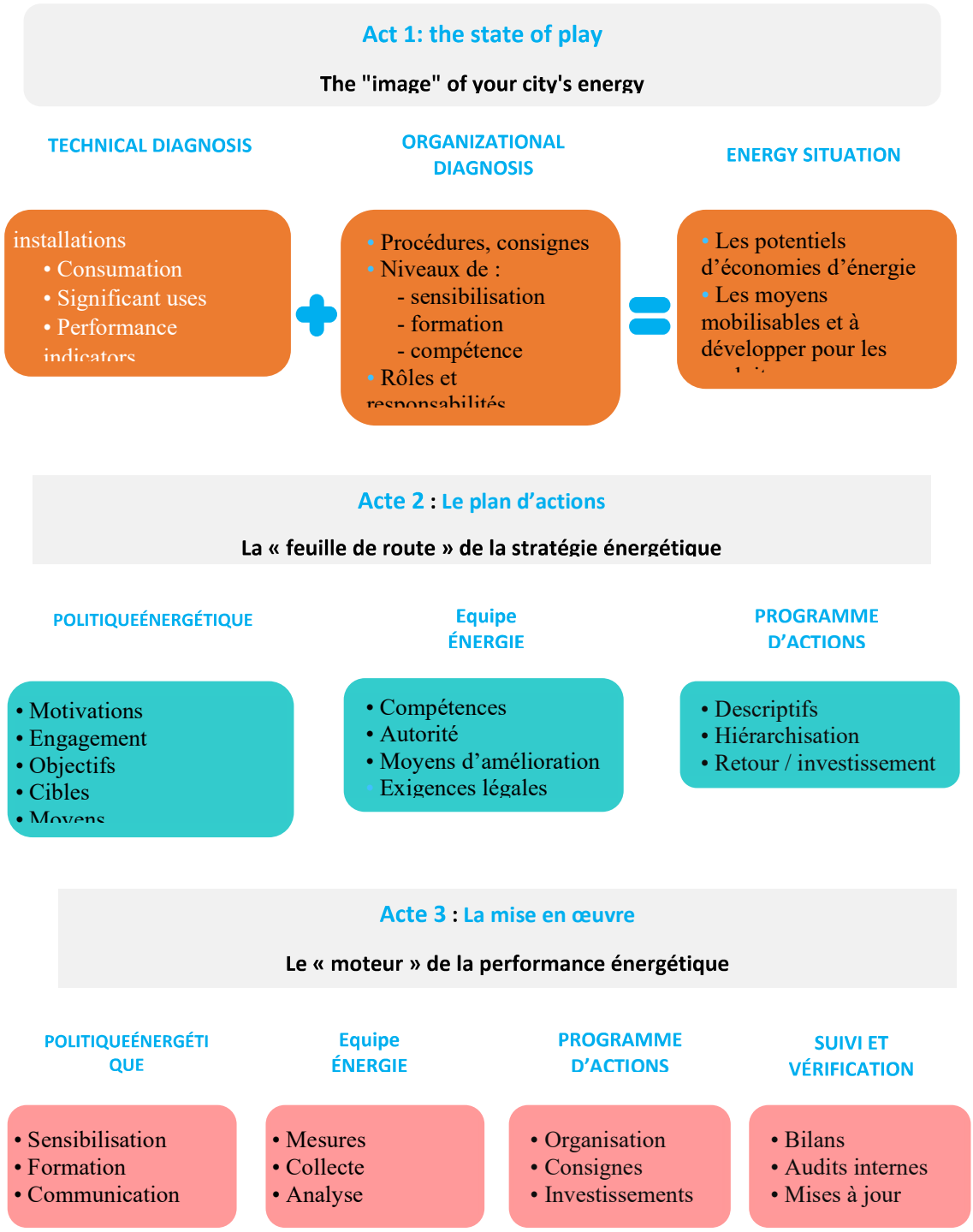
Figure 6. Structure of the ISO standard.

The purpose of this standard is to help organizations develop methodical control management to improve their energy efficiency, thereby reducing their costs and greenhouse gas emissions. ISO 50001 could impact up to 60% of global energy demand, ISO estimates.[15]

The energy management system is an essential factor of success it is in the interest of being defined after the inventory of fixtures because it will be increased by the result of the diagnosis the potential of energy and the targets (perimeter of intervention, activities ...) it must contain:

[15]ISO Standard 50 001 Energy Management System. (2018).

3.4. The Energy Management System in 3 acts



3.5. Recommendation

In order to concretize this renewable energy policy as well as that of energy efficiency in the context of sustainable development it is imperative that the public authorities decide to:

- Raise awareness and inform the public about energy issues by launching a reflection or debate with media coverage (press, radio, television) and within schools, universities, mosques, associations, political parties, etc.
- Align the prices of electricity, fuel and water at their real cost price and this in a progressive way, so that citizens pay more attention and preserve them. Today we get to pay the difference between the real price and the subsidized price thanks to the oil windfall; maybe in the near future we will not be able to do it anymore.[16]
- Require public buildings (Ministries, hospitals, universities ...) to use solar water heaters for heating sanitary water. The use of photovoltaics for public lighting.
- Require an energy audit prior to the construction of new and large buildings (plan audit).

For the implementation of an Energy Management System, actually, it is not the resources that are lacking, nor the technologies. The real challenges lie in our will, our organization and our societies. For renewable energies, as for energy efficiency measures, progress will not come simply from capital investment. This progress will also depend on education and institutional frameworks to promote appropriate behaviors and solutions to prevent rebound effects and additional costs. In reality, there is a relative disinterest of the general public; the topic of energy was not and is not yet part of the major concerns of Algerians to the hot issues of the moment (housing problems and unemployment). The modification of our energy behaviors means changes in our types and lifestyles and poses, simultaneously, a problematic of society:

[16] Ezzedine Khalfallah. (2010). *Maîtriser l'énergie pour lutter contre le réchauffement climatique*, The Institute for Prospective Economics of the Mediterranean World. IPEMED.France.

consumption, transport, habitat, and city. These behavioral changes can bring us a lot more in energy saving, therefore, a money saving.

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