Energy conservation indicators in Southern Mediterranean countries

Country report for Algeria

APRUE

RCREEE
Regional Center for Renewable Energy and Energy Efficiency

Plan Bleu
UNEP/MAP Regional Activity Center

plan bleu

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Content

Preface

The design, implementation and monitoring of national energy policies require relevant indicators reflecting energy-use performances at macro and sector level. Moreover, for developing countries the implementation of information systems in energy and greenhouse gas emissions indicators will be a key condition for the development of new mitigation financing mechanisms (NAMAs, sectoral mechanism, etc.) currently under negotiations for the new international climate governance regime. In fact these mechanisms will need Measures, Reporting and Verification systems (MRV) to prove the integrity of these actions. Also, for the Arab League States Energy Efficiency Directive, such indicators are crucial for the monitoring and assessment of the National Energy Efficiency Action Plans (NEEAPs).

For these reasons and based on European experiences (ODYSSEE), PLAN BLEU, in cooperation with RCREEE and with the support of MED-ENEC, has launched the current Energy Efficiency Indicators Project in ten MENA countries, namely: Morocco, Algeria, Egypt, Lebanon, Syria, Jordan, Libya, Palestine, Tunisia and Yemen as a tenth member state of RCREEE. This project aims to i) strengthen the capacities of these countries in monitoring their energy policies by using the energy efficiency indicators approach ii) build and interpret a range of basic common indicators for the region.

The project was carried out according to a two-year process based on specific methodology including:

- A participatory approach associating national public and private experts
  - 4 workshops and working sessions held in Tunisia, Egypt, France and Morocco
  - Selection, by the participants, of the common indicators to be developed in the project, based on the data availability and the relevancy for the country
  - Technical assistance throughout the project provided by the regional coordination
- Capacity building through " learning by doing " and exchanging experiences
  - Data collection by the national experts with the support of RCREEE focal points, strengthening the cooperation between public and private experts
  - Common development of a simplified calculation tool for data collection and indicators' calculation used by the experts
  - Development of capacity for analysis and interpretation of energy indicators by national experts
  - Country reports developed by the national teams
- Dissemination of the results and the learned lessons
  - Organization of final seminar for the decision-makers in June 2012
  - Publication and wide dissemination of the results recorded in flyers, national and regional reports.

The project was coordinated by:

- Plan Bleu: Ferdinand Costes, El Habib El Andaloussi
- RCREEE: Amel Bida
- MED-ENEC: Florentine Visser
- ALCOR: Rafik Missaoui, Hassen Ben Hassine, Adel Mourtada.

In a context where rising energy prices seems inevitable, where energy safety has become a concern and where the political climate is evolving, decision-makers in the energy sector focus increasingly on renewable energies and energy efficiency.

1. Subject of the study

The "Energy Management Indicators in ALGERIA" study falls within the framework of a service contract between the PLAN BLEU and the APRUE.

The country study (Algeria) will contribute to the regional study which is aimed at "developing a set of energy management indicators in Southern Mediterranean countries and Yemen".

2. Purpose of the study

The original intention of the study was to present the overall situation concerning the supply, production and consumption of energy in order to process information to facilitate analysis and decision-making. The study consisted in collecting and compiling in-depth energy and social economic information in order to obtain reliable statistical data to present the particular aspects of energy on a macro and micro level according to the specific characteristics of the country. The aim is to come up with a set of energy efficiency and environmental indicators to make it easier to monitor trends and how they evolve, particularly in terms of knowing and understanding the impacts of national and regional development.

The purpose of this study is to improve the national, sectoral, and regional distribution of energy supply and demand. It sets out to develop economic information and knowledge of the regional energy footprint. It seeks to bring perspective to the choices of all those, particularly in the energy sector, wishing to understand the challenges and issues of energy management.

3. Who is this study DESIGNED for?

This study, "Energy Management Indicators in ALGERIA", targets three categories of users:

- Firstly, it targets decision-makers who must have access to processed and reliable statistical information at all times in order to facilitate decision-making;
- Secondly, engineers or technicians who require information on energy production, transformation and final consumption indicators at all times in their profession;
- Finally, students and researchers who need processed data to carry out research.

4. Structure of the study

This study covers a period of ten years (2000-2009) and examines the analysis of social and energy-related data. It is structured around an overall approach that looks at the national balance, and a sectoral approach that looks at the sectoral balance. With both approaches, social economic data is fundamental as it is used as a starting point and is an essential component on which the entire analysis is based.

However, in the area of energy management, energy data can only be explained through social economic data. Therefore by proposing statistical information on demographic and social dynamics as well as on economic development in different sectors, explanatory data is provided.

Consequently, aspects such as employment, population, added value and energy consumption must be correlated.

List of abreviations

APRUE: Agence Nationale pour la Promotion et la Rationalisation de l'Utilisation de l'Energie – Algerian National Agency for the promotion and rationalisation of energy use.

LPG: Liquefied Petroleum Gas.

NGF: Natural Gas Fuel.

MEM: Ministry of Energy and Mines.

NAFTAL: Algerian National petroleum products distribution and sales corporation.

OME: *Observatoire de Maitrise de l'Energie* – Observatory for energy management.

ONS: Algerian national statistics office.

LHV: Lower Heating Value.

HHV: Higher Heating Value.

EAS: Economic Activity Sector.

SONATRACH: *Société Nationale pour la Recherche, la Production, le Transport, la Transformation, et la Commercialisation des Hydrocarbures* – Algerian National hydrocarbon research, production, transport, transformation and sales corporation.

SONELGAZ: *Société Nationale de l'ELectricité et du Gaz* – Algerian national electricity and gas corporation.

AAGR: Average Annual Growth Rate.

TOE: Tonne of Oil Equivalent.

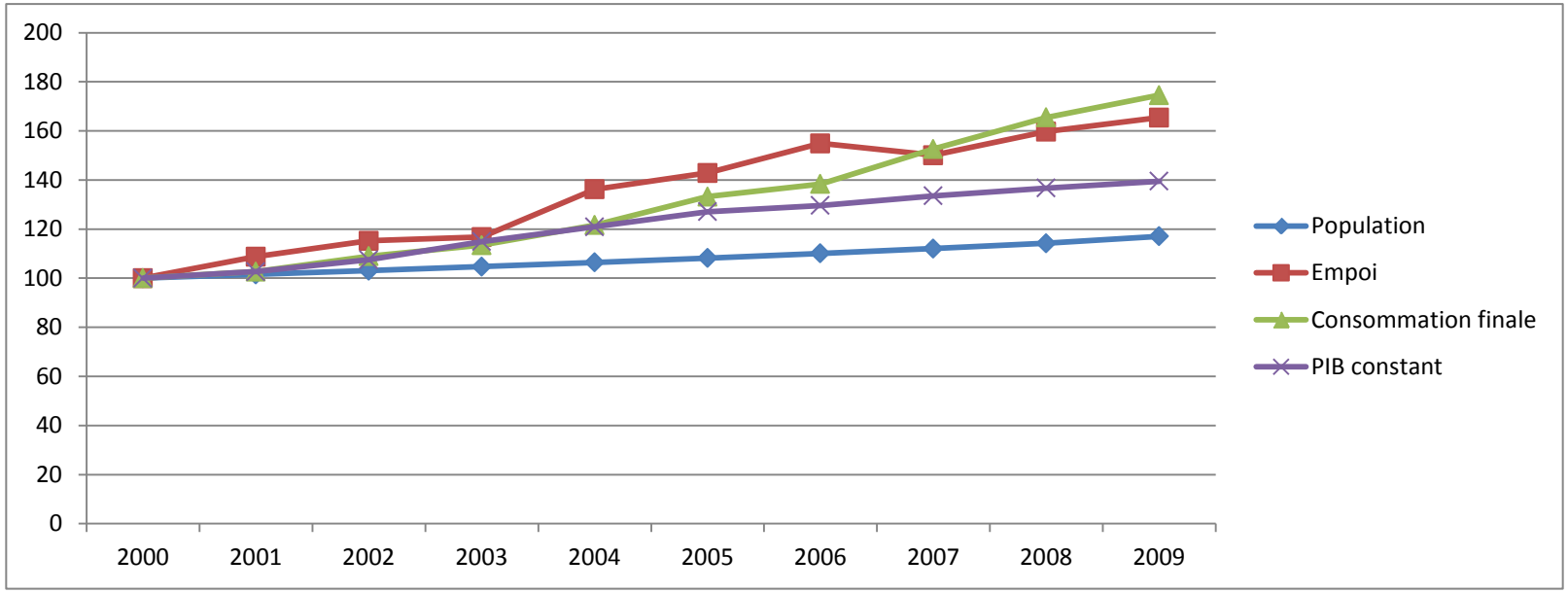
UAE: Energy analysis unit.

I. General context for Algeria

1. Economy and population

In 2009, the population was 35.6 million people and the final energy consumption in relation to the population was 0.677 TOE/capita. However, the final energy consumption in relation to the gross domestic product (excluding oil) gives an energy intensity of 0.004 TOE/1000 DZD.

Figure 1 - Compared **change in final energy consumption, constant GDP, population and employment (2000/2009) – Base index of 100 in 2000**

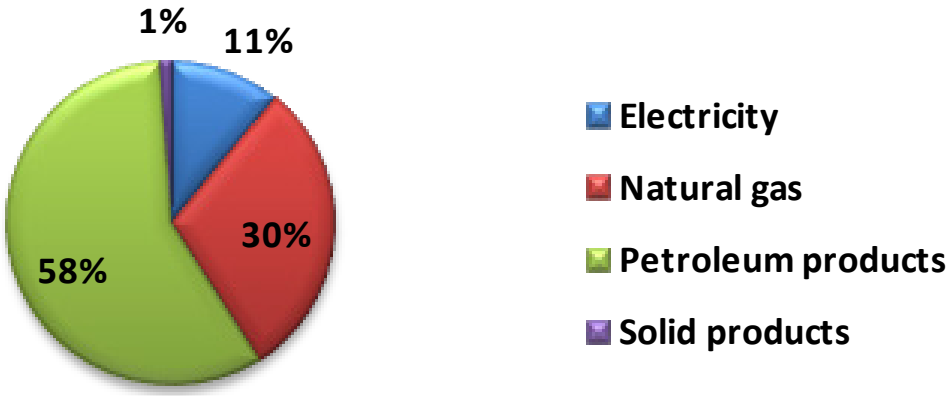


Between 2000 and 2009, final consumption had an AAGR of 6.39% to reach 24.12 MTOE in 2009. As shown in the graph above, final consumption is strongly correlated to employment.

1.1. Distribution of final consumption by energy product

In Algeria, oil (petroleum products) is the main source of energy consumed. Petroleum products make up 58% of final consumption, including more than 70% diesel and 30% land-use fuels (gasoline and LPG fuel).

Figure 2 - Distribution of final consumption by energy product in 2009



At 30%, natural gas represents the second source of final energy consumed, while electricity accounts for 11%. Solid products such as wood and coal remain insignificant (1%).

Over the 2000-2009 period, petroleum products were the predominant source of consumption with an AAGR of 6.04%. This can be explained by development in the transport sector.

Figure 3 - Distribution of final consumption by activity sector

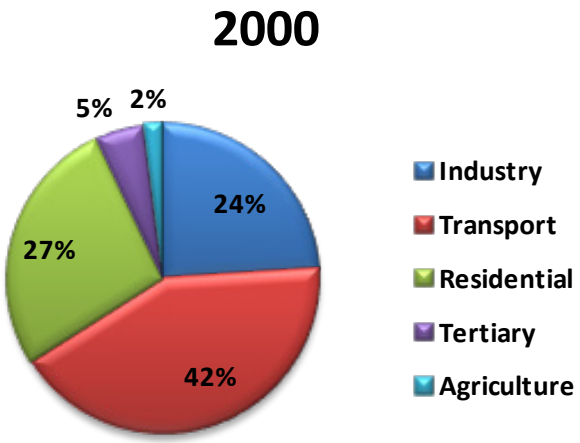
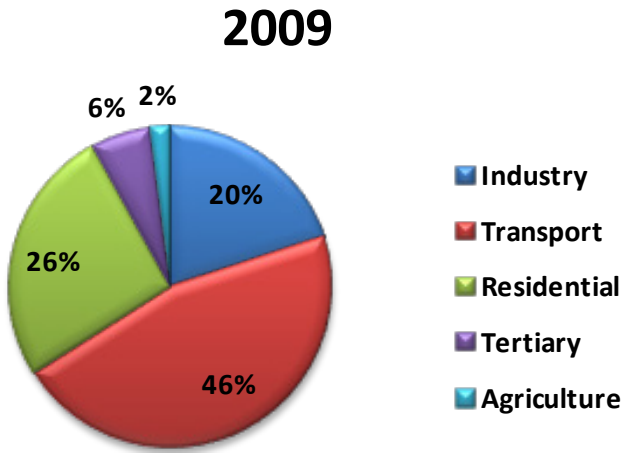


Figure 4 - Distribution of final consumption by EAS



2. National strategy for energy efficiency and renewable energies

Algeria's political desire to promote renewable energies and energy efficiency has become even clearer with the national programme for renewable energies and energy efficiency for 2030, adopted by the Council of Ministers on 3 February 2011.

2.1. The renewable energies programme

The programme aims to install nearly 22,000 MW in renewable power by 2030, including 12,000 MW to cover domestic demand and 10,000 MW for export "if conditions are favourable". Once completed, the programme will enable "nearly 600 billion cubic metres of gas over 25 years" to be saved, or the equivalent of the annual quantities of gas currently exported by Algeria.

2.2. Sectoral energy efficiency programmes

This programme includes all sectors with the potential for creating energy savings, with the following main prescribed actions:

- Thermal insulation of buildings;
- Development of solar water heaters;
- Widespread use of low energy lamps;
- High performance public lighting;
- Improvement of energy efficiency in industry;
- Promoting LPG fuel and NGF;
- Introduction of the main techniques for solar air-conditioning.

II. Data collection process

1. Main data sources

The main sources for this study include national energy reports published by the Ministry of Energy and Mines (MEM), monthly reports, SONELGAZ reports and statistical yearbooks, NAFTAL statistics reports, SONATRACH annual statistics reports.

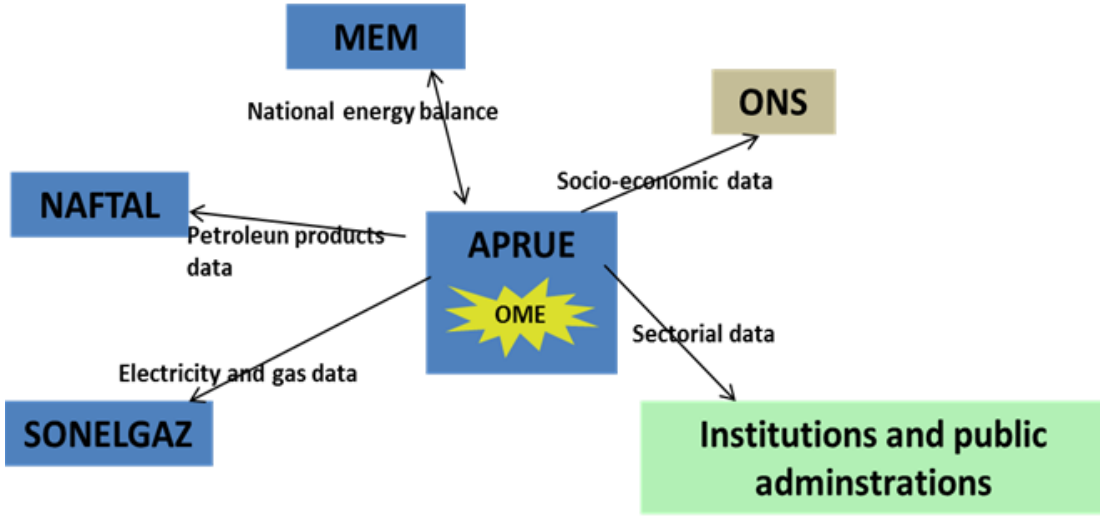
Social economic data was taken from the Algerian national statistics office (ONS) where sources are mainly surveys and investigations conducted with businesses and households.

Some data was taken from reports from public institutions or national administrations such as the ministries of agriculture, housing, transport and the Bank of Algeria ("*Banque centrale Algérienne*").

Consumption in each sector and for each energy product must be known in order to calculate indicators. The Ministry of Energy (MEM) and statistical yearbooks and reports do not contain this information, or if they do, it is incomplete. Consequently, a certain number of assumptions had to be made in order to estimate consumption in each sector. To do so, these assumptions were based on work carried out by the APRUE.

This data was expressed in TOE/LHV in order to apply conversion factors (Algeria study) and to enable comparison between countries (regional study).

Figure 5 – Dara flow



2. Information on data sources

Institution	Address	Telephone and Fax	Email and website
Ministry of Energy and Mines	Tour A, Val d'Hydra. BP 677 Alger Gare. Algiers	Tel : +213(0)21488 526 +213(0)21488 522 +213(0)21488 531 Fax : +213(0)21488 557	www.mem-algeria.org
APRUE	02 Rue chenoua Bt 265 hydra, 16035 Algiers	Tel: +213(0)21603132 +213(0)21602711 Fax :+213(0)601347	inf www.aprue.org.dz
SONELGAZ	02, boulvar krim belkacem Algiers	Tel : +213(0)21723100 Fax:+213(0)212670	www.sonelgaz.dz
SONATRACH	General Direction: Djenane El Malik Hydra, Algiers	Tel : +213(0)21548011 +213(0)21547000 Fax : +213(0)21547700	sonatrach@sonatrach.dz
NAFTAL	Route des dunes Chéraga BP 73, Algiers.	Tel: +213(0)21381313 Fax +213(0)391919	webmaster@naftal.dz http://www.naftal.dz
National statistics office (*Office national des statistiques*)	Rue Mohamed Belkacemi -Oued Kniss- Ruisseau, Algiers-	Tel : +213(0)21777854 +213(0)21777856 +213(0)21777866	ons@ons.dz / stat@ons.dz
Bank of Algeria (*Banque d'Algérie*)	38 Avenue Franklin Roosevelt, Algiers.	Tel : +213(0)21230023	www.bank-of-algeria.dz
Ministry of Transport	01 Chemin Ibn Badis El Mouiz El Biar ,16300 Algiers.	Tel :+213(0)21929885/86/87 Fax :+213(0)21929894	www.ministère-transports.gov.dz
Ministry of Housing	135 Rue Didouche Mourad, Algiers	Tel : +213(0)21740722	www.mhu.gov.dz
Ministry of Agriculture	12 Avenue Colonel Amirouche, Algiers	Tel : +213(0)21711712 Fax :+213(0)21745129	www.minagri.dz mhabitat@mail.mhu.gov.dz

3. Table of data availability

Sector	Energy data			Socio-economic data			Environmental data		
	Total* number of data	Available data**		Total number of data	Available data		Total number of data	Available data	
		Number	%		Number	%		Number	%
Macro	80	80	100	60	60	100	10	10	100
Transformation sector	140	130	93	0	0	0	0	0	100
Transport sector	70	70	100	150	100	67	30	30	100
Tertiary sector	40	30	75	50	30	60	10	10	100
Residential sector	30	21	70	70	60	86	10	10	100
Industry sector	80	50	63	130	70	54	10	10	100
Agriculture & fishing	20	10	50	80	60	75	0	0	100
Total	460	391	85	540	380	70	70	70	100

For energy data, 85% of information is available.

However, social economic data is only somewhat available at a rate of 70%. The agriculture sector has a rate of 50% due to the lack of fishing data. The transport sector is less covered (67%) due to a lack of certain in-depth data concerning usage, such as the number of kilometres travelled by cars (gasoline, diesel), as well as the budgets of Algerian households for daily transport. Unfortunately this information cannot be found anywhere as no surveys have been conducted.

III. Calculation of indicators

In order to gain a comprehensive view of the role of energy in the national economy, we opted for a broader analysis. The stages must be differentiated, from energy supply to energy spending, i.e. production, transformation, final consumption for each activity sector.

To this end, energy efficiency and environment indicators were calculated for each level.

For the production and transformation stages, data was taken directly from the national report drawn up by the Ministry of energy and mines, and SONELGAZ statistics reports for all power generation information.

For the sectoral report (final consumption by sector in industry, transport, the tertiary sector, the residential sector and agriculture), the majority of data was taken from the APRUE database, which is based on NAFTAL data for petroleum products, and SONALGAZ for natural gas and electricity consumption.

For households and industry, energy audits were conducted to determine the useful consumption of equipment for each use.

Residential: the characteristics of the national housing stock (type of housing, year of construction, heating method and fuels used) were crossed with unit consumption coefficients.

It should be noted that the surface areas of dwellings in m^2 are calculated based on the average of a two bedroom dwelling as a weighted mean over the entire period (2000-2009) by using data files from the Ministry of housing.

Industry: the report was based on data from the departments of economic studies and energy statistics at SONELGAZ. The activity is defined using the list of energy consumption, which was completed and adjusted with the latest updated data from the annual survey on MECs (Major Energy consumers) specific to facilities subject to the audit and established by the APRUE for facilities consuming more than 2,000 TOE, with information on activity, production, size of company, employment, added value and profit.

In this study, the industry sector also includes hydraulics and construction sectors.

Transport: the report is based on fuel deliveries published in the activity report of NAFTAL, on data specific to transport available with the Ministry of transport and the road traffic union, as well as on environmental data files, such as CO_2 emissions, compiled by the laboratory of the University of Blida.

Tertiary sector: this involves the consumption of buildings and services in the sector, excluding transport, established through a survey and a study on merchant and non-merchant activities in the tertiary sector.

Agriculture: using agricultural surveying and ONS data, energy consumption is calculated using regional energy ratios taken from studies conducted by the APRUE.

In this study, the sector also includes fishing. However, because no surveys have been conducted to cover this sector in any way, we were unable to gather this information.

IV. Presentation of results

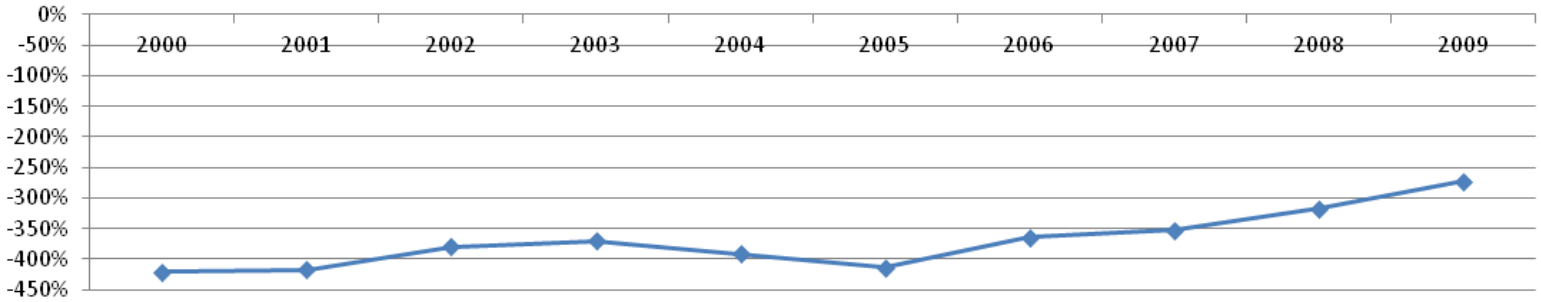
1. Macro indicators

On average, Algeria produced 78,890 KTOE, 1.33 million barrels per day (Mb/d) of crude oil in 2009, compared to 85,255 KTOE (1.42 Mb/d) in 2008. This is partly due to reductions in quotas dictated by OPEC. Algeria is incidentally the third largest producer in Africa after Libya and Nigeria.

As for natural gas, Algeria has reserves estimated at 161.7 trillion cubic feet (Tcf). In 2009, it produced 71,004 KTOE, compared to 74,658 KTOE in 2008, which makes it the world's eighth producing country.

Abbreviation	Indicators	Unit	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
EDR	Energy dependence Ratio	%	-421%	-418%	-380%	-370%	-391%	-414%	-365%	-352%	-317%	-273%
IPE	Intensity of Primary Energy	toe/Million DA	6,50	6,13	6,62	6,87	6,37	6,09	6,54	6,45	6,80	6,99
IFE	Intensity of Final Energy	toe/Million DA	3,35	3,35	3,40	3,31	3,37	3,51	3,58	3,83	4,06	4,19
RFEPE	Ratio of final energy consumption to primary energy	%	52%	55%	51%	48%	53%	58%	55%	59%	60%	60%
REB	Ratio of National Energy Bill to GDP	%	7,7%	7,7%	8,1%	8,9%	8,2%	9,0%	11,2%	10,5%	12,3%	11,1%
RPSE	Ratio of public subsidies for energy to GDP	%	3,4%	3,3%	3,6%	4,9%	4,4%	5,4%	7,8%	7,1%	9,2%	7,5%
AEF	Average emission factor	teCO2/toe	2,76	2,75	2,77	2,74	2,75	2,71	2,72	2,75	2,74	2,73
ICO2	Intensity of CO2	teCO2 / 1000 DA	0,018	0,017	0,018	0,019	0,017	0,017	0,018	0,018	0,019	0,019
AECH	Average Primary Energy Consumption per habitant	ktoe/1000 hab	0,881	0,840	0,936	1,022	0,981	0,970	1,044	1,041	1,104	1,130
AELCH	Average Electricity Consumption per habitant	MWh/hab	0,600	0,625	0,651	0,699	0,717	0,744	0,765	0,798	0,852	0,866

Figure 6 - Change in the energy dependence ratio over the 2000-2009 period



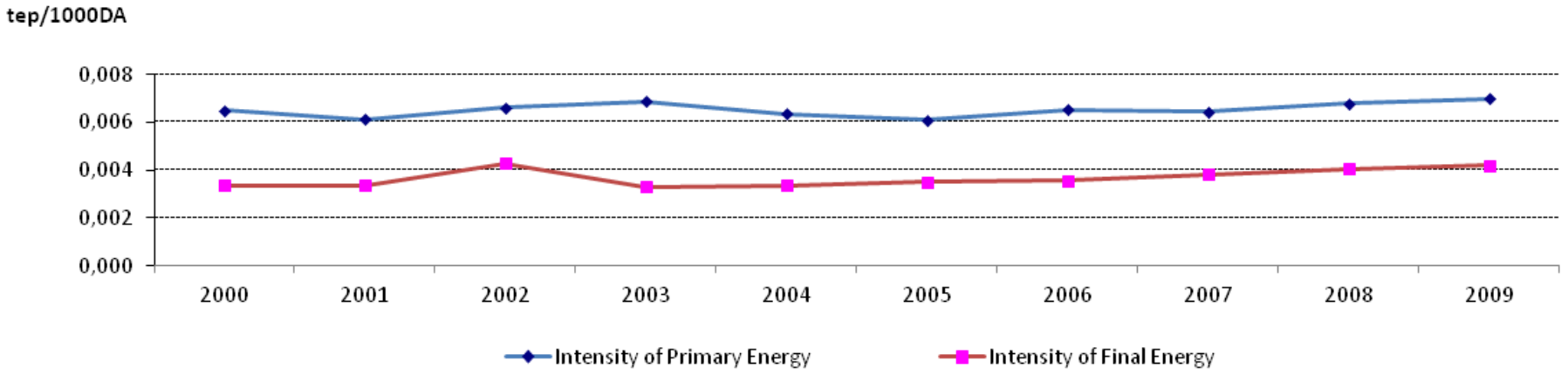
Source: APRUE

Over the last decade (2000-2009), Algeria sustained its production capacity, increasing from 139,735 KTOE in 2000 to 150,007 KTOE in 2009, i.e. an AAGR of 0.79%, tied to the exploitation of new deposits discovered by SONATRACH.

The intensity of primary energy recorded an AAGR of 0.81%. It increased from 6.50 TOE per million DZD in 2000 to 6.99 TOE per million DZD in 2009.

The intensity of final energy recorded an AAGR of 2.52%, a significant increase explained by a strong increase in final energy consumption (AAGR of 6.39%) and tied to population growth (1.76%) and transport flows.

Figure 7 - Change in Intensity of Primary and Final Energy 2000-2009



2. Energy transformation indicators

In Algeria, energy transformation includes among others, refining, coking coal, natural gas liquefaction and power generation.

Due to the presence of fossil resources (oil and natural gas), developing renewable energies was never a priority for Algeria. Natural gas has the advantage of producing electricity and this explains the very low share of renewable energies in the energy balance (i.e. 1% of electricity from hydraulic power).

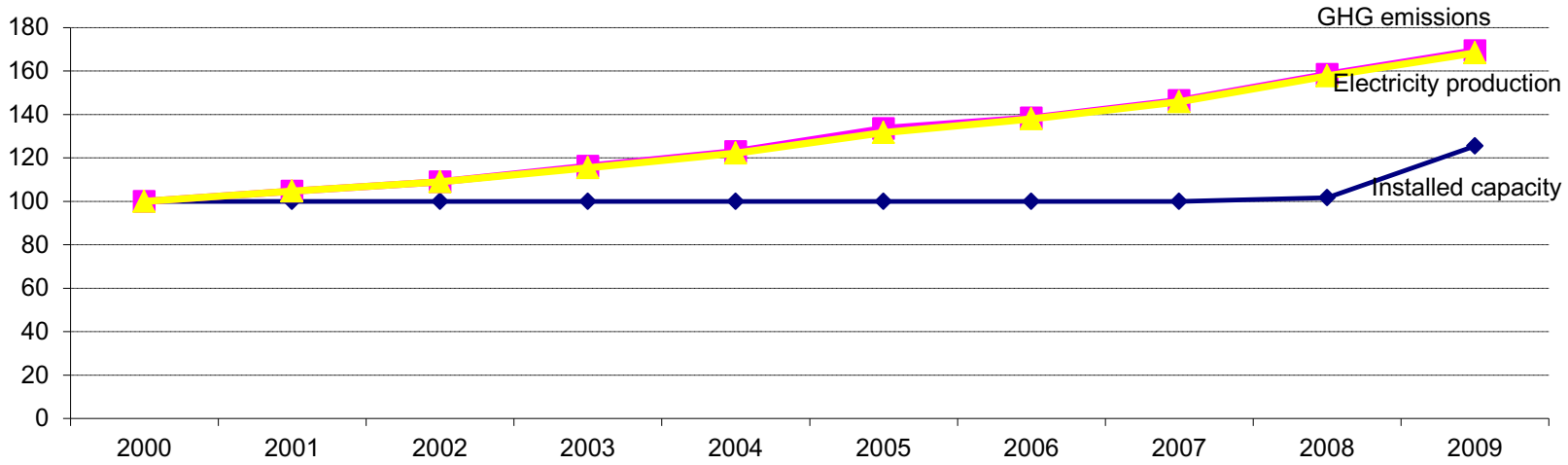
The **installed capacity** in Algerian comes from fossil fuels used to generate thermal power. It grew significantly between 2000 and 2009 with an AAGR of 3.50%; increasing from 8,503 MW in 2008 to 11,325 MW in 2009, i.e. a 33.19% increase. This considerable change comes from the introduction of combined cycle power plants.

Electricity **production** in the country uses mainly natural gas and continues to grow at an average annual rate of 6.14% for all energy sources. Production increased from 2,151 KTOE in 2000 to 3,678 KTOE in 2009.

In terms of yield, electricity production is quite acceptable. It saw continued improvement over the 2000-2009 period, to reach 35% in 2009, following the introduction of combined cycle power plants.

Losses during distribution are more substantial than losses from transmission in the grid. The country's size (2,381,741 km²) could be the primary cause of these losses as electricity is distributed throughout the entire Algerian territory with a 99% rate of electrification.

Figure 8 - Compared change in electricity production, GHG emissions and installed capacity (2000/2009) – base index of 100 in 2000



Abbreviation	Indicators	Unit	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
SREC	Share of installed RE electricity capacity	%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
URIC	Usage rate of the installed power generation capacity	%	48%	51%	49%	52%	52%	51%	50%	50%	54%	43%
AETS	Apparent Efficiency of Energy Transformation Sector	%	83%	83%	82%	82%	81%	81%	80%	81%	80%	80%
PGEFF	Power generation efficiency of thermal plants	%	33%	33%	32%	32%	32%	32%	33%	34%	34%	35%
SCFFP	Specific Consumption of thermal power plants	toe/GWh	263,34	263,98	268,59	272,11	269,75	268,75	264,47	256,55	255,59	242,91
PGF	Power generation efficiency	%	33%	33%	33%	32%	32%	33%	33%	34%	34%	36%
SCPG	Specific Consumption of Power Generation	toe/GWh	258,89	259,21	264,58	266,77	265,25	262,05	260,81	253,24	252,02	239,19
TDEE	Transmission and Distribution Electricity system Efficiency	%	83%	83%	84%	85%	84%	81%	82%	82%	81%	79%
PGEF	Power Generation Emission Factor	teCO2/GWh	636,66	636,30	635,06	634,32	632,42	606,79	620,90	594,99	596,96	569,84
ESEF	Electricity Sector Emission Factor	teCO2/GWh	766,89	762,82	757,39	742,58	753,84	744,77	757,80	725,17	732,51	720,72

3. Industry sector indicators

The industry sector represents 20% of the national balance. In nine years it increased consumption significantly, by 46.14%. Although the number of industrial facilities decreased in the 2000 - 2009 period, industrial consumption continues to grow at a rate of 4.31% per year. In 2009 it reached 4,811 KTOE.

The industrial sector in Algeria specialises in construction materials (cement and brick plants), the steel industry, metalworking, mechanics and electricity (ISMME), chemistry, as well as manufacturing industry, construction and hydraulic sector. These sectors employ nearly 33.1% of the industrial workforce.

In 2009, natural gas consumption was predominant. It accounted for more than half the sector balance. Electricity and petroleum product use seem to be on the rise with 20% and 17% respectively of the sector balance.

The sector is therefore characterised by an increase in unit consumption per use: this involves manufacturing processes (76% of gas products) and power (17% of electricity).

Abbreviation	Indicators	Unit	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
BSEC	*Specific energy consumption for the Cement*	toe/t	0,108	0,104	0,102	0,104	0,102	0,102	0,100	0,102	0,102	0,151
	Specific energy consumption for the Phosphate		0,003	0,003	0,003	0,009	0,015	0,014	0,015	0,014	0,013	0,018
	Specific energy consumption for the Phosphoric acid		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	Specific energy consumption for the T. Super Phosphate		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	Specific energy consumption for the Steel		1,139	0,957	0,831	0,875	0,865	0,873	0,944	0,775	ND	ND
	Specific energy consumption for the Paper		0,244	0,234	0,262	0,228	0,227	0,203	0,143	0,167	0,316	0,316
	Specific energy consumption for the Sugar		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
FEIIS	Final Energy Intensity of Industry Sector	toe/MillionDA	5,261	5,245	5,191	5,141	5,304	5,297	5,505	5,282	5,297	4,758
IEBR	Ratio of Industry sector Energy Bill to Added Value	%	7%	8%	7%	8%	8%	7%	13%	11%	15%	10%
IESR	Ratio of public subsidies to added value	%	2%	3%	3%	4%	4%	2%	8%	7%	11%	7%
IESRGB	Ratio of public subsidies for energy to Government Budget	%	1%	2%	1%	2%	2%	1%	4%	3%	4%	3%
IELSR	Ratio of public subsidies for electricity to added value	%	0%	0%	0%	1%	0%	0%	2%	2%	3%	2%
IICO2	CO2 intensity of industry sector	teCO2/MillionD	19,95	20,07	19,93	19,69	20,14	20,00	21,04	19,97	19,97	17,70
IAEF	Average emission factor of industry sector	teCO2/toe	3,791	3,828	3,840	3,830	3,798	3,777	3,822	3,780	3,770	3,721

4. Tertiary sector indicators

In 2009, tertiary activities employed approximately 436,000 people, accounting for more than half of all jobs (56%). The most represented branches were office activities (services), commerce, health and education-related activities.

Final energy consumption in this sector reached 1,518 KTOE in 2009 and saw the most growth (101.96% in nine years).

Despite the high concentration of jobs in the sector, final energy consumption remains low with 6% of the national balance. Electricity and natural gas consumption were predominant and represented more than 80% of energy used on tertiary premises. The share of petroleum products remains low even though their use is on the rise.

Abbreviation	Indicators	Unit	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
FEITS	Final Energy Intensity of Tertiary Sector	toe/Million DA	0,593	0,582	0,575	0,600	0,600	0,666	0,661	0,711	0,730	0,788
TDRSHR	Diffusion Rate of Solar Water Heaters in tertiary sector	m²/1000 hab	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TEBR	Ratio of energy bill to added value in tertiary sector	%	1%	1%	1%	1%	1%	2%	2%	2%	2%	2%
TELSR	Ratio of public subsidies for energy to added value	%	0,1%	0,3%	0,2%	0,4%	0,3%	0,8%	1,2%	1,1%	1,6%	1,2%
TESRGB	Ratio of public subsidies for energy to Government Budget	%	0,1%	0,3%	0,2%	0,4%	0,3%	0,8%	1,2%	1,0%	1,2%	0,9%
HECNG	Energy Consumption per night guest	kgoe/Nigh Guest	10,33	10,22	10,10	9,62	9,26	10,20	10,49	ND	ND	ND
TICO2	CO2 intensity of tertiary sector	teCO2/Million DA	3,140	3,110	3,106	3,259	3,195	3,701	3,629	3,88	3,769	4,052
TAEF	Average emission factor	teCO2/toe	5,295	5,340	5,406	5,428	5,327	5,559	5,489	5,461	5,164	5,139

5. Residential sector indicators

The residential sector accounts for 26% of national consumption and is in second position after transport.

In 2009, final consumption for the sector reached 6,157 KTOE, with an average annual growth rate of 5.93% over the period (2000-2009). This sector is characterised by mainly urban and individual housing, i.e. 4,962,859 of the 7,089,798 total dwellings. There was a significant increase in consumption (67.97% over the 2000-2009 period), which can be particularly attributed to the conjunction and combination of several factors: mainly the introduction of new uses in homes such as the widespread use of multiple equipment including television, computers, the arrival of clothes dryers, microwaves, air-conditioning as well as the emergence of the trend of non-cohabitation.

Abbreviation	Indicators	Unit	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
UCED	Unit Consumption of Energy per Dwelling	kgoe/Dw	694,05	689,96	680,45	701,97	736,27	831,40	785,38	868,17	805,74	868,45
SCEM²	Specific Consumption of Energy per area unit	kgoe/m²	9,3	9,2	9,1	9,4	9,8	11,1	10,5	11,6	10,7	11,6
UEICD	Unit Consumption of Electricity per Dwelling	kWh/Dw	1352,65	1402,57	1458,00	1623,82	1704,66	1497,73	1648,33	1502,84	1682,23	1608,93
SCEIM²	Specific Consumption of Electricity per m²	kWh/m²	18,035	18,701	19,440	21,651	22,729	19,970	21,978	20,038	22,430	21,452
RIPE	Intensity of Residential Sector	toe/MillionDA	2,176	2,151	2,088	2,101	2,109	2,307	2,184	2,373	2,281	2,771
RELSR	Ratio of public subsidies for energy to private consumption	%	1%	1%	1%	1%	2%	3%	5%	5%	7%	6%
RESRGB	Ratio of public subsidies for energy to Government Budget	%	1%	1%	1%	2%	2%	3%	4%	4%	4%	3%
RAEF	Average emission factor	teCO2/toe	3,727	3,764	3,789	3,850	3,861	3,522	3,713	3,461	3,627	3,457
RICO2	CO2 intensity of residential sector	teCO2/ 1000 LC	0,008	0,008	0,008	0,008	0,008	0,008	0,008	0,008	0,008	0,010
RDRSHR	Diffusion Rate of Solar Water Heaters in Residential sector	m2/1000 hab	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
ERACR	Equipment Rate of Air conditioning in Residential sector	Unit/Dw	5,0%	6,1%	7,2%	8,3%	9,4%	10,5%	11,5%	12,6%	13,7%	14,8%
ERFR	Equipment Rate of refrigerator in Residential sector	Unit/Dw	82,6%	83,3%	84,0%	84,7%	85,4%	86,2%	86,9%	87,6%	88,3%	89,0%
SEPC	Share of energy expenses in household private consumption	%	2,6%	2,5%	2,4%	2,5%	2,4%	2,4%	2,2%	2,2%	2,1%	2,0%

6. Transport sector indicators

The transport sector accounts for 46% and is in first position in the national balance. In 2009 it consumed 11,316 KTOE. The sector is dominated by the use of personal vehicles for travelling (increase in the tourism vehicle fleet from 1,692,148 in 2000 to 2,593,310 in late 2009, i.e. an average annual growth rate of 8% over the 2000-2009 period). Petroleum products represent 46% in the sector balance, including 48% for gasoline, 46% for diesel and 6% for LPGs.

Abbreviation	Indicators	Unit	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
TrFEI	Final Energy Intensity of transport sector	toe/MillionDA	1,430	1,450	1,524	1,487	1,511	1,562	1,605	1,756	1,902	1,967
STEHE	Share of household expenditure for transport	%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
EUCC	Average Energy Unit Consumption of Cars	kgeo/car/year	2948,8	3076,1	3306,3	3404,3	3494,4	3666,0	3577,9	3697,9	3670,1	3754,8
EUCC G	Average Energy Unit Consumption of gasoline Cars	kgeo/car/year	1441,6	1432,2	1426,2	1450,7	1432,0	1400,7	1332,3	1347,6	1445,2	1309,2
EUCC D	Average Energy Unit Consumption of diesel Cars	kgeo/car/year	17241,9	17936,9	19640,5	18306,1	17914,5	18401,2	15982,0	15117,9	12570,0	14575,3
AEFTS	Average emission factor of transport sector	teCO2/toe	2,898	2,896	2,912	2,892	2,894	2,895	2,896	2,894	2,899	2,900
MR	Motorization rate	persons / Vehicle	17,97	18,08	18,03	17,94	17,64	17,27	16,39	15,30	14,11	13,73
ICO2	CO2 intensity of transport sector	teCO2/Million DA	4,14	4,20	4,44	4,30	4,37	4,52	4,65	5,08	5,51	5,70
SCRW	Specific consumption for Rail ways	kgoe/ p.km	3,21E-09	3,6848E-09	3,8753E-09	4,4574E-09	5,1548E-09	4,1181E-09	5,8507E-09	7,699E-09	6,8338E-09	4,8411E-09
SCAT	Specific consumption for air transport	kgoe/ p.km	2,154E-08	1,6895E-08	1,6545E-08	1,677E-08	1,6385E-08	1,8203E-08	2,3599E-08	1,6011E-08	1,3202E-08	1,5728E-08
SCMT	Specific consumption for maritime transport	kgoe/ t.km	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SEAT	Specific emission factor for air transport	kgeCO2/p.km	6,461E-08	5,0684E-08	4,9431E-08	5,031E-08	4,9156E-08	5,461E-08	7,0797E-08	4,8033E-08	3,9606E-08	4,7184E-08
SEMT	Specific emission factor for maritime transport	kgeCO2/t.km	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

7. Agriculture sector indicators

In 2009, the agriculture sector accounted for 13% of jobs in the country. This sector is made up of three branches: cultivation and livestock production, irrigation and dams, and fishing (due to a lack of surveys conducted in the sector, we do not have any consumption data for the fishing branch).

The sector balance is based mainly on SONALGAZ data and the work of APRUE (energy analysis unit).

Between 2000 and 2009, energy consumption in the sector remained stable and very low in the national balance. It represents just 2% and reached 367 KTOE in 2009.

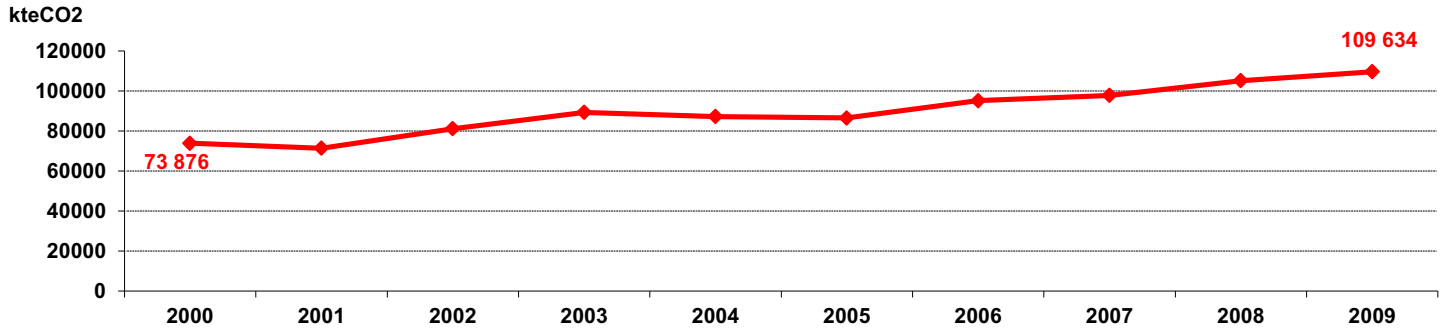
Over this period, petroleum products (diesel) were predominant. They accounted for 80.8% of the sector balance. The share of electricity was 13.87%, with irrigation activity dominating.

Abbreviation	Indicators	Unit	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
FEIA	Final Energy Intensity of agriculture	toe/MillionDA	0,694	0,626	0,687	0,605	0,642	0,646	0,538	0,559	0,739	0,603
FEIF	Final Energy Intensity of fishing	toe/ 1000 LC	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SCF	Specific consumption for fishing	toe/ tone	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SDCA	Share of Dry cultivated area	%	94%	94%	93%	92%	91%	90%	90%	90%	89%	89%
SICA	Share of Irrigated cultivated area	%	6%	6%	7%	8%	9%	10%	10%	10%	11%	11%
SEWMP	Share of equipped wells with Moto pumps	%	54%	54%	54%	54%	54%	54%	54%	54%	54%	54%
SEWEIP	Share of equipped wells with electro pumps	%	46%	46%	46%	46%	46%	46%	46%	46%	46%	46%

8. Assessment of greenhouse gases

CO_2 is the main greenhouse gas as it accounts for 80% of all emissions. In 2009, emissions from energy combustion generated approximately 109 million tonnes of CO_2, with an AAGR of 4.48% between 2000 and 2009.

Figure 9 - Change in greenhouse gas emissions (2000-2009)



The transport sector is the main cause, generating 52% of greenhouse gas emissions from the massive use of petroleum products and particularly diesel.

At 20%, the residential sector is the second highest emitter of national emissions, with a large part of emissions stemming from the use of natural gas in households.The industry sector is also a major emitter with 17% in the greenhouse gas emissions balance. A large part of these emissions are generated from high natural gas consumption. On the other hand, the sectors that are low energy consumers are also the sectors that emit the least amount of greenhouse gases, particularly agriculture and the tertiary sector.

V. Conclusion

Energy efficiency has never generated so much worldwide discussion as it does today and it is gradually gaining importance. However critical challenges still remain.

This study gives a certain number of energy efficiency indicators on a macro and sector scale that provide decision-makers with an overall comprehensive view of the situation in the country's energy sector. It also provides a comparison with other countries in the region and contributes to wise decision-making in each sector.

Furthermore, it provides insight into the advantages and drawbacks of the energy system, such as Algeria's energy independence, the non-integration of renewable energies into energy production and the low yield of thermal power plants.

It is in this context that Algeria has become conscious of the important role of renewable energies and energy efficiency in sustainable development. It has therefore adopted an ambitious programme to diversify energy sources and opt for clean, renewable energy such as solar power to meet demand on the national and international market.

Table of illustrations