

ENERGY POLICY ASSESSMENT – TUNISIA



Table of Contents

.....	1
August 2017	1
1. Introduction	3
2. Tunisia and Climate Change	3
3. Objectives and Scope	4
4. General Overview on the Energy Sector	5
5. Energy Policy and the Legal Framework	6
5.1. General overview	6
5.2. Subsidies	7
5.3. Renewable energy policy	7
5.4. Energy efficiency policy	11
6. Renewable Energy Potential and Applications	13
6.1. Renewable energy potential	14
7. Challenges Facing Renewable Energy Deployment	14
References	15

1. Introduction

Tunisia is a small country located in Northern Africa, sharing borders with Algeria and Libya. The country entails the Northern reaches of the Sahara desert and the Eastern end of the Atlas Mountains and has a Mediterranean coast. Therefore, the country enjoys diversity in terms of climate and biosphere.

With a climate characterized by aridity (precipitation ranging from 800 mm in the North to 150 mm in the South) and a Mediterranean coast of more than 1300 km, the country remains very vulnerable to climate change, including reduced rainfall and elevation of the sea level.

These climate risks would have adverse effects on social, economic and ecological aspects, manifested by scarcity of water resources, weakening of terrestrial and marine ecosystems, decline in agricultural and tourist activities and an increase in vector and water-borne diseases.

2. Tunisia and Climate Change

In 2012, the gross emissions of Tunisia amounted to 46.6 MteCO₂ and net emissions to 32.6 MteCO₂, whereas they were 29 and 20.5 MteCO₂ in 1994 respectively. The net emissions per capita in Tunisia amounted to 3 TeCO₂ in 2012, which remains well below the world average (5 T eCO₂/hab.).

The proactive energy policy and the transformation of the economic structure played a crucial role in declining carbon emissions of Tunisia since the early 1990s from 0.8 T eCO₂/MDT in 1994 to only 0.6 T eCO₂/MDT in 2012.

This energy policy has enabled a clear decoupling between economic growth and the evolution of net GHG emissions. Indeed, while the GDP has more than doubled between 1994 and 2012, GHG emissions have increased by 1.3 times.

In October 17, 2016, the Tunisian Parliament ratified the Paris Agreement by unanimity of all its members. By this ratification, Tunisia formally committed its national contribution by submitting its INDCs to the UNFCCC on 16 September 2015.

This ratification is part of a continuous process of commitment by the Tunisian Government to combat climate change that began with the adoption of the UNFCCC Convention in 1992 and its ratification in 1993. Since then, Tunisia has always fulfilled its commitments to the UNFCCC by submissions of national communications, the first biennial report as well as its INDCs. Figure 1 hereunder shows the decoupling between GDP and GHG emissions.

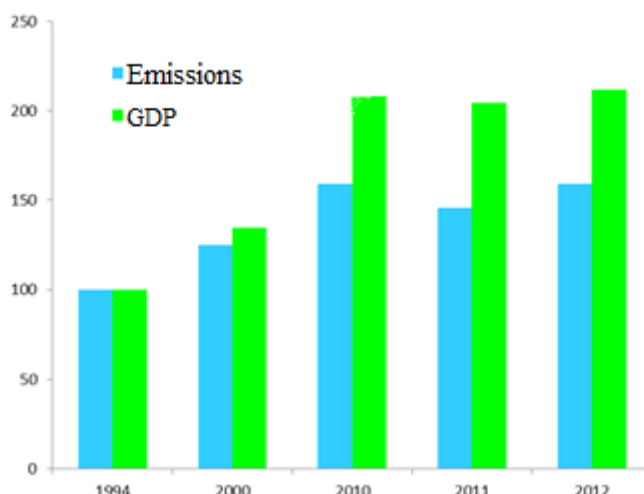


Figure 1: Decoupling of GHG emissions and GDP (1994 = 100)

Table 1 hereunder shows the Tunisian Government's commitments to the UNFCCC.

Table 1: Commitments of the Tunisian Government to the UNFCCC

Year	Object
1992	Signature of the Convention Framework on Climate Change UN
1993	Ratification of the Convention Framework on Climate Change UN
2001	Submission of the First National Communication Report
2002	Ratification of the Kyoto Protocol
2010	Submission of actions of GHG mitigation in the context of implementing the Copenhagen Accord
2014	Submission of Second National Communications
2014	The First Biennial Report
2015	Quote of the INDCS
2016	Ratification of the Paris Agreement

3. Objectives and Scope

The aim of this report is to provide an overview of current evolving policies and regulations in the energy sector in Tunisia with a particular focus on the integration of renewable energy and energy efficiency applications.

4. General Overview on the Energy Sector

Since 1990, the Tunisian primary energy consumption has increased in a roughly linear way, with approximately 4,500 ktoe in 1990, 6,700 ktoe in 2000 and 8,300 ktoe in 2010 (without biomass). As shown in Figure 1, the sharpest increase is to be noticed in the gas sector, which represented 55 % of the primary energy supply in 2012. As a result, the share of oil, including crude oil and petroleum products, has slightly decreased. The share of coal and peat has always been minimal and reached zero in 2012. The amount of biofuel and waste slightly increased (58 PJ in 2011) and represents 15 % in 2012 of the primary energy supply. In 2014, primary energy consumption was about 9,200 ktoe^[1] (i.e. 107,000 GWh or 385 PJ), without biomass⁽¹⁾.

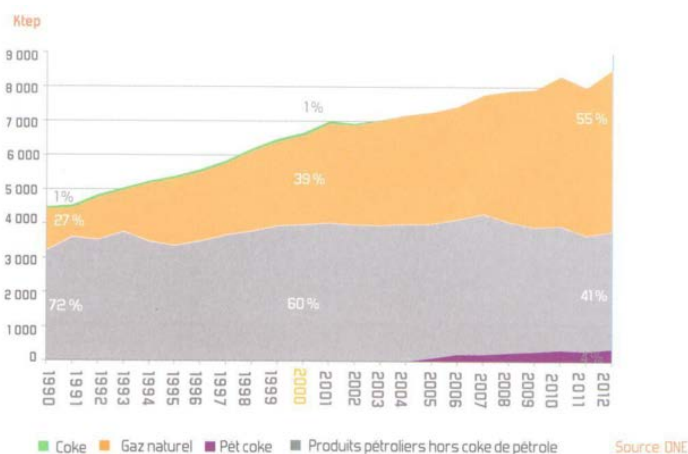


Figure 2: Primary energy consumption since 1990

In 2016, oil products constituted 99% of primary energy consumption. Natural Gas covers only 52.2% of the primary energy consumption while 47.3% are being covered by other oil products. Electricity consumed 75% of the total natural gas consumption in 2016.

Electricity production depends on 99% of natural gas: this dependence may pose a serious security problem in terms of electricity (electric power) production, knowing that the domestic production of natural gas is going through stagnation, or even a declining trend in the recent years.

Domestic production of oil products provides 40% of the primary energy consumption compared with 60% from imports. The total consumption of petroleum products is distributed as follows: 56% for the transport sector compared to 44% for industry, building and agriculture. The transport sector is highly dependent on petroleum products, which represent 99% of its energy consumption.

Reliance on fossil-fuel reserves and the absence of political support has meant that, historically, development of renewable energy has not been considered a high priority for Tunisia. However, the rapid expansion of the global renewables market, recognition of the country's significant RES potential and a number of major international solar initiatives has resulted in a strong commitment towards diversifying the country's power generation portfolio, particularly through investment in

¹ https://energypedia.info/wiki/Tunisia_Energy_Situation#cite_ref-ANME_Ma.C3.AEtrise_de_l.27Energie_en_Tunisie_-_Chiffres_Cl.C3.A9s.2C_p19._1-0

wind and solar power capacity. The share of electricity generated by RES is around 1%; however, government targets aim to increase this to 11% by 2016 and 25% by 2030.

5. Energy Policy and the Legal Framework

5.1. General overview

The energy sector is managed by the Ministry of Energy. The Ministry defines the Government's energy policy and monitors the enforcement of legislations that are related to the energy sector. The Energy General Department (DGE) within this Ministry is in charge of the execution of Tunisia's energy.

Since the mid-eighties, Tunisia developed an energy control policy. The implementation of this policy is based on four main instruments: institutional, legislative, financial and fiscal. The National Agency for Energy Control (ANME) is the institutional body in charge of implementing the State's policy in terms of RE promotion and the rational use of energy.

In order to reduce its dependency on Algerian gas, Tunisia needs to diversify its electricity mix and extend its interconnections. A gas interconnection with Italy already exists (Gazoduc), currently being used to transport Algerian gas to Europe. However, this interconnection may be used for imports in future. An electric interconnection with Italy via a 400 kV submarine cable is currently being considered. It may be used for imports and exports later on: complementary daily and annual production and consumption profiles of North Africa and Europe can create synergies.

In 2016, Tunisia developed an energy strategy, which aims to guarantee the security of energy supply of the country while ensuring access to energy at an affordable price for the economy and the Tunisian population. This strategy focuses on four key areas:

- a) Developing national resources of hydrocarbons, especially natural gas,
- b) Strengthening the activities of refining, transporting and distributing petroleum products,
- c) Developing electrical production and strengthening interconnections, including the construction of the interconnection with the Italy line,
- d) Realize energy transitioning by strengthening energy efficiency and developing renewable energy. Tunisia has set objectives, by 2030, to reduce its consumption of primary energy by 30% and to achieve a share of renewable energy in the production of electricity by 30%.

Furthermore, there is a strong need for institutional and budget reforms in the energy sector since the current situation drastically differs from around 20 years ago. Some of its aspects such as subsidies have become a burden hindering a further development of the whole sector. In November 2014, the Ministry of Industry, Energy and Mines called for drastic cuts for the year 2015. Subsidies should decrease from 1.3 billion Euros (2.7 billion TND) to 0.9 billion Euros (1.96 billion TND) in order to use the saved money in investment projects. In 2014, energy prices were raised by approximately 10% in total in order to reduce subsidies. By June 2014, electricity price subsidies for cement producers were completely phased out.

Forecasts from the ANME expected the consumption to double by 2030 without implementation of a comprehensive action; therefore, energy efficiency should be further strengthened. Measures since 2000 have brought results: Tunisia has reduced its energy intensity by 20%².

5.2. Subsidies

The energy sector is heavily subsidized in Tunisia. Subsidies for natural gas as well as electricity started a sharp increase in the early 2000s. In 2012, energy subsidies amounted to 5,600 million TND (3,100 million EUR), i.e. 20% of public budget or 9% of GDP. Whereas energy subsidies only represented 3% of GDP in 2005. This rise in subsidies is not sustainable for the State and has several negative impacts on public spending such as a decreasing budget for public investments.

Subsidizing procedures remain non-transparent. The subsidy system is composed of indirect and direct subsidies. Indirect subsidies constitute the difference between supply costs of crude oil and gas for the State and the selling prices to the two public operators STIR for oil and STEG for natural gas. Direct subsidies are subsidies made directly by the State to STIR and STEG in order to offset their deficits.

As for electricity, average retail prices (0.14 TND/kWh in 2012) are significantly lower than average production costs for the State (0.26 TND/kWh in 2012). The discrepancies between average production cost and average retail price are even larger for natural gas³.

5.3. Renewable energy policy

By the 1980s, Tunisia has spearheaded a policy for proactive and continuous energy management, positioning itself as one of the pioneering countries in the region. More recently and in the mid-2000s, Tunisia embarked in a process of acceleration of energy transition, which is part of a strategic vision toward a Bursar to lower carbon, based on two main axes:

- a. Improving energy efficiency by better controlling the energy demand, with the goal of reducing the demand for primary energy by 30% by 2030 compared to the scenario.
- b. Substantial use of renewable energy, for the diversification of the energy mix for electricity production with a target of a 30% share from renewables in electricity generation by 2030.

Since the middle of the eighties Tunisia has developed a suitable regulatory framework for the development of RE, which has been constantly enhanced to support the Government's policy in this domain.

² https://energypedia.info/wiki/Tunisia_Energy_Situation#cite_note-http.2F2Fdirectinfo.webmanagercenter.com.2F2014.2F11.2F30.2Ftunisie-une-augmentation-attendue-de-7-des-prix-de-lelectricite-et-du-gaz-en-2015.2F19

³ https://energypedia.info/wiki/Tunisia_Energy_Situation#cite_note-Ibid.-5

Decree 2002-3232, dated December 3, 2002, then modified by Decree 2009-3377, authorizes cogeneration facilities to sell their surplus to STEG and to transmit their production via the national network. Law No. 2015-12, dated May 11, 2015, related to the production of electrical power through RE complements the existing legal framework. It takes on provisions related to self-production and authorizes the creation of specialized companies in the production of power designed for local consumption (STEG) or for exports⁴.

Law No. 2005-106, dated December 19, 2005, provides for the creation of the National Fund for Energy Control (FNME). It constitutes the financial instrument supporting RE promotion policies. It can be used to provide direct financial incentives granted in the framework of the energy control law and related legal texts. Direct subsidies granted by FNME have been complemented by specific fiscal incentives allocated to the purchase of equipment and products used in RE production: application of minimal customs fees and VAT exemption.

These benefits come in addition to the investment code's general system, which also offers incentives and subsidies related to investments, according to geographic areas and activities.

Despite the relatively low levels of current installed RES capacity, it could be argued that Tunisia has in fact spent the last 20 years preparing for the transformation of its energy sector that is currently taking place. Since 1985, Tunisia has pursued a "Rational Use of Energy" policy and has sought to establish an appropriate institutional environment conducive to energy conservation and management. Among the MENA countries, Tunisia is acknowledged as a "pioneer" in the initiation of energy efficiency and renewable energy policy.

Since its creation in 1985, its name, authority, prerogatives and organization have frequently changed. Presently, ANME's attributions are defined by Law No. 2004-72 dated August 2, 2004. ANME is also in charge of promoting and following up the execution of the "Tunisian Solar Plan".

The Tunisian Solar Plan, initiated in 2009, includes a number of projects to implement before the year 2016. It was reviewed in 2012 and in 2015 but achievements have been well below expectations. Repurchase tariffs offered by STEG of surplus made by electricity self-producers were defined in a decision issued by the Ministry of Energy on June 1st, 2010 then reviewed in 2014.

The Tunisian Solar Plan, is a renewable energy development plan elaborated by the ANME but not officially adopted by parliament or government, foresees a 30% share of renewables in the electricity mix by 2030. This corresponds to an additional totally capacity of 3 GW and an overall

⁴ Center of Mediterranean and International Studies & Konrad Adenauer Stiftung

investment of 4.75 billion Euros. Figure 3 shows the development goals by technology. The Tunisian Solar Plan was updated in 2014.

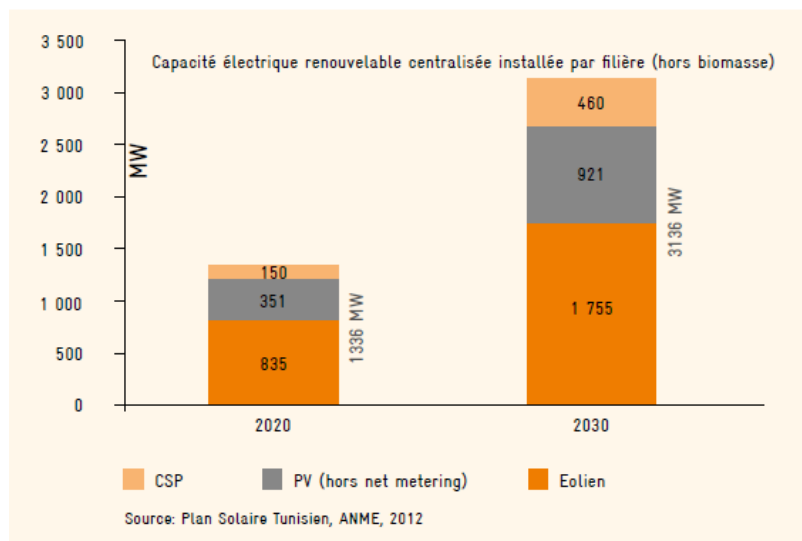


Figure 3: Foreseen RE installed capacity in Tunisia in 2020 and 2030

A new **law on renewable energies** was adopted by Parliament in May 2015. The objective of this law is to promote private investment in renewables to contribute to the 30/30 objective of the Tunisian Solar Plan. The law foresees three project development regimes:

- (1) Self-consumption,
- (2) Complete sale of electricity to the utility STEG (feed-in tariffs, projects under 10 MW for PV and 30 MW for wind),
- (3) Complete sale of electricity to the utility STEG (tenders, projects above 10 MW for PV and 30 MW for wind),
- (4) Electricity export. The implementation of by-laws of the RE law were approved by the Council of Ministers (Cabinet) in July 2016, as of August 2016.

The Tunisian Government has adopted a renewable energy action plan with two main objectives:

- Development of large scale projects for the production of electricity from renewable energy sources with a target of 14% the share of renewable energy in national electricity production by 2020.
- Strengthening of the solar water heaters program in the residential and tertiary sectors and its extension to the industrial sector (for process heat).

Thus, the program targeting the installation of 1010 MW of renewable energy on the 2017-2020 period, is divided as follows:

- 1) The installation of additional **wind** capacity of 570 MW, of which:
 - 490 MW is centralized

- 80 MW is decentralized
- 2) The installation of additional **PV** capacity of 420 MW, of which:
 - 290 MW is centralized
 - 65 MW by clients connected to the network (net-metering) as part of the "Solar Roofs" program
 - 65 MW by clients connected to the network MT/HT
- 3) The installation of additional electric capacity from biomass (mainly electric generators to biogas) 20 MW
- 4) The installation of additional capacity of solar collectors for water heating of 487000 m²; 450 000 m² in the residential sector, 23000 m² in the tertiary sector and 14000 m² in the industrial sector.

The implementation of the action plan in the field of renewable energy will require the mobilization of a total investment of about 1.46 billion U.S. dollars (3.36 billion Tunisian Dinars) and should avoid the emission of 1.9 MTeCO₂, distributed as follows:

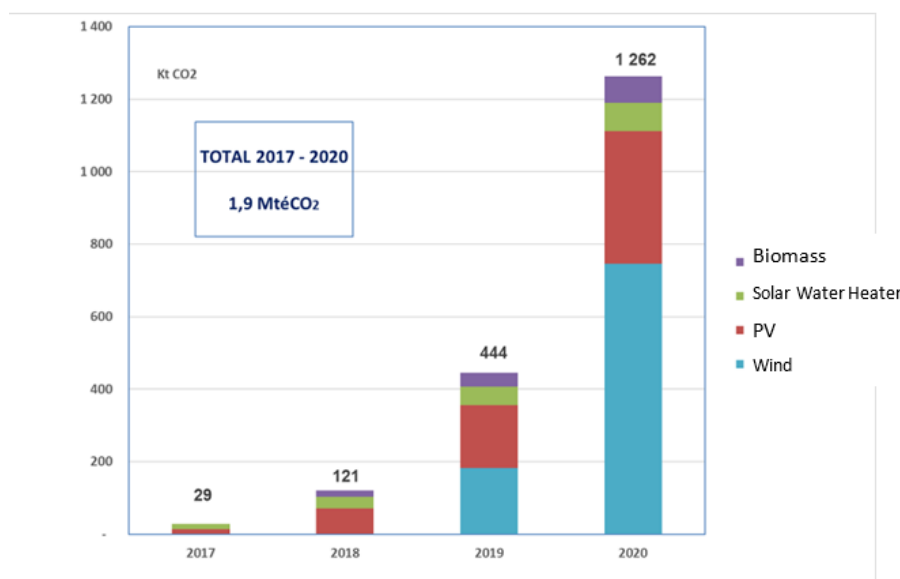


Figure 39: Impacts of the action plan targeting the renewable in terms of reduction of GHG emissions (KTeCO₂)

The Tunisian program “**Alliance of Commons for energy Transition**” (Acte), which was launched in May 27, 2015, has laid a partnership between the National Agency for the Control of Energy (ANME), the Fund of Loans and Support of Local Communities (CPSCL) and the General Directorate of Public and Local Authorities (DGCPL). The program aims to strengthen the capacity of Tunisian Municipalities to contribute to their levels in the national energy transition through energy efficiency and the use of renewable energy at the level of the municipal heritage and its territory.

The scope of the Act Program at the local level covers all Tunisian municipalities. Currently, there are 350 municipalities, out of which 86 were recently created (May 2016) but not yet functional. The program mainly addresses six areas:

1. Buildings and urban planning to support municipalities in their roles in regulating and developing their territories, to promote territorial and sustainable urban planning and to be resilient to climate change.
2. Equipment and municipal buildings to support municipalities in their roles towards consumers and public service providers to become a " Model" on Energy diversification.
3. Enhancing municipalities capacity to promote energy efficiency and the use of renewable energy within its regions and territories.
4. Provide support to municipalities on transportation related issues.
5. Strengthen municipalities capacities on internal organization, monitoring and evaluation to set up a system of internal governance within municipalities, inclusive monitoring and evaluation systems for their local energy policies.
6. Enhancing municipalities capacities on cooperation and communication matters to support their public, private and civil societies and to facilitate energy control, including areas that are not directly within their jurisdictions.

A local authority, that is committed to energy control through the ACTE program will benefit from a threefold support, namely:

- 1) Direct or indirect technical assistance through national, regional and local experts (based in the regions) throughout the project cycle: energy audits, development of action plans, implementation, monitoring and evaluation of program contracts.
- 2) Legal and institutional support for the structuring of investment projects, the preparation of energy performance contracts and development of management methods best suited to the public service concerned, e.g. use of energy service companies (ESCO) or Other forms of public-private partnerships (PPP).
- 3) Mobilization of financial support through the CPSCL.

5.4. Energy efficiency policy

Law No. 2004-72 on the rational use of energy defines prudent use of energy as a national priority and as the most important element of the sustainable development policy. It states three principal goals: energy saving, renewable energy promotion and creation of new forms of energy that favour cost reduction and national economy as well as environmental protection.

The energy action plan for the period 2017-2020 has been developed as part of the preparation of the new plan of development for Tunisia over the same period. The implementation of this action plan should combine a 2.5 Mtoe primary energy saving and a reduction in GHG emissions of 6.3 MTeCO₂. For the 2017-2020 action plan, the total investment required would be 4.7 billion Tunisian Dinars, equivalent to US \$ 2 billion.

The National Energy Efficiency Action Plan consists of three phases:

- Phase I: Awareness raising, first concrete and grass-root actions were taken under two programs, (2000-2013) that contributed to an annual decrease of 2% in energy intensity;
- Phase II: Continued implementation and voluntary investment via the mobilisation of industry, construction and transport (audits, cogeneration, lighting, household appliances, buildings, transport);
- Phase III: Implementation of large scale projects in order to reach the 30-30 goals - 30% of electricity shall be produced by renewable sources by 2030 – (2020-2030).

The Action Plan also foresees an independent regulator in the electricity market. However, the main actions to be undertaken are as follows:

- a. Achieve 500 contract programs of large consumers of energy from different economic sectors (industry, building, tertiary, transport).
- b. Install an additional capacity of cogeneration in industrial and tertiary 278 MW power
- c. Broadcast 4 million of LBC in the residential sector and 1.4 million LED in the tertiary sector (trade)
- d. Broadcast 545 000 LED lights and install 6 000 inverters of tension for efficient public lighting
- e. Replace 300 000 fridges over 10 years by class 1 fridges
- f. Renovate 40 000 homes as energy efficient buildings
- g. Ensure that 250 industrial enterprises enter the process of implementation and certification of their energy management systems according to the standard ISO 50001
- h. Achieve 26 (PDU) urban transport plans in Tunisian cities

The implementation of the Action Plan in the field of energy efficiency will require the mobilization of a total investment of about 467 million U.S. dollars (1075 million Tunisian Dinars) and should avoid the issuance of 4.5 MTeCO₂, distributed as per Figure 4 hereunder.

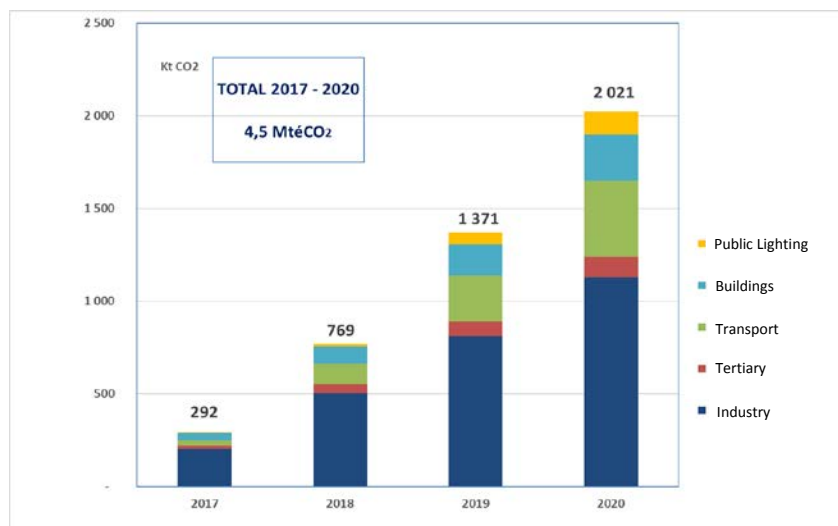


Figure 4: Impacts of the action plan targeting energy efficiency in terms of reduction of GHG emissions (KTeCO₂)

6. Renewable Energy Potential and Applications

Currently, renewable energy plays a minor role in the energy supply. The use of solar energy for thermal purposes is widespread in Tunisia and can be regarded as a success story. Since its launch in 2005, the ANME program “Prosol Thermique”, meant to promote the installation of solar water heaters; it has led to an installed capacity of 487,853 m² in 2012.

Regarding grid-connected renewables, the total installed capacity of renewable energy was estimated at 312 MW in early 2016 (245 MW of wind energy, 62 MW of hydropower and 25 MW of PV), that was 6% of the total capacity. In terms of electricity production this meant 3% of this annual production in 2013: 2.6% (357.8 GWh) from wind turbines and 0.4% (60.1 GWh) from hydropower.

There are two large wind parks in Tunisia, both operated by State utility STEG, one is located in the region of Bizerte in Metline and Kechabta with a capacity of 190 MW – it has been operational since 2012; and the other one in the region of Sidi Daoud, with a capacity of 55 MW – it was built in 3 phases between 2000 and 2009.

As for photovoltaics, there was a total capacity of 25 MW as of early 2016, mostly small-scale private installations, most of their capacities ranges between 1 kW and 10 kW. On low voltage for the residential sector, the capacities range from 1 kW to 17 kW and in the commercial sector capacities are between 10 and 30 kW. On medium voltage, capacities in the commercial sector range between 25 and 100 kW.

As of early 2015, there were only three operational PV installations with a capacity of at least 410 kW; a 149 kWp installation in Sfax, a 211 kWp installation operated by the Tunisian Potable Water Supply Company (SONEDE) and a 100 kWp installation in the region of Korba, all of them are connected to the medium voltage and implemented by Tunisian installer companies.

The first large scale solar power plant of a10 MW capacity, co-financed by the German Development Bank (KfW), the EU's Neighbourhood Investment Facility (NIF) and implemented by STEG, is due 2018 in Tozeur.

Regarding the off-grid use of renewable energies, 11,000 decentralised PV systems have been installed.

6.1. Renewable energy potential

a) Wind energy

The wind Atlas which was published by ANME highlighted windy regions across Tunisia. ANME considers that Tunisia's onshore wind potential is 8,000 Megawatts. (MW). The evaluation of the offshore wind potential still needs to be investigated. The estimated wind energy capacity factor of on-shore facilities ranges between 25% and 30%;

b) The thermal and photovoltaic (PV)

Solar energy may partially replace the thermal production of electricity. Furthermore, solar energy may replace conventional water heating systems in homes and civil buildings if solar panels are used. The solar energy potential in Tunisia is therefore quite high theoretically;

c) Bio-energy

Bio-energy sources are estimated at 1.6 Mtep/year and mainly include Dendro Power / Energy but also biogas, bio-fuel and waste. Its 10% impact on the energy overall balance should be reassessed.

d) Hydro-electrical resources

The modest hydro-electrical resources are relatively well developed and very little potential can still be valued;

e) Geothermal potential

Geothermal potential has been subject to incomplete assessment studies. Identified resources have limited enthalpy and their impact on the energy balance is also very little.

7. Challenges Facing Renewable Energy Deployment

Technical and economic constraints still face the production of renewable electrical power; in fact, the use of RE for the production of electrical power is facing various types of constraints in terms of:

1. Availability and quality of renewable resources.
2. Quality of the electrical power transmission network.
3. Increase of fossil energy international prices (mainly gas and coal)
4. In Tunisia, RE utilization potential to produce electrical power varies according to the activity sector.

5. The production potential of renewable electrical power based on hydraulic, bio-fuel and geothermal sources is almost not known.
6. Although the potential of wind and solar power is considered relatively high, the production of wind-generated electrical power is nevertheless limited due to its irregular character.
7. The contribution of RE in the production of electrical power amounts to a few percentage; the quality and isolation of the electrical power transmission network constitute barriers impeding the development of wind energy.
8. The competitiveness of the wind electrical power of solar electricity will still depend on the international prices of natural gas and equipment required for power plants.

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