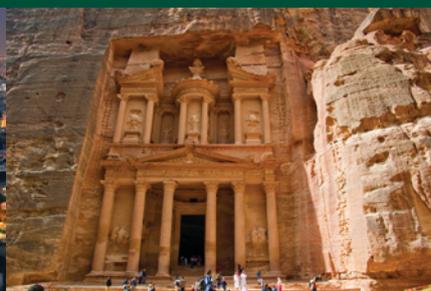




JORDAN

Regular Review of Energy Efficiency Policies 2010



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**Energy Charter Protocol on Energy Efficiency and
Related Environmental Aspects PEERA**

**THE HASHEMITE KINGDOM OF
JORDAN**

REGULAR REVIEW 2010

Part I:

**Trends in energy and energy efficiency policies,
instruments and actors**

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EXECUTIVE SUMMARY

Jordan is a lower-middle-income country, with a nominal per capita income of approximately US\$3,419 in 2008. Despite a series of external shocks, GDP growth averaged 6.5 % over 2001-08 and is projected by the IMF to continue, albeit at a lower rate in the light of the global economic downturn. GDP growth until the end of 2008 stood at 5.6% per year compared with 6.6% in 2007. Inflation, which had been relatively high at 14.9% in 2008, decreased in the first two months of 2009 and stood at 4.5% compared with 9.1% for the same period in 2008. This reflected the impact of the substantial decrease in oil prices and Jordan's vulnerability with the ending of the preferential rates that it had negotiated with Iraq. The fall in fuel prices in 2009 is expected to result in a reduction in the inflation rate to 7%.

Jordan has a substantial trade deficit. While exports grew by 13.4% in January 2009 to JD 408 million, imports decreased by 15%, totalling some JD 782.3 million. As a result, the trade deficit decreased by 33.2% - to JD 374.3 million. This deficit is offset by a sustainable balance of payments generated by service exports (tourism), overseas remittances and private financial flows (FDI). At the balance of payments level, current account deficit decreased to JD 1,720.6 million in 2008 compared with JD 1,987.8 million in 2007.

Natural gas and crude oil/petroleum products cover approximately 98% of Jordan's total primary energy supply while renewable energy represents less than 1%. As Jordan lacks domestic natural gas and conventional crude oil resources, their high shares in the national energy mix imply a striking dependence on energy imports of more than 90%. In 2007, total spending on energy imports was equivalent to around 20% of the gross domestic product. While Jordan is short of conventional crude oil reserves, it accommodates an extremely large proven oil shale resource. Geological surveys indicate that the existing shale reserves cover more than 60% of the country and amount to in excess of 50 billion tonnes. So far, economic constraints did not justify the exploration of this resource. However, in 2007, the Jordanian government has adopted an updated national energy strategy in which it aims to foster oil shale exploration due to rising crude oil prices and growing energy demand.

The Jordanian energy sector is under auspices of the Ministry of Energy and Mineral Resources (MEMR), which was established in 1984. The role of the MEMR is to define policies, to fix tariffs and to regulate all activities with an impact on energy. MEMR's responsibilities also include strategies and projects to promote renewable energy technologies, such as solar water heaters or wind energy. In the electricity sector, MEMR aims to increase the share of efficient natural gas-fired power plants and foster the utilisation of nuclear power as Jordan possesses significant proven recoverable reserves of uranium. By 2013, the construction of the country's first nuclear power plant is scheduled to begin. The plant is expected to be operational by 2017/2018. At the time being, total installed power generating capacity is 2,098 MW with fossil-fired steam units and combined cycle plants accounting for nearly 92%. Wind turbines, biogas facilities and hydro units cover less than 1% of the national power supply. Almost 95% of Jordan's electricity is supplied by the Central Electricity Generating Company (CEGCO), while the National Electric Power Company (NEPCO) is responsible for the transmission and distribution of electricity.

The 2007-2020 energy strategy of the Jordanian government includes ambitious targets to increase the contribution of renewable energy sources to the national energy supply. The share of renewable energy in the total energy mix shall reach 7% by 2015 and 10% by 2020, including 600 MW of wind energy projects and 300-600 MW of solar thermal projects.

Furthermore, the strategy recognises the country's great potential to reduce energy consumption via energy efficiency measures. For example, studies came to the result that the industrial and commercial sector may reduce energy consumption by 20%. In order to meet the target for renewable energy and to improve energy efficiency, legal provisions were established for a fund supporting renewable energy and energy efficiency projects.

A new Renewable Energy and Energy Efficiency Law was approved by the cabinet in 2010. The new Renewable Energy and Energy Efficiency Law allows the Ministry of Energy and Mineral Resources to work with other specialised entities to conserve energy and increase energy efficiency in different sectors (Clause 3c), and the Council of Ministers will issue by-laws necessary for execution of the provisions, including procedures and measures for energy conservation and energy efficiency in the various sectors (Article 17). The by-law and regulatory framework to implement the must be developed to support and promote implementation of the Roadmap. The law also sets incentives to promote renewable energy utilisation in Jordan.

The Jordanian Government began a phased lifting of subsidies on gasoline, diesel, fuel oil and kerosene in 2005. On 8 February 2008, oil product prices were fully liberalised with the last subsidies removed. This reduced government expenditure by nearly \$200 million and resulted in a noticeable jump in inflation.

The removal of subsidies was driven in part by the financial burden imposed by rising oil prices, but also as part of an overall strategy of liberalising its markets. While acknowledging the challenges presented and the need for improved energy efficiency and increased use of renewable energy, the move is part of a broader reform that will make the economy more efficient and attract foreign investment. In particular, it is expected that the removal of subsidies will increase investment from the oil-producing countries in the region.

1. INTRODUCTION

The Hashemite Kingdom of Jordan (Jordan) is located in the heart of the Near East, Northwest of Saudi Arabia, South of Syria, Southwest of Iraq, and East of Israel and the Palestinian National Authority. Jordan has access to the Red Sea via the port city of Aqaba, located at the northern end of the Gulf of Aqaba.

Jordan has a population of about 6 million people, over a total area of 92,300 sq km. The capital is Amman. Jordan is divided into 12 governorates (Muhafaza) - Ajlun, Al 'Aqabah, Al Balqa', Al Karak, Al Mafrqa, 'Amman, At Tafilah, Az Zarqa', Irbid, Jarash, Ma'an, Madaba, which are subdivided into districts, subdistricts, municipalities, towns and villages.

Figure 1: Map of Jordan



Jordan is a lower-middle-income country, with a nominal per capita income of approximately US\$3,419 in 2008. Despite a series of external shocks, GDP growth averaged 6.5 % over 2001-08 and is projected by the IMF to continue, albeit at a lower rate in the light of the global economic downturn. Inflation, which had been relatively high at 14.9% in 2008, decreased in the first two months of 2009 and stood at 4.5% compared with 9.1% for the same period in 2008. This reflected the impact of the substantial decrease in oil prices and Jordan's

vulnerability with the ending of the preferential rates that it had negotiated with Iraq. The fall in fuel prices in 2009 is expected to result in a reduction in the inflation rate to 7%.

Table 1: Hashemite Kingdom of Jordan – Country Fact Sheet

Total Area	92,300 sq km
Capital	Amman
Other Major Cities	Irbid
	Zarqa
	Aqaba (Jordan seaport)
Population	5,850,000
Monetary unit	1 Jordan Dinar (JD) = 1,000 fils (In December 2009, 1 JD was approximately equal to 1€ or 1.4 USD)
Main exports	Phosphates, fertilisers, agricultural products
Languages	Arabic (English is also widely used)
Literacy	92.1%
Work force	1.8 million: services 34%, manufacturing 20%, public sector 19%, education 12%, health and social services 11%, agriculture 3%
Unemployment rate	13% of economically active Jordanians (2008)
GNI GNP per capita	US \$2,850

Source: MEMR 2008, World Bank 2007

The Government has implemented cautious macro-economic policies and focused on monetary stability and fiscal consolidation as its key targets. As a result, the macro-economic climate has remained robust and positive improvements have been achieved in public finance management. IMF missions of March and November 2008 confirmed that fiscal and monetary disciplines were being maintained; these protected the economy, to a degree, from the excesses of the global economic downturn.

Since 1989, Jordan has passed through several phases of economic reform aimed at stabilising the economy and managing the transition from a state-dominated model to a market economy.

In July 1989, Jordan signed its first Stand-By Arrangement (SBA) with the International Monetary Fund (IMF) for 275 million USD. The aim of the first phase (1989–1991) was to stabilise the economy through reducing the budget and current account deficits, control the inflation rate, rebuild the Jordan Central Bank's (JCB) foreign reserves, and recover from negative economic growth. The Government pledged increases in administered prices and specific taxes along with cuts in subsidies to reduce the budget deficit.

In 1990, due to the Gulf War, external aid dropped and the SBA with the IMF was terminated in January 1991. The Government reverted to its previous policies of capital and price controls and increased subsidies. After the Gulf War, the second phase (1992-1999) continued the process of stabilisation with the signing of a new SBA in February 1992, followed by two successive Extended Funding Facility (EFF) arrangements (1994-1999).

The third phase (1999 to present) marked a more consolidated reform effort and economic reform become one of the countries' top priorities by launching a number of initiatives and

projects aimed at promoting economic development, including the establishment of the Aqaba Special Economic Zone. During this phase, a new EFF arrangement was implemented from 1999 to 2001.

A new SBA was introduced from 2002 to 2004. This period featured an acceleration of the privatisation process and a rapid integration of the Jordanian economy in the global economy (by joining the WTO and entering into a free trade agreement with the US and the EU)

In 2005, a Royal Decree established a committee to develop the National Agenda. The Royal Committee operated with the support of subcommittees and several hundred experts and governmental officials contributed to its work, which took nine months to complete.

The **National Agenda**, a ten-year programme of action, covers the years 2006-2015, embodies a developed vision of Jordan to achieve sustainable development through a transformation programme that puts Jordan on a trajectory to fast economic growth and greater social inclusion. It includes comprehensive strategies and initiatives developed to realise social, economic and political development, and to evaluate and monitor progress of its implementation according to detailed performance indicators.

In 2006, the objectives of the National Agenda were further enhanced in the “**Kuluna al Urdun**” (**We are all Jordan**) initiative to develop consensus on the future reform agenda of the country. The National Agenda and the Kuluna Al Urdun documents spell out the national vision and priorities for the period 2006-2015 and rest on the following pillars: Political Development and Inclusion; Justice and Legislation; Financial Services and Fiscal Reform; Employment Support and Vocational Training; and Social Welfare. They set ambitious objectives, most of which are in line with the Millennium Development Goals.

In order to ensure that the momentum of reforms continues, an **Executive Programme** (2007-2009) for the National Agenda/Kuluna al Urdun was prepared in 2007, keeping reform initiatives focused on concrete actions, with related budget allocations, in order to translate the principles of these reform and development initiatives into actions.

The reform process has resulted in Jordan successfully stabilising its economy and entering into a process of liberalisation and privatisation of state enterprises. The reforms contributed almost 6% to real GDP growth, on average, during 2000-2007. Public debt was reduced from almost 100% of GDP in 2002 to 60% in March 2008. The reforms have also contributed to reducing public debt from 98.4% of GDP in 2002 to 60.3% at the end of March 2008, and increasing the average annual inflow of foreign direct investment (FDI) from US\$155 million during 1990-00 to US\$3,121 million in 2006. Trade liberalisation has resulted in real GDP growth of 5.9% and relatively low inflation of 3.1%, on average per year during 2000-07.

Jordan also successfully reduced its outstanding external debt as a percentage of GDP from 74.6% in 2003 to 25.8% as of November 2009, mainly as a result of a debt buy-back deal reached with the Paris Club in October 2007.

2. BACKGROUND: ENERGY POLICIES AND PRICES

2.1. Energy Policy – General Trends and Objectives

The future of energy supply in Jordan is a high priority on the Government's agenda. The National Agenda recognises that the energy sector is facing essential challenges, especially the reliance on energy markets for direct imports; the rising cost of crude oil and oil product imports (estimated at 17.6 percent of GDP in 2008); a growing demand for oil products expected to exceed 3 percent growth per year, and electricity consumption maintaining an upward trend (expected to exceed 4 percent growth per year).

Other challenges include the provision of necessary funding for investment in the development of the energy industry and its installations in time to meet energy needs, promoting an efficient use of energy in all sectors and upgrading oil derivatives products specifications in line with international standards in order to ensure safety and environmental protection.

To address these challenges the Government has set certain goals, namely:

- achieving security of oil products supply;
- shifting the energy fuel mix from oil to gas in power generation and energy-intensive industries; and
- Achieving security of electricity supply.

The current Energy Strategy charts the best way forward for the sector, with the aim of diversifying the energy mix. To this end, four approaches have been developed:

- utilise oil shale through direct burning by 2015;
- develop Jordan's civil nuclear programme with a functioning nuclear reactor by 2020;
- generate 10% of the Kingdom's electricity through renewables by 2020, particularly through wind and solar power; and
- Improve energy efficiency to reduce demand.

The Government is also accelerating restructuring of the Natural Resources Authority, as well as strengthening the role of the National Energy Research Center (NERC) to develop the exploitation of new and renewable energy resources, and to promote energy conservation.

In line with the National Agenda, a National Energy Strategy for 2005-2015 was approved by the Council of Ministers on 7 December 2004. Since completion of that strategy, primary energy demand has grown at 5.5% per year, much faster than the original expectation of 3.4% in the 2004 strategy. Similarly, electricity demand has grown at 7.4% per year, much faster than the 4.6% growth projected. So, in 2006 H.M. King Abdullah II entrusted HRH Prince Hamzah Iben Al Hussaein to head the Royal Committee on the Energy Sector.

The Royal Committee was mandated to work on upgrading the 2004 National Energy Strategy and as a result the "Jordan Energy Sector Master Plan" (also referred to an "Energy Strategy") for the period (2007-2020) was approved by the Council of Ministers in December 2007.

The main recommendations of the Jordan Energy Sector Master Plan can be summarised as follows:

- maintain and expand the current functioning of the Jordan Petroleum Refinery and enable it to function on a commercial basis;
- restructure the Jordan Petroleum Refinery by unbundling of activities and ending the Concession Agreement;
- liberalise the oil market and open it up to competition;
- remove subsidies on oil products, in phases, and review the pricing policy for such products in a regular manner in line with international prices;
- diversify the sources and kinds of imported energy to reduce dependency on a single source or kind and to ensure security of energy supply to the Kingdom from a variety of sources, as well as develop related infrastructure;
- increase the use of natural gas as a fuel in various sectors and specifically electricity generation;
- encourage the establishment of natural gas distribution companies in cities;
- increase the contribution of renewable energy in total energy consumption and put in place an energy efficiency policy;
- develop the market on the principle of selling energy to consumers at its cost price, as a minimum;
- continue with the restructuring of the electricity sector;
- establish a single regulatory body for the energy sector which will take over some of the responsibilities of the MEMR as well as other bodies currently functioning in the energy sector, and accordingly restructure MEMR and its agencies;
- develop the related environmental regulations and instruction.

Energy supply and demand

Natural gas and crude oil/petroleum products cover approximately 98% of Jordan's total primary energy supply while renewable energy represents less than 1%. As Jordan lacks domestic natural gas and conventional crude oil resources, their high shares in the national energy mix imply a striking dependence on energy imports.

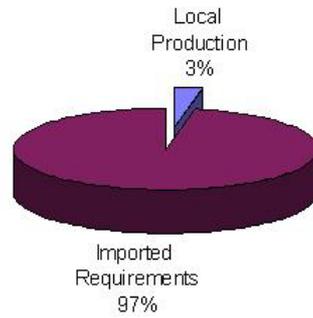
In 2008, the local oil and natural gas production was around 154,000 toe which forms only 3.0% of the country's total energy needs. Remaining energy needs are imported. These reached almost 4,426,000 toe of oil and its products and 2,726 million m³ of natural gas imported (from Egypt). Imported electricity (from Egypt and Syria) reached almost 547 GWh. These translated into a total cost of energy imports in 2008, of 2,763 million JDs, 21% higher than 2007 and was equivalent to around 20% of national GDP.

Table 2: Local Production of Oil and Natural Gas (2005-2008)

Local Production of Oil and Natural Gas	2005	2006	2007	2008
Crude Oil (ktoe)	1.1	1.2	1.2	107
N.Gas (Billion cubic ft)	8.5	8.9	7.7	7.2
Total (ktoe)	180	187	166	154

Source: Jordan national statistics

Figure 2: Local Production Share of Oil and Natural Gas (2008)



Source: Jordan national statistics

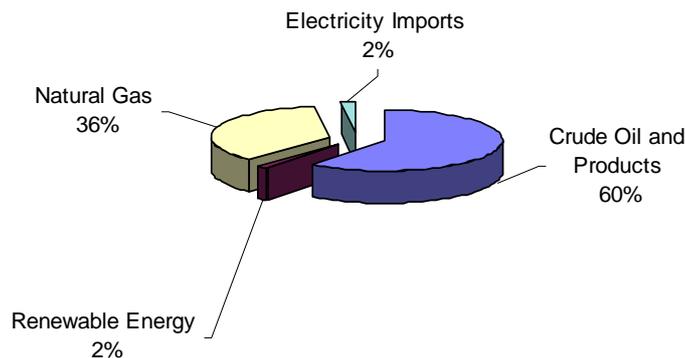
The demand for primary energy in 2008 was approximately 7,335,000 toe, a fall of 1.3% from 2007, while final energy consumption was 4,707,000 toe, a fall of 6.3% from 2007. The demand for oil and its products was 4,426,000 thousand toe, and electricity generation in the country reached 13,838 GWh with growth rate of 6.4% from 2007.

Table 3: Primary Energy Consumption, by Source (2005-2008)

Primary Energy Consumption	2005	2006	2007	2008
Crude Oil and Products (000 toe)	5325	4953	4906	4426
Renewable Energy (000 toe)	83	110	118	128
Natural Gas (Billion cubic ft)	56.4	76	92	104
Imported Electricity (000 toe)	238	124	53	137
Total (000 toe)	7028	7187	7438	7335

Source: Jordan national statistics

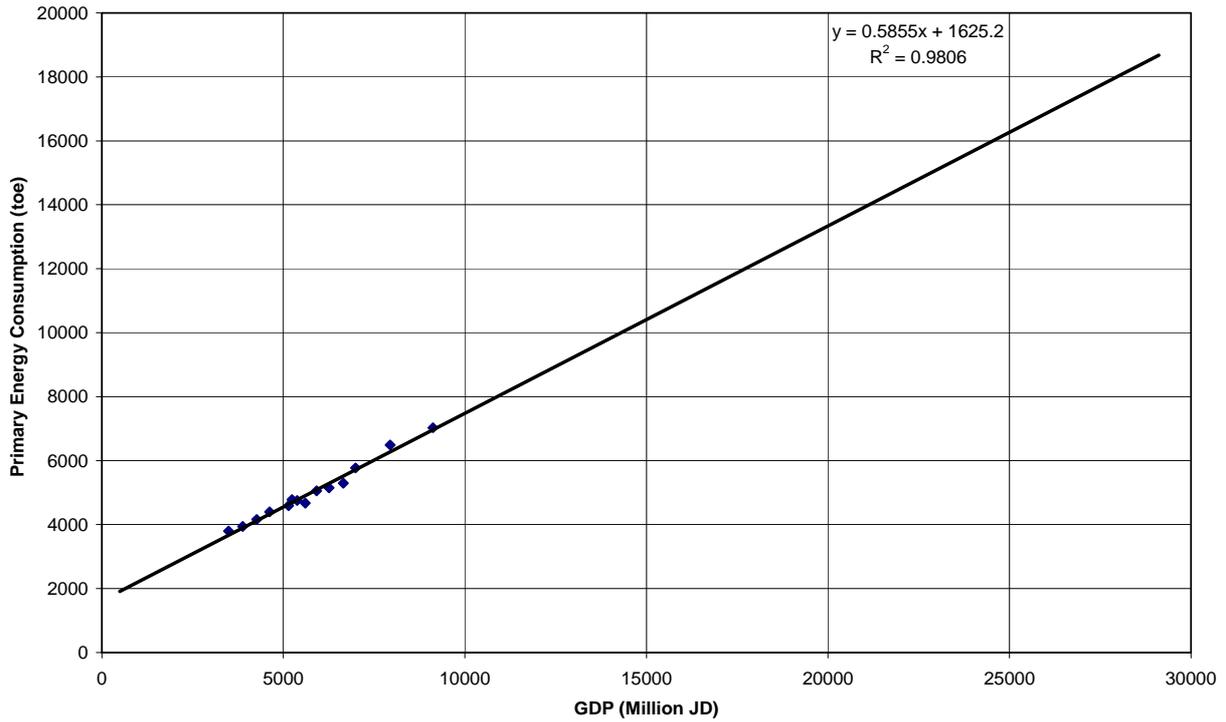
Figure 3: Primary Energy Consumption, by Source (2008)



Source: Jordan national statistics

GDP and Energy consumption have been highly correlated in Jordan (see figure below). Given projected annual growth of GDP of about 7.2 % in the national agenda, GDP is expected to reach 26 billion JD in the year 2020. Accordingly primary energy consumption is expected to increase to 16,733 TOE in the year 2020.

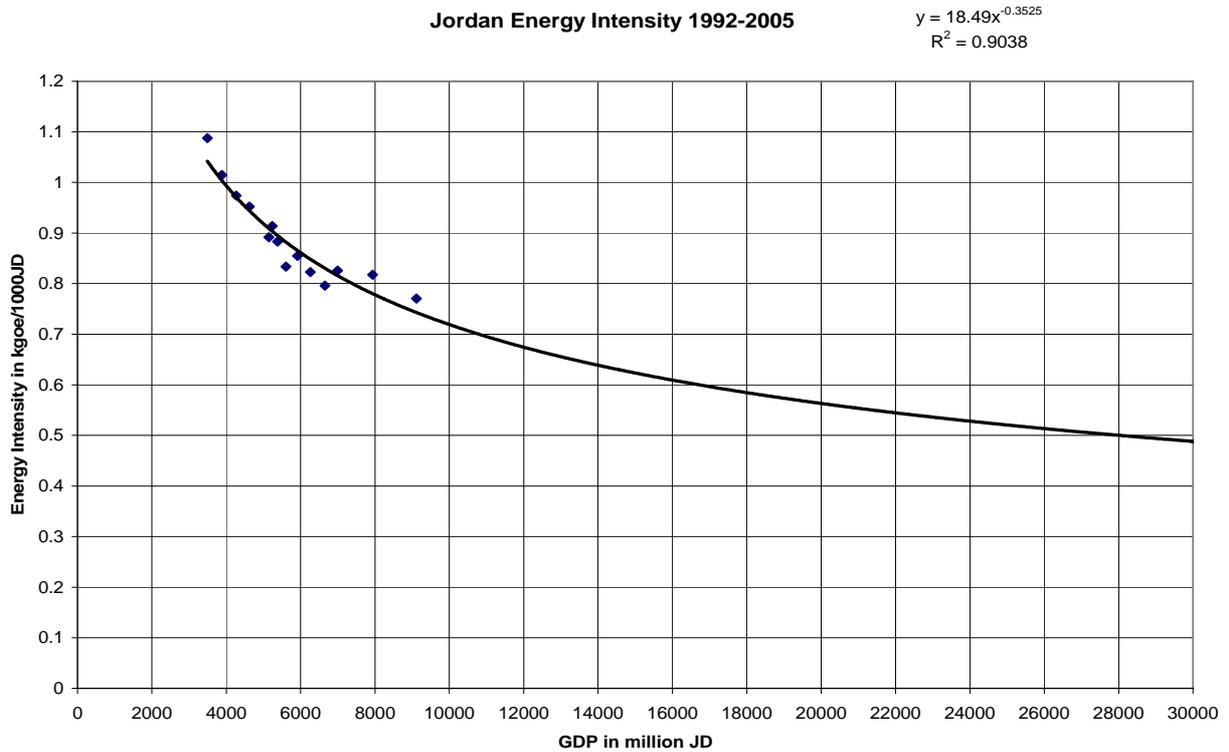
Figure 4: GDP and Energy Consumption



Source: Jordan national statistics

On the other hand, it is expected that energy intensity in Jordan will fall to 0.5 TOE / 1000 JD (see figure below).

Figure 5: Jordan Energy Intensity, 1992-2005



Source: Jordan national statistics

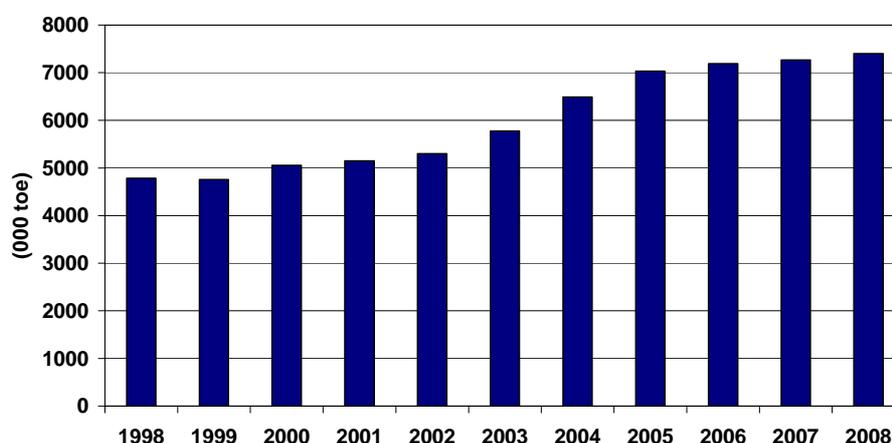
Table 4: General Energy Indicators, 2005-2008

	2005	2006	2007	2008
GDP (Million JD)	8954	10521	11722	12378
GDP Per Capita (JD)	1636	1880	2048	2116
Energy Intensity (Toe/1000 JD 94)	0.96	0.93	0.88	0.82
Per Capita Primary Energy Consumption (kgoe)	1284	1284	1270	1265
Per Capita Consumption of Electricity (kwh)	1592	1713	1844	1967
Percentage of Population Supplied with Electricity(%)	99.9	99.9	99.9	99.9

Source: Jordan national statistics

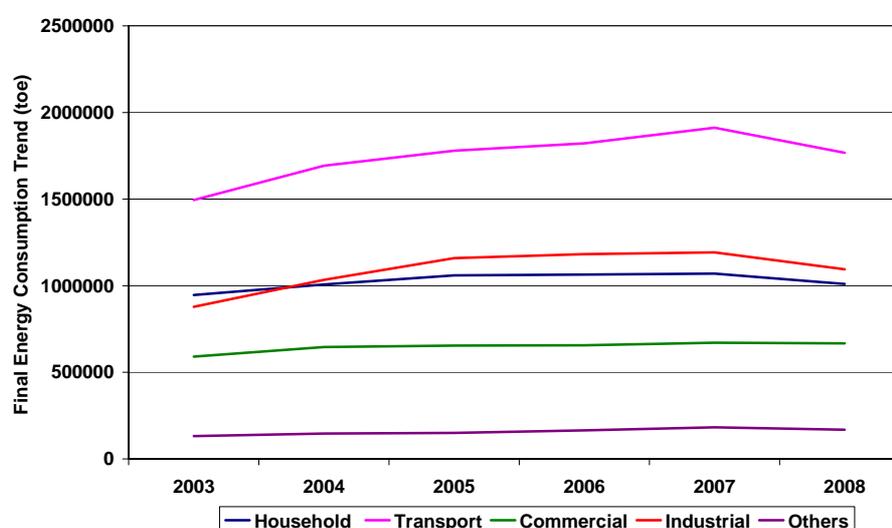
The figures below show the trends in the primary energy consumption for 1998-2008 as well as the final energy consumption by various sectors.

Figure 6: Primary Energy Consumption, 1998-2008



Source: Jordan national statistics

Figure 7: Final Energy Consumption Trends, by Sector (2003-2008)



Source: Jordan national statistics

Energy Resources

The Ministry of Energy and Natural Resources (MEMR) and the Natural Resources Authority (NRA) were able to attract a number of international companies to explore for oil in the country. To this end, the Kingdom's territory was divided into 8 exploration areas based on the geology of each area and its potential.

Jordan has modest reserves of natural gas (230 billion cubic feet (Bcf)), and has developed one gas field, at Risha in the eastern desert near Iraq. The National Petroleum Company (NPC) is implementing measures to increase productivity and has undertaken studies to develop the field. The NPC has set itself an ambitious target to increase gas production from the field to 300 MMcf/d by 2015. Currently, NPC is negotiating an agreement with BP, to participate in developing the Risha gas field.

While oil shale is not exploited so far in Jordan, the county has high oil shale reserves, estimated at around 40 billion tons, containing around 4 billion tons of oil. There are 18 known surface and near surface deposits, eight of which namely El-Lajjun, Sultani, Jurf Ed-Darawish, Attarat Um El-Ghudran, Wadi Maghar, Siwaga, Khan El-Zabib and El-Thamad were investigated at different levels.

Summary Table I: Priority of Policy Objectives

1 (the highest priority), 5 (the lowest priority)

Policy objective	Mark
Reduce total final consumption / GDP	2
Reduce dependency on energy imports	1
Diversification of fuels	3
Reduction of CO ₂	5
Increase utilisation of indigenous primary energy sources	4

2.2. Energy Policy Implementation

Institutional structure

The **Ministry of Energy and Mineral Resources (MEMR)**, established in 1984, is in charge of defining policy, fixing energy tariffs and regulating the activities linked with energy. MEMR undertakes the comprehensive planning of energy sector in terms of organisation, drafting and following up the implementation of general policies for achieving the anticipated goals.

Other key Ministries involved in the energy sector include:

Ministry of Planning and international Cooperation (MOPIC). MOPIC works with MEMR and reviews the energy sector plans and incorporates them within the national planning process. MOPIC also co-ordinates the foreign borrowing requirements for development projects.

Ministry of Finance (MOF). MOF is responsible for designing the fiscal policy of the Kingdom and supervises its implementation, steering Government investments in line with

fiscal policies. It also manages the governmental internal and external debt and achieves integration between fiscal and monetary policies in order to serve the national economy, in cooperation and coordination with the Central Bank of Jordan and related institutions.

Ministry of Environment (MoEnv.) MoEnv is in charge of designing and implementing environmental policies in Jordan. There is a strong trend in increasing environmental standards to be in line with international norms. MoE has a strong focus on the water sector, which is a high energy consuming sector and high emitter of carbon.

Other Government agencies concerned with the energy sector are:

Executive Privatisation Commission (EPC), established in 1996 to reduce the Government's involvement in direct production activities by way of restructuring and privatisation of public institutions or enterprises owned by the public sector. Its activities included the unbundling of the Jordanian power and utility sector,

The **Electricity Regulatory Commission (ERC)**, established in 2002, is responsible for electricity sector regulation as established under the Electricity Law;

The National Energy Research Center (NERC) it, is a semi-governmental body established in Amman - Jordan in 1998 for the purposes of research, development and training in the fields of new and renewable energy; raising the efficiency of using energy in the different economic sectors. This research center is considered as one of the specialised science and technological centers working under the umbrella of the Higher Council for Science and Technology. NERC is responsible for scientific research and development, transfer of technology of new and renewable energy, energy conservation and energy efficiency issues.

In the nuclear energy field, two agencies were established in 2007. **The Jordan Atomic Energy Commission (JAEC)**, which is an independent body responsible for peaceful uses of nuclear energy in industry, agriculture, medicine, water and mineral exploration, and the **Jordan Nuclear Regulatory Commission (JNRC)** which is an independent regulatory body, responsible for insuring the safe and secure usage of radioactive material.

Energy Legislation

A range of laws, regulations and instructions are currently (15 May 2009) in force:

Regulation for the Regulation and Administration of the Ministry of Energy and Mineral Resources No 26 for the year 1985;

- General Electricity Law No. 64 for the year 2002;
- Electricity Companies Licensing Regulations No. 76 for the year 2001;
- Electricity Tariff Instructions;
- Clearance Distance Instructions;
- Meter Certification Instructions;
- Dispute Resolution Instructions;
- Tempering Instructions;
- Natural Resources Law No. (12) for the year 1968;

- Mining Regulation No, (131) for the year 1966;
- Mining and Quarries Fees Regulation No. (8) for the year 1966;
- Conditions and procedures for issues Mining Rights;
- Conditions and procedures for issues Quarry Rights;
- Instruction for the Issuing of Quarry Licenses and Permits;
- Radiation Protection and Nuclear Safety and Security Law No. (43) for the year 2007.
- Nuclear Energy Law No. (42) for the year 2007, and
- By-Law of the National Energy Research Center for the year 1998.

2.3. Energy Prices

2.3.1. Energy pricing policy

The Ministry of Energy and Mineral Resources (MEMR), Ministry of Industry and Trade are the main responsible bodies for setting and update energy prices in Jordan.

The Jordanian Government began a phased lifting of subsidies on gasoline, diesel, fuel oil and kerosene in 2005. On 8 February 2008, oil product prices were fully liberalised with the last subsidies removed. This reduced government expenditure by nearly \$200 million and resulted in a noticeable jump in inflation.

The removal of subsidies was driven in part by the financial burden imposed by rising oil prices, but also as part of an overall strategy of liberalising its markets. While acknowledging the challenges presented and the need for improved energy efficiency and increased use of renewable energy, the move is part of a broader reform that will make the economy more efficient and attract foreign investment. In particular, it is expected that the removal of subsidies will increase investment from the oil-producing countries in the region.

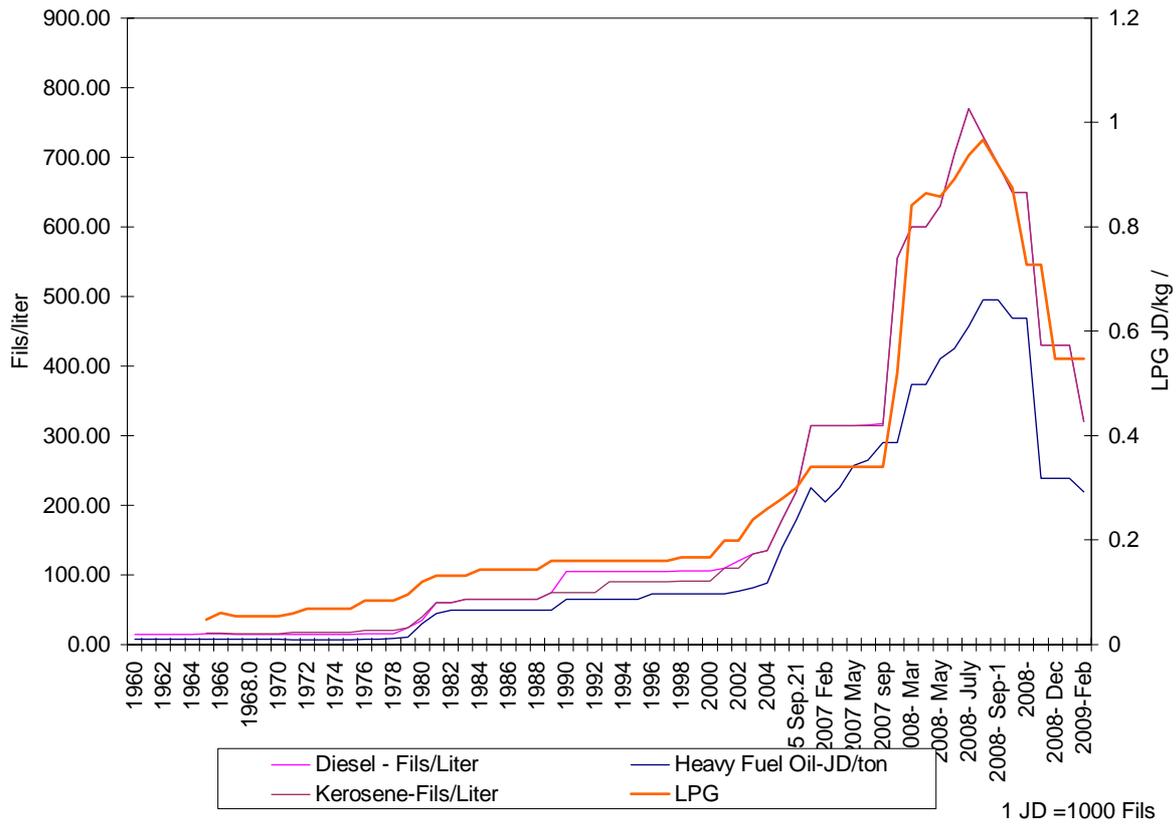
Price levels

One of the key elements in managing demand growth is to make sure that the price of energy including electricity reflects the full cost of producing and delivery it. It is well known that energy prices specifically oil products prices fluctuate frequently according to the international changes in oil prices. The government of Jordan has set a policy/decision to monthly change oil derivatives prices that reflect the international changes in oil prices.

Electricity prices don't have that many changes as seen in oil products prices. Around 90% of power production is being produced using NG which is imported from Egypt at low and fixed prices.

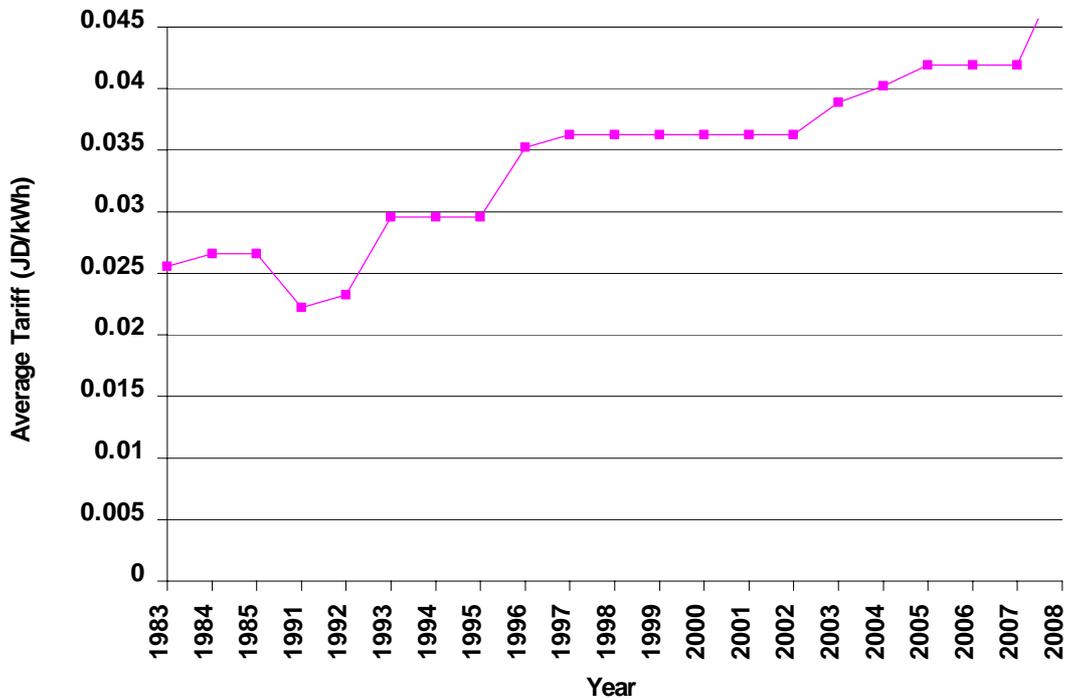
The behaviours of consumers are not taken much into account for updating energy prices. It mostly depends on international energy/oil prices. But, the structure of the existing electricity tariff took some points that encourage consumers in industrial (medium and large industries) and residential sectors to rationalise their energy use and consumption.

Figure 8: Growth in Oil Products and Electricity Prices



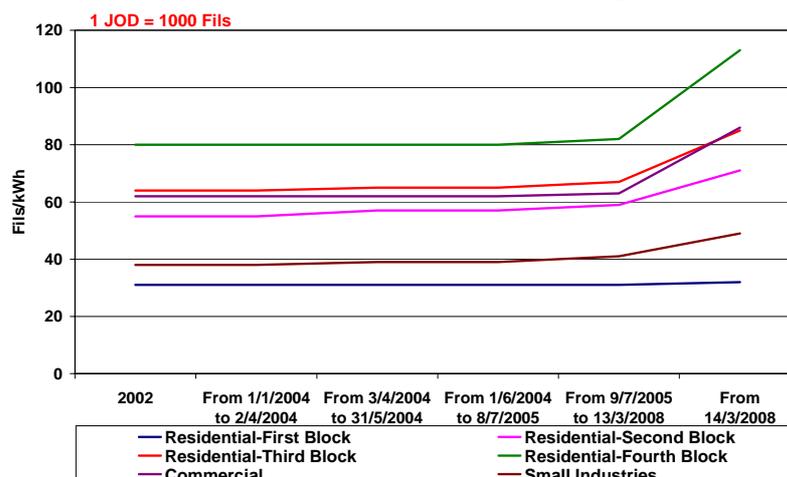
Source: Jordan national statistics

Figure 9: Average Electricity Tariff – Medium Industries



Source: Jordan national statistics

Figure 10: Trends in Electricity Tariffs, per Sector



Source: Statistics from Ministry of Energy and Mineral Resources

Table 5: Electricity Prices, by Sector (2003-2008)

	2003	2004	2005	2006	2007	2008
Domestic (Fils/kWh)						
First block, from 1-160 kWh/Month	31	31	31	31	31	32
Second Block, from 161-300 kWh/Month	55	55	57	57	59	71
Third Block, from 301-500 kWh/Month	64	64	65	65	67	85
Fourth Block, more than 500 kWh/Month	80	80	80	80	82	113
Flat Rate Tariff For TV and Broadcasting Stations (Fils/kWh)	60	60	60	60	61	86
Commercial (Fils/kWh)	62	62	62	62	63	86
Small Industries (Fils/kWh)	38	38	39	39	41	49
Medium Industries						
Peak Load (JD/KW/Month)	3.05	3.05	3.05	3.05	3.05	3.79
Day Energy (Fils/KWh)	35	35	36	36	38	46
Night Energy (Fils/KWh)	25	25	27	27	28	36
Agriculture (Fils/kWh)	26	26	28	28	31	47
Peak Load (JD/KW/Month)	-	-	-	-	3.05	3.79
Day Energy (Fils/KWh)	-	-	-	-	30	46
Night Energy (Fils/KWh)	-	-	-	-	20	36
Water Pumping (Fils/kWh)	38	38	38	38	40	41
Hotels (Fils/kWh)*	60	60	59	59*	60*	86
Day Energy (Fils/KWh)	-	-	-	55	56	81
Night Energy (Fils/KWh)	-	-	-	44	45	70
Street Lighting (Fils/kWh)**	25	25	27	27	30	51
Armed Forces (Fils/kWh)	-	67	67	67	67	81
Ports Corporation (Fils/kWh)	-	-	44.6	44.6	46.6	58
Monthly Minimum Charge						
Domestic (JD/Month)	1 JD					
Other Consumers (JD/Month)	1.25 JD					
* The 5 & 4 Stars Hotels can choose between the 3 categories tariff or continue using the Flat rate tariff						
** Applied for Consumption Which Exceeds The Average Level of 1988 Consumption						
Note: In December 2009, 1 JD was approximately equal to 1 Euro						

Source: Statistics from Ministry of Energy and Mineral Resources

Summary Table II: Energy Prices

Energy Prices	Yes	No	Partly
Is there an independent regulator of energy prices?		•	
Are there any subsidies on energy prices?			•
Are there any cross-subsidies?			•
Are the environmental costs fully internalised?		•	
Do you have a tax related to energy consumption?		•	
Do you have a tax related to CO ₂ emissions?		•	

3. END-USE SECTORS

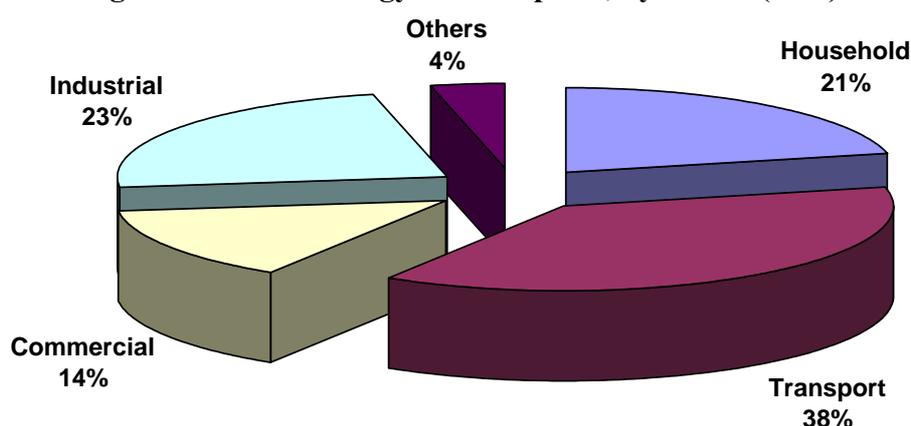
The transport is the largest energy-using sector in Jordan, followed by the Industrial and Residential Sectors. While energy consumption in many sectors fell in 2008 due to the effects of high global energy prices, removal of subsidies and the global financial crisis, it is expected that energy use will continue to grow over the medium term.

Table 6: Final Energy Consumption, by Sector (ktoe)

Final Energy Consumption	2005	2006	2007	2008
Transport	1779	1822	1912	1767
Industrial	1159	1182	1192	1095
Household	1060	1064	1070	1010
Services & Others	804	821	853	835
Total (ktoe)	4802	4889	5027	4707

Source: Jordan national statistics

Figure 11: Final Energy Consumption, by Sector (ktoe)



Source: Jordan national statistics

Transport Sector

The transportation sector consumes around 38% of the country's total final energy consumption, which is equal to 1,767,000 toe. This is not the actual consumption of this sector because some of the fuel sold at petrol stations is used for heating of residential and commercial buildings and some of it is also used by some industries. 20% of total energy consumed by this sector, or the equivalent of 355,800 toe, can be saved by implementing some simple measures.

Industrial Sector

The industrial sector consumes around 24% of the kingdom's final energy consumption, which is equal to 1,095,000 toe. Preliminary studies and Detailed Energy Audits conducted by NERC showed that 28% of the total energy bill can be saved, or the equivalent of 324,520 toe as shown in the table below.

Residential Sector

The residential sector's share of the total final energy consumed in 2008 was 21.5% or 1,010,000 toe. Studies conducted by NERC showed that at least 20% of this total energy bill can be saved or 212,000 TOE. In addition, implementing energy labelling for household appliances can save up to 15% of the electricity consumed by household appliances (refrigerators, cloth washers, room air conditioners, etc.). This saving is equivalent to 9% of the residential sector electricity consumption or 23,130 toe, which bring the total potential savings in the residential sector to 235,000 toe.

Service sector

The service sector consumes around 14.5% of the country's final energy consumption, which is equal to 675,000 toe. Preliminary studies and Detailed Energy Audits conducted by NERC show that 20% of this total energy bill can be saved, or the equivalent of 160,800 TOE.

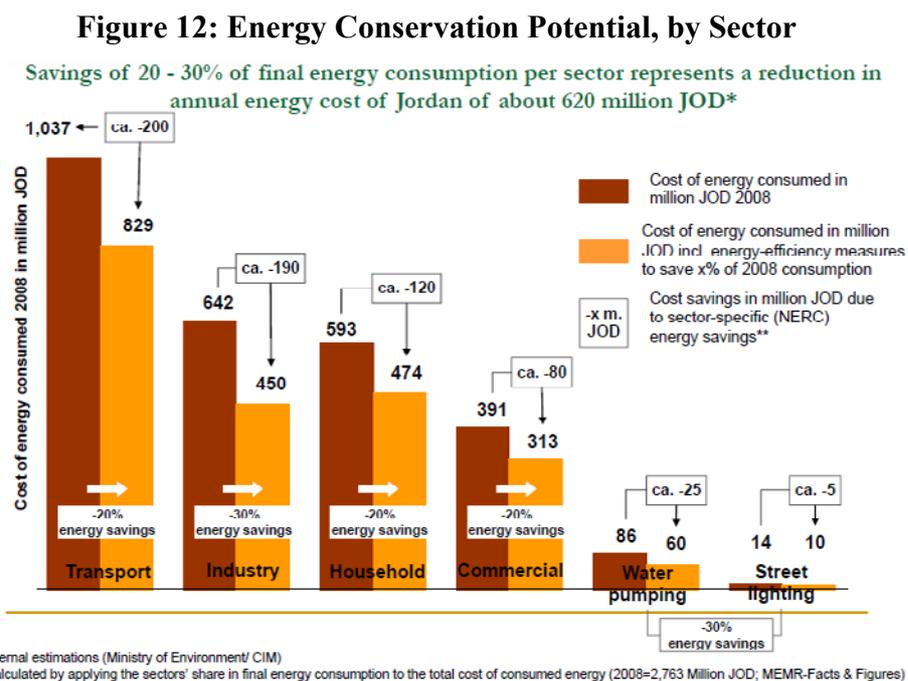
Water Sector

Water pumping in Jordan consumes around 15% of the country's total electricity consumption or the equivalent of 1,713 GWh (147 toe). A study conducted by NERC in 2004 at a number of pumping stations showed that it is possible to save 30% of the total electricity consumed for pumping. The study also showed that the saving can be achieved through a number of measures such as the use of variable speed drives (VSD) and the use of high efficiency pumps in the pumping stations, which will yield a payback period of 4-5 years.

Combined sectoral potential

By implementing energy efficiency projects in the various sectors, the sum of savings to be achieved is around 1,198,520 toe, which is 21% of total energy consumption.

The figure below shows a summary of energy conservation potential by sector.



Source: NERC November 2007

Table 7: Energy Savings Opportunities in the Industrial Sector (JD)

	Thermal Systems	Compressed Air	Cooling & Pumping	Water	Lighting Systems	Electrical Systems	Others	Total	Annual Energy Cost	Percentage of Saving	Payback (Yr)	Investment (JD)
American Jordanian Com. for Apparel (Jordache)	15000	34000	0	12458	7000	4025	0	72483	467740	15.50%	0.46	
Alpha Beta Food Industries	47,526	4,970	6,266	14,990	2,848	0	0	76,600	250,000	30.60%	0.5	38230
Quality Foods	12,121	470	1,936	2,352	378	4,882	0	22,139	49,728	44.50%	0.74	16290
Jordan Paper and Cardboard Factories	40,372	9,500	48,000	0	4,317	4,978	0	137,869	568,857	24.20%	0.79	109488
Jordan Ceramics Co	60,116	700	5,370	0	3,919	13,302	0	123,823	1,371,856	9.00%	1.67	206438
Jordan Oil Company	29,311	0	11,790	0	0	0	0	57,821	293,514	19.70%	1.76	102054
AL Keena Hygienic Paper	0	0	0	0	0	0	0	556,106	1,581,593	35.20%	2.71	1504853
Alahli Plastic Factories Co	0	11,640	54,252	0	2,862	4,538	22,940	142,882	246,554	58.00%	1.5	213853
Al-Nyrooz Plastic Company	0	547	688	0	73	177	528	2,013	18,855	10.70%	1.12	2250
United Iron & Steel Co	98,000	0	31,111	0	13,206	125,000	0	1,465,317	2,829,000	51.80%	4.39	6433773
Jordan Phosphate Mines Company- Eshidiya	50,000	0	0	64,347	48,031	17,100	0	380,691	3,300,246	11.50%	4.04	1539265
Technical Packaging Company (PET)	10,950	8,935	6,461	0	786	878	0	10,950	29,665	36.90%	3.04	33234
RUM Manufacturing Company	16,370	4,542	0	0	7,115	1,000	0	29,027	97,664	29.70%	0.93	27075
Total	364,766	41,304	165,874	81,689	83,535	171,855	23,468	3,005,238	10,637,532	28.30%	3.64	10947138

Source: NERC November 2007. All figures in JD

Table 8: Energy Savings Opportunities in the Commercial Sector (JD)

Company Name	Boilers& Steam Systems	Cooling& Pumping Systems	Electric Systems	Water Systems	Lighting Systems	HVAC	Others (Building Envelope, LPG, etc.)	Total Cost Saving	Energy Consumption (JD/Year)	% of Saving	Pay Back Period (Yr)	Investment Required
Arab Center for Heart and Special Surgery	5,800	7,688	4,765	25,415	24,321	0	0	67,989	313,832	22%	1.8	123,102
Radisson SAS Hotel (Amman)	5,646		0	0	29,163	0	359	35,168	243,276	14%	0.4	15,731
Radisson SAS Hotel (Aqaba)	11,551	40,975	0	0	11,194	0	4,555	68,275	196,196	35%	1.3	87,544
Le Meridian Hotel (Amman)	4,950	15,087	150,200	11,825	19,179	0	2,721	203,962	776,883	26%	1.9	382,387
Grand Hyatt Amman Hotel	16,506	15,207	41,241	9,761	30,246	0	0	112,961	578,654	20%	2.1	235,285
Movenpick Resort & Spa Dead Sea	7,179	4,235	486	44,985	19,166	770	0	76,821	665,625	12%	0.8	60,052
Movenpick Resort Aqaba	3,342	8,190	29,553	26,751	12,183	6,430	0	86,449	358,223	24%	1.9	164,819
Four Seasons Hotel (Amman)	7,418	13,150	43,056	15,644	34,099	0	6,940	120,307	648,569	19%	1.4	170,670
Jordan Kuwait Bank	0	5,343	0	0	9,111	0	3,400	17,854	103,505	17%	1.3	23,579
Industrial Development Bank	1,143	0	0	0	2,877	0	0	4,020	33,065	12%	2.9	11,711
TOTAL	63,535	109,875	269,301	134,381	191,539	7,200	17,975	793,806	3,917,828	20%	1.6	1,274,880

Source: NERC November 2007. All figures in JD

4. ENERGY EFFICIENCY POLICIES

4.1. Energy Efficiency Policy

In 2004, the Government adopted an Energy Efficiency Strategy (2004 EES) (adopted by the Council of Ministers on 7/9/2004). The main of Energy Efficiency Strategy are:

- reducing energy consumption without negatively effecting production or the standard of living, in order to lower the imported oil bill at the national level and reducing the harmful gas emissions into the environment;
- improving the standard of living;
- achieving a balance between imports and exports;
- reducing production cost and improving competitiveness of the local industries and other sectors; and
- reducing investment in the equipment used for the production, conversion, transport and distribution of energy.

The 2004 Energy Efficiency Strategy focused on the following policies to achieve its goals:

- Tariff policy - removing subsidies on petroleum products and electricity and applying a pricing structure based on actual cost.
- Legislation - Strengthening and goal oriented legislations are considered as the most important tools in improving energy use efficiency and increase the demand for high efficiency equipment and services. Proposed legislation includes taxation and customs policy, building standards, minimum energy performance standards for energy using equipment.
- Awareness and Training - Implementation of awareness and training programmes for improving energy consumption through increasing awareness at the sectoral level, such as investors and energy service suppliers, and at the general public level to improve consumption and savings. This can be achieved through media; education programmes; seminars and workshops as well as by involving private sector and non-governmental organisations. Additionally, establishing an integrated energy database is essential to assist consumers and service suppliers to make informed decisions to optimise consumption and invest. Here the EES also focuses on training and national capacity building to enhance the capacities of targeted groups and provide policy makers and legislators with the needed experience and information to develop and put into place the necessary measures, this is next to ensuring that skilled personal are available to ensure the implementation of such. The establishment of energy information system or energy data base is already included within the mandate of the National Energy Research Center. But due to the financial constraints, NERC is not able to conclude this mission. In spite of this situation, NERC has the data on wind and solar. Detailed measurements were begun in 1989 at 10 sites and now reached 20 wind measuring point in different locations in Jordan.
- Financial Policies - Setting proper tools to allow and facilitate the financing of projects and activities aimed at efficient energy consumption through increasing the awareness among local financing institutions of the importance of energy conservation

projects and their economic returns; and establishing a special fund to finance energy conservation projects with a shared capital from Government and donor institutions to provide soft loans for such projects.

4.2. Legal Framework

A new Renewable Energy and Energy Efficiency Law was approved by the cabinet in 2010. The new Renewable Energy and Energy Efficiency Law allows the Ministry of Energy and Mineral Resources to work with other specialised entities to conserve energy and increase energy efficiency in different sectors (Article 3c), and the Council of Ministers will issue by-laws necessary for execution of the provisions, including procedures and measures for energy conservation and energy efficiency in the various sectors (Article 17). The by-law and regulatory framework to implement must be developed to support and promote implementation of the Roadmap. The law also sets incentives to promote renewable energy utilisation in Jordan.

New energy efficiency buildings codes were drafted as well as, solar energy code and green building Guide, the adoption of tax exemptions to promote use of energy efficient products and equipment, and the adoption of the Renewable Energy and energy efficiency Law in 2010. Recently, Jordan witnessed the establishment of Jordan Green Building Council which is NGO entity supported by USAID. A short description on the above mentioned codes is illustrated below.

Energy Efficient Buildings Codes

The goal of the Energy efficient buildings code is to enhance the energy efficiency concept in the construction sector through the implementation of certain measures and requirements that cover the following areas:

- Building envelope: which includes walls, roofs, site considerations, windows, shading devices, and insulation materials.
- Energy efficiency in Heating Ventilation and Air Conditioning (HVAC) systems: this includes the best performance/efficiency indexes for various equipments used in HVACF systems. Also it includes waste heat recovery systems.
- Energy Efficiency in ventilation systems: it includes ventilation requirements that cope with the followed local standards in terms of energy saving.
- Energy efficiency in water heating systems: this includes domestic hot water systems and swimming pool heating.
- Energy efficiency in lighting systems.

Solar Code

Solar Code deals with benefiting from the free abundant solar energy. Issuing the “solar Energy Code” reflected the intention of the “National Jordanian Building Council” to follow the scientific and practical developments in the field of solar energy utilisation; especially that Jordan has a very good availability of solar energy which is about (5.5 kWh/m².day). This code is endorsed simultaneously with the National Strategy for Energy Efficiency Improvement in Jordan. Solar Energy Code describes the methods used in the design of safe solar systems, and selection of system components based on international and local followed standards.

Jordan Green Buildings Guide

The goal of this guide is to clarify the technical and technological requirements needed to obtain sustainability for buildings in Jordan through the following:

- Reducing the environmental impact of the buildings.
- Reducing the energy used in operating the buildings, and increasing the energy efficiency.
- Reducing the water used in the buildings.
- Reducing the materials used in construction and after building occupancy and encouraging material recycling.
- Establishing a starting point for the preparation of Green Buildings Code for buildings in Jordan.
- Contributing in obtaining hygienic, sustainable, environmentally friendly and energy efficient buildings.

The requirements included in this guide can be applied to all new buildings.

4.3. Energy Efficiency Targets

According to the National Energy Strategy (2007-2020), Jordan has to reach a reduction of 20% of its energy consumption via improving energy efficiency by 2020.

4.4. Energy Efficiency Priorities

Most of energy consuming sectors have somehow the potential for improving energy efficiency. Transport sector has a significant potential for improving energy efficiency since it has the largest portion of energy consumption in Jordan 38% but it is not so easy to realise all this potential. The problem behind is that this sector owned and operated by different operators. The Transportation Regulatory Commission is regulating this sector in terms of defining the routes and issuing permissions and controlling the whole sector operations. In addition, the internal transportation (inside cities) especially small cars (service and taxis) have its own regulations and mostly are controlled by Municipalities.

Building Sector has also big potential for energy efficiency. It consumes around 35% of the total final energy consumption in Jordan which is considered the second largest energy consumer in Jordan. This sector requires the enforcement of the existing and hopefully the adoption of new drafts of building codes, bearing in mind that the enforcement of building codes will be only applied on new constructions and will not lead to realise the whole estimated potential for energy saving in this sector. Therefore, implementing a comprehensive energy efficiency campaign is necessary to address the public specially existing building owners, occupants and operators.

According to studies carried out by NERC, the other sectors such as water pumping, street lighting which considered as public sectors show significant energy saving potential. This saving can be realised through actual actions which can adopted or directed by the public entities who run these sectors.

The following table summarises the priority for energy efficiency in different sectors.

Table 9: Priority for Energy Efficiency, by Sector

Sector	Level of energy consumption	Energy saving potential	Political attention	Possible influence on the target group	Priority
Transportation	high	High	Medium	Low	Medium
Industrial	medium	High	High	Medium	High
Building	High	High	High	medium	High
Water pumping	Low	High	Medium	High	Medium
Street lighting	Low	High	Medium	High	Low

4.5. Energy Efficiency Financing

The government of Jordan has not allocated a specific budget dedicated for energy efficiency in its annual budget. The only that has been done in this regard is the establishment of Renewable Energy and Energy Efficiency Fund and put some money.

Renewable Energy and Energy Efficiency Fund:

Government is working on the establishment of a Renewable Energy and Energy Efficiency Fund (JREEF). The JREEF would be a key energy policy instrument that would contribute to the development of renewable energy and energy efficiency in Jordan, based on the diversity of renewable energy resources available in the country and the potential for energy savings reflecting the country's pattern of energy consumption. The proposed JREEF windows would provide support at each stage of development, from demand for renewable energy and energy efficiency through public awareness and training, to early stage project preparation, access to credit, cost of financing and access to equity financing. The Government is commitment to provide credible and substantial financial recourses to the Fund in addition to donor resources that would be dedicated to the Fund.

The JREEF would be established pursuant to the new Renewable Energy and Energy Efficiency Law, which currently has been approved by his Majesty King Abdulla. Its functioning would be determent pursuant to a specific Regulation covering its powers, authorities, functions, structure and administration.

Currently, the available national funds or funding tools are: the Jordan Upgrading and Modernisation Fund (JUMP) which affiliated to the Ministry of Trade and Industry. This entity covers various activities within its funding tool and energy efficiency is one of these activities. This fund cooperates with Amman chamber of Industry to provide some assistance to the industrial sector (SMEs). The assistance includes providing grants for carrying energy audits by local consultants. Also, this funding entity gives limited grants for implementing energy efficiency measures.

The Higher Council for Science and Technology (HCST) provides small grants for carrying out energy audits and implementing energy efficiency measures through Industrial Scientific Research Fund and National Fund for Support Enterprises. Again, not all the money available or allocated by (HSCT) is dedicated for energy efficiency.

ESCOs can play a major role in funding and implementing energy efficiency measures. But unfortunately, these ESCOs are very limited in Jordan and it don't have enough budget to

play this role. Therefore, they seek loans from local banks and the local banks are not so familiar with such kind of funding.

External sources are also available and contribute a lot in energy efficiency in Jordan. These sources give its money through implementing energy efficiency programmes, applied research and pilot projects, capacity building, awareness raising and other relevant policy issues.

4.6. International Co-operation

EU support to EE and RE:

The EU sectoral programme, a strong component for supporting the development of EE and RE has been proposed in the amount of 10 M€ over a 3 year period. The Grant will be managed by NERC.

Table 10: International Agreements

Country	Signed Agreement
EU	Bilateral Agreements Signed Between Jordan And European Countries
Argentina	An Agreement on Scientific-Technological and Technical Cooperation was signed on 23 October 2008
United States of America	An Agreement on Science and Technology Cooperation was signed in April 2008
Brazil	A Scientific and Technological Cooperation Agreement was signed on 24 October 2008
Central African Republic	An Agreement on Economic, Scientific and Technical Cooperation was signed on 20 November 2005
Malaysia	An Agreement on Economic, Technical, Scientific and Cultural Cooperation was signed on 19 December 1994
Japan	An Agreement on Technical Cooperation was signed on 16 July 1985

Source: Ministry of Planning and International Cooperation, www.mop.gov.jo

4.7. Energy Efficiency Institutions

Ministry of Energy and Mineral Resources is the main responsible body for energy efficiency policies in Jordan. Other Ministries may involve in policy issues related to energy efficiency such as the Ministry of Public Works, Ministry of Environment, Ministry of Trade and Industry and Ministry of Planning and International Cooperation. There is no specific institutional setup for the implementation of energy efficiency policy in Jordan. The efforts are scattered in this regard.

The **National Energy Research Center (NERC)** was established in 1998 for the purposes of research, development and training in the fields of new and renewable energy, and raising the efficiency of using energy in the different economic sectors. This research center is considered as one of the specialised science and technological centers working under the umbrella of the Higher Council for Science and Technology. NERC provides various services in the field of energy conservation and the implementation of projects related to energy efficiency and solar thermal energy, including audits, training, public awareness, and assistance with project

implementation and financing. Additionally, MEMR has established an Energy Efficiency Bureau, and published an Energy Efficiency pamphlet to assist the public in energy efficiency issues.

The Energy Management Service (EMS) Company, a fully private company, performs consultancy, audit, and design studies for new and existing facilities in the field of energy management.

4.8. Energy Efficiency Monitoring

There is no systematic monitoring and ongoing assessment of the implementation of energy efficiency policies and programmes.

Summary Table III: Energy Efficiency Policies

Energy efficiency policies	Yes	No	Partly
Has an energy efficiency policy been developed?			×
Is energy security a driving force for energy efficiency?	×		
Is climate change/environment a driving force for energy efficiency?			×
Is sustainable development a driving force for energy efficiency?	×		
Is employment creation a driving force for energy efficiency?			×
Is industrial competitiveness a driving force for energy efficiency?	×		
Is export of technology a driving force for energy efficiency?		×	
Is comfort perceived as a priority for improving energy efficiency?		×	
Are international obligations a driving force for energy efficiency?		×	
Is there an energy efficiency law?			×
Is energy efficiency incorporated in other legislation?	×		
Have national targets been formulated?	×		
Is there a special fund for energy efficiency?			×
Is there international cooperation in the field of energy efficiency policies?	×		

5. ENERGY EFFICIENCY INSTRUMENTS AND MEASURES

5.1. Cross-sectoral Instruments and Measures

Table 11: Cross-Sectoral Instruments and Measures

Type of Instruments	Programme Description and Aims	Implementation Status	Budget	(Expected) Results
Financial	Exemption of EE & RE equipment from sales tax and custom duties It aims at promoting the use of EE & RE equipments through reducing end user prices	Done and ongoing	NA	
Information/ awareness	Preparation and implementation of public awareness campaign	Under development	NA	
Information/ awareness	Design and implementation of energy efficiency training programmes for those who are involved in energy efficiency issues	Under development	NA	

5.2. Instruments and Measures in the Residential Sector

Table 12: Instruments and Measures in the Residential Sector

Type of Instruments	Programme Description and Aims	Implementation Status	Budget	(Expected) Results
Normative/ Legislative	Equipment energy efficiency labelling	Under development	1.5 Mln Euro	Reduction in energy consumption in the household sector
Normative/ Legislative	Energy efficiency building codes	Done	NA	
Information / awareness	Implementation of energy efficiency demonstration projects like energy saving lamps , efficient street lighting and solar water heaters	Ongoing	NA	Getting public aware on various actions and measures which lead to reduce energy consumption

5.3. Instruments and Measures in the Industrial Sector

Table 13: Instruments and Measures in the Industrial Sector

Type of Instruments	Programme Description and Aims	Implementation Status	Budget	(Expected) Results
Education/ Advisory	Appointment of “Qualified energy auditor”	Under development	NA	
Financial	Provision of grants and soft loans for large and costly energy conservation projects	Ongoing	NA	
Education/ Advisory	Energy Bus Clinic to improve energy efficiency in industrial sector	Ongoing	NA	Reduction of energy consumption and accordingly enhance competitiveness
R&D	Studies - JUMP Support and Funding	Ongoing	NA	Reduction of energy consumption and accordingly enhance competitiveness
Information / awareness	Measures to improve efficiency, including electrical load management of production, transmission and distribution of electricity	Ongoing	NA	
Information / awareness	Energy audits - Higher Council for Science and Technology Funding	Ongoing	NA	Reduction of energy consumption and accordingly enhance competitiveness

5.4. Instruments and Measures in the Services Sector

Table 14: Instruments and Measures in the Services Sector

Type of Instruments	Programme Description and Aims	Implementation Status	Budget	(Expected) Results
Normative/ Legislative	Application of thermal insulation and other energy efficiency measures in design and construction of public buildings	Done		
Information / awareness	Implementation of energy efficiency demonstration projects like energy saving lamps , efficient street lighting and solar water heaters	Ongoing		

5.5. Instruments and Measures in the Transport Sector

Table 15: Instruments and Measures in the Transport Sector

Type of Instruments	Programme Description and Aims	Implementation Status	Budget	(Expected) Results
Information	Encourage ownership of small cars and discourage usage of old cars	Ongoing		
Information	Promotion and establishment of Taxi Stops in several places, printing of maps that show bus lines in different parts of the Kingdom and make those maps available to the public	Ongoing		
R&D	Investigate the feasibility of using train between Amman and Zarqa for transportation of people and between Amman and Aqaba for transportation of goods	Under Development	NA	Improve traffic condition, reduce traffic jam, reduce fuel consumption and air pollution

Summary Table IV: Instruments and Measures

Please indicate in the table (with X) the availability of the different policy instruments and measures groups in the national energy efficiency policy:

Sectors	Instruments					
	Normative	Financial	Information/ awareness	Education/ advisory	Voluntary agreements	R&D
Residential	×		×			
Industry		×	×	×	×	×
Services	×		×			
Transport			×			×

6. ACTORS IN ENERGY EFFICIENCY

6.1. Division of Responsibilities and Coordination

Ministry of Energy and Mineral Resources

MEMR is in charge of follow-up the progress of the implementation of the procedures of the Energy Efficiency (EE) Strategy. The progressive implementation of the EE Strategy contributes to the building of a more favourable framework for developing EE in Jordan.

National Energy Research Center

NERC was established in 1998 for the purposes of research, development, training in the fields of new and renewable energy and raising standards of energy use in the different sectors. The Center is considered as a Center for scientific and technological research and part of the Higher Council for Science and Technology. NERC is acting as an EE Center for delivering information and performing audits. NERC is also considered as the advisory technical arm of the MEMR/Government relating to EE and RE.

The Minister of Energy and Mineral Resources is the chairman of the board of directors of the National Energy Research Center. Due to its position, NERC is involved in most of activities dealing with EE, RE, cogeneration, the shift from oil to gas, and related policies and financing tools. (See: www.nerc.gov.jo)

Ministry of Environment (MoE)

The Ministry of Environment (MoE), established in 2003, is in charge of designing policies in environment. There is a strong trend in increasing environmental standards in order to be in line with international norms. MoE is working with MEMR and NERC to ensure that EE strategy is implemented in a manner that supports the country's Environmental Policy, particularly with respect to the water sector which is a high energy consuming sector and carbon emissions. (See: www.moe.gov.jo)

Table 16: Intermediary Organisations in the Residential Sector

Residential Sector Intermediaries	Interest in Keywords	Active Role in EE (Yes/No)	If Yes, with Which Instruments
NERC	Studies & implementing EE measures	Yes	Energy Label, Building Codes, awareness
MOPWH	Construction	Yes	Building Codes
Municipalities	Licences, permissions, supervision	Yes	Building codes, regulating
MEMR	Policy, Legislations and regulations	Yes	Awareness raising, advisory
JEA	Design, supervision	Yes	Building codes

Table 17: Intermediary Organisations in the Industrial Sector

Residential Sector Intermediaries	Interest in Keywords	Active Role in EE (Yes/No)	If Yes, with Which Instruments
Ministry of Environment	Supervision and inspection and follow-up	yes	Tax exemption
Chambers of industry	Policy implementation	yes	Awareness raising

Table 18: Intermediary Organisations in the Transport Sector

Residential Sector Intermediaries	Interest in Keywords	Active Role in EE (Yes/No)	If Yes, with Which Instruments
Ministry of Transport	Planning, Tax exemption, Regulations	Yes	Awareness, tax exemption, policy
Public Transport Regulator Commission	Awareness, Tax exemption, Regulations	Yes	Awareness, tax exemption, policy implementation
Municipalities	Monitoring, controlling	yes	Traffic signs, awareness, control

7. RENEWABLE ENERGY

7.1. National Policy for Renewables Deployment

The National Energy Strategy provides that renewable and alternative energy resources should contribute 7% of the total energy mix in 2015 and 10% in 2020.

A main condition for the development of renewable energy power production solutions is the existence of a favourable framework for the grid connection, including the price for electricity delivered to the grid. The new Renewable Energy and Energy Efficiency law has been adopted by the government in 2010. This Law will promote renewable energy projects and the development and use of renewable energy by providing a number of incentives, including setting up of a renewable electricity tariff and connectivity with the national grid as well as the general rules and procedures needed to govern the sector. In addition, it would establish the “Renewable Energy and Energy Efficiency Fund” to support these projects.

7.1.1. Solar Energy

A number of projects have been launched to develop solar energy in Jordan, such as the project for measuring solar radiation and developing solar cells laboratory.

In 2006, 14% of households were served by solar collectors for water heating purposes, while this figure has been decreased to around 12% in 2009 according to the last survey done by Department of Statistics (DOS). The total energy output was estimated at 380 GWh yearly. Assuming 17% of solar collectors were used instead of electrical heaters and 83% instead of using fossil fuels, and then the total savings in the primary energy was 61, 218 toe. Due to the increasing penetration of solar collectors, it is expected that the contribution of solar collectors will rise in 2020 to be 50% of households. The resulting energy savings are projected to be 2,712 GWh, or primary energy savings of 436,871 toe.

Regarding use of photovoltaics, the total installed capacity was 0.5 MW in the year 2006. Most of these units have been installed in the remote areas of Jordan, and have the capability of producing 0.9 GWh per year. Therefore, the savings in the primary energy is equivalent to 226 toe. This is expected to rise to 200 MW in the year 2020, equivalent to 18 GWh per year, or 905 toe in primary energy.

7.1.2. Bio-Energy

In 2006, the total installed capacity of bio-energy was about 3.5 MW in the Russaifa Biogas Plant, capable of producing 26 GWh yearly. This has a potential primary energy equivalent savings of 8,167 toe. The Jordan Bio-Gas Company (owned equally by CEGCO and Greater Amman Municipality) has continued to work on the organic waste treatment at the Rusaifa waste land fill. In 2007, the volume of solid and liquid waste treated, reached around 5440 tons, and the amount of electricity generated was 9,494 MWh. The plant consists of two parts, the first part seeks to restrict and use the gas emissions from the Rusaifa landfill for generating energy, and the second part handles the organic waste treatment away from the source. The waste treatment takes place via a special reactor for producing the bio-gas and organic fertilisers.

While bio-gas from landfill has been used in several industrialised countries, this project is the first of its kind to be implemented in the near east region, as a means to demonstrate the

success of using bio-energy to generate electricity in Jordan and the region. The Biogas Plant started operation in 2007. The Jordan Environment Society (JES) has played an important role in assisting information dissemination and awareness in cooperation with the Jordan Hashemite Fund for Human Development.

It is expected that the contribution of bio-energy will be 150 MW in 2020. This has a potential production of 1,117 GWh which is equivalent to 276,811 toe of primary energy.

7.1.3. Wind Energy

Two wind farms are in operation in the Northern Part of Jordan. The first was installed in Al-Ibrahemya in 1987 with a capacity of 320 kW. The second wind farm was installed in Hofa with a capacity of 1,125 kW. In 2006, the total capacity of these two wind farms was 1,445 kW with output of 3 GWh per year, equivalent to 784 toe of primary energy mix). It is expected that 600 MW will be available in 2020, with a capacity of 1,577 GWh. This has a potential saving of 390,792 toe of primary energy.

7.1.4. Hydro Power

In hydro energy, the resources are very limited in Jordan. The King Talal Dam provides 25 GWh/year with a 10 MW capacity installation, and there is a small hydropower project in Aqaba Water Company, illustrating some of the present barriers to RE development. The building of the new pipe between the water field and Aqaba would be an opportunity to install 3 small hydro power stations (3 falls of 200 m each), with a total cost estimated at 0.8 M JD. The power line is close to the pipe (500m) and AWC discussed with EDCO (the electricity distribution company) the possibility of selling the produced electricity, as EDCO currently buys the power from NEPCO. Such a project could be possible in the future only provided the Electricity Regulation Commission approved it.

Very small power plants could be developed in the urban water supply systems, but only for very small capacities. The only strong potential seems to be in the canal Red Sea – Dead Sea (600 MW), and in pumping storage in Al-Wehda Dam (200 MW).

7.1.5. Geothermal Energy

Geothermal energy is available along the Dead Sea Rift at medium temperature (110-115°C). This temperature is not high enough for economical production of power. Therefore, it could be used only as heat, meaning locally (heat is hardly transportable).

Low level heat (30 to 65°C) is also available: 108 hot springs are discharging 25 M m³/year of hot water in the Dead Sea. This energy can only be used as heat. At a small scale, it is presently used for greenhouses (heating in winter) or for fishing farms (Arab Fish Company) in Zarqa Ma'in. More ambitious projects are identified to use heat in absorption systems for refrigeration, and desalinisation of water in Azraq. Higher temperature resources can be expected in the future (deeper wells) in Zerqa Zarqa Ma'in and Zara, that would permit producing power.

7.1.6. Summary of capacity and potential

The Table below summarises the contributions of all renewable resources in Jordan with projections in the year 2020.

Table 19: Contribution of Renewables to the Total Energy Mix

	2006				2020			
	Capacity, MW	Produced Energy, GW.hr	Produced Energy (TOE)	Saving in Primary Energy (TOE)	Capacity, MW	Produced Energy, GWh	Produced Energy, (TOE)	Savings in the primary Energy (TOE)
Solar Collectors	158	380	$\frac{17\% \text{ electricity } 5556}{83\% \text{ fuel } 27124}$	61218	1130	2712	39647	436871
Thermal Solar Concentrators	0	0	0	0	150	274	23543	67846
PV	0.5	1	78	226	10	18	314	905
Bio-Energy	305	26	2241	6459	150	1117	96053	276811
Wind Energy	1.445	3	272	784	600	1577	135605	390792
Total		410	35272	68687		5698	488730	1173224
Percentage of Renewable Energy in the Total Energy Mix.				0.94%				8.85%
Reduction in CO ₂ Emissions (ton)				206061				3519672

Source: NERC November 2007

8. ENERGY AND ENVIRONMENT

8.1. General Trends and Objectives

Jordan has a strong record on respect for environmental protection. The Government recognises that to ensure the sustainable development of its economy, Jordan must continue to develop its environmental regulatory structure and to strengthen its means for ensuring compliance with and enforcement of its environmental laws and regulations.

In 1991, Jordan was the first country in the Middle East to complete a national environmental strategy, which included a detailed assessment of the Jordanian environment and an environmental protection plan. Jordan followed up on the strategy with a five-year national economic and social development plan (1993-1997), which prioritised environmental issues and identified environmental challenges for the 1990s.

In 1995, the Government published a national environmental action plan that further defined environmental problems and identified specific actions to address these problems. An Environmental Protection Law No. 12, was enacted which consolidated national environmental protection authority under a new government entity called the General Corporation for Environmental Protection (GCEP), which reports to the Ministry of Municipal and Rural Affairs and the Environment. Pursuant to this environmental protection law, Jordan drafted environmental regulations.

In 2006, a new Environment Protection Law No. 52 from the year 2006 was enacted –which replaced the temporary law for 2003. Under the provision of this Law, the Ministry of Environment is the authority responsible for environmental protection. Jordan has promulgated major environmental regulations, addressing: noise pollution, management and transport of hazardous waste, marine resources and coastline protection, and control of ozone-depleting substances, soil protection, solid waste management, clean air regulations, national parks and reservations management, greenhouse emissions regulation, water protection regulation, hazardous waste management, pesticide pollution, vehicle emissions regulation, and environment impact assessments for agricultural products. The Ministry of Environment has also issued the necessary implementing instruction.

An Environment Strategy (2007-2010) was developed with the objective of promoting a high quality natural environment while protecting human health and ensuring the integration of environmental considerations into economic and sectoral policies. The operational programmes of the Environment Strategy were derived from the National Agenda; National Biodiversity Strategy and Action Plan; National Action Programme to Combat Desertification; POPs National Implementation Plan, and the National Capacity Self Assessment for Global Environmental Management. (NCSA) Action Plan, all of which were all published by the MoEnv. (see: www.moenv.gov.jo).

Jordan is a party to several multilateral environmental agreements.

Table 20: Multilateral Environmental Agreements of which Jordan is Party

Instrument	Entry into force
Constitution of the Food and Agriculture Organisation of the United Nations	1/23/1951
International Convention for the Prevention of Pollution of the Sea by Oil, 1954, as amended in 1962 and 1969	8/8/1963
International Plant Protection Convention	4/24/1970
Convention of the International Maritime Organisation	11/9/1973
Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter	8/30/1975
Convention Concerning the Protection of the World Cultural and Natural Heritage	12/17/1975
Convention on Wetlands of International Importance especially as Waterfowl Habitat	5/10/1977
Amendments to Annexes to the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter concerning Incineration at Sea	3/11/1979
Convention of International Trade in Endangered Species of Wild Fauna and Flora (CITES)	3/14/1979
Amendments to the Annexes to the Convention of the Prevention of Marine Pollution by Dumping of Wastes and Other Matter	3/11/1981
International Convention for the Safety of Life at Sea (SOLAS)	11/7/1985
Protocol to amend the Convention on Wetlands of International Importance especially as Waterfowl Habitat	10/1/1986
Amendment to the Convention on International Trade in Endangered Species of Wild Fauna and Flora (art. XI)	4/13/1987
Protocol on Substances that Deplete the Ozone Layer	8/30/1989
Convention for the Protection of the Ozone Layer	8/31/1989
Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal	5/5/1992
Convention on Biological Diversity	2/10/1994
Amendment to the Montreal Protocol on Substances that Deplete the Ozone Layer	2/10/1994
Framework Convention on Climate Change	3/21/1994
Amendment to the Montreal Protocol on Substances that Deplete the Ozone Layer	9/28/1995
United Nations Convention on the Law of the Sea	11/27/1995
Agreement relating to the Implementation of Part XI of the United Nations Convention on the Law of the Sea of 10 December 1982	7/28/1996
International Convention to Combat Desertification in those Countries Experiencing Serious Drought and/or Desertification, particularly in Africa	12/26/1996

Source: www.moenv.gov.jo

8.2. Environmental Policy Implementation

Access to Finance:

The Government is supporting the Agence Française de Développement's (AFD) Green Lending Programme in partnership with Jordanian banks, which will promote sustainable development patterns in Jordan, in partnership with interested Jordanian banks as well as the government and donors. This includes reducing the dependence of the Jordanian economy on fossil energy, limiting carbon emissions and preserving environmental quality of water, air and soil, inter alia by providing soft loans to actors in industry and commerce sectors to allow them to upgrade their systems of production or facilities in a manner that would contribute to energy efficiency.

Jordan Clean Production Programme:

Jordan Clean Production Programme is based on a network of entities, with recognised competence or expertise in the different environmental fields. When an industry meets difficulties for complying with the standards, the industry is provided with the list of entities part of the network and may contract them to perform a Gap Analysis Report: identification of measures to implement for complying with regulation. Based on the report, MEMR tries to find an agreement with the industry to elaborate a programme on 3 to 5 years.

Water Sector:

Most of the water systems are under the direct control of the Water Authority of Jordan (WAJ), which takes decisions regarding investments. WAJ does not use commercial banks for financing the investments. There were intents to introduce private companies in the water sector. For instance, in Great Amman, the French Company LEMA is contracted for the operation and management of the facilities. But LEMA is not in charge of realising the investments. A particular case is located in the Aqaba Special Economic Zone: Aqaba Water Company (AWC) is a public company, realising investments and potentially interested in loans with commercial banks, for instance for its new water treatment plant or for developing Energy Efficiency projects in the pumping stations. The model from AWC could be extended to the rest of the sector.

The Japan International Cooperation Agency (JICA) during April 2009 undertook an appraisal mission for a study on the Project Conservation through Water Network. The project will improve EE of water network management, its components include the replacement of pumps and provision of gate valves, water meters, pipes, etc. GTZ is also working in the water sector with support from the German Government, under the project titled Management of Water Resources in Jordan, which includes a component for improving EE and safeguarding the environment.

Clean Development Mechanism:

Jordan is a party to the United Nations Framework Convention on Climate Change, including the Kyoto Protocol. Non “Annex I” countries such as Jordan are eligible for funding from “Annex I” countries as part of the Clean Development Mechanism (CDM). Under the CDM, “Annex I” countries can implement projects in non “Annex I” countries that reduce emissions and use the resulting emission reductions to help meet their own targets.

The Ministry of Environment is the CDM designated authority and is responsible for qualifying projects to enjoy potential carbon credits. A RE or EE project has to be described under a completed form. On this basis, the CDM Designated National Authority will confirm eligibility for CDM accreditation, define the development steps needed to obtain funding (including the baseline study and quantification of emission reductions from the project), and then sell the carbon credits on behalf of the Jordanian Government. Sales of carbon credits associated with the project’s emission reductions can then be part of the Project’s revenue stream. To the date, only 2 projects have been submitted to UNFCCC, including the fuel switch from heavy oil to gas of the Aqaba power station (reduction evaluated at 1,400,000 t CO₂). The Jordan Cements Factories company has also appointed a consultant to elaborate an application form for the conversion of the Rashadya plant from oil to natural gas.

Jordan Upgrading and Modernisation Programme (JUMP):

The JUMP Programme, monitored by the Ministry of Industry, was created to be the continuation of the former EC Programme EJADA, a 45 M€ programme for the modernisation of industry in Jordan. When established, JUMP received funding from EU and the Government, the programme is currently under the scope of Jordan Enterprise (see: www.jedco.gov.jo), which is an independent government body, following the Ministry of Industry and Trade.

JUMP gives grants to industries for consultancy services, training (capacity building) and equipment in the case of Energy Efficiency. Conditions and eligibility are described in the section “Financing mechanisms”. Specific activity related to Energy Efficiency and Gas Conversion is described in section “Existing possibilities for institutional support and Technical Assistance”.

Business and Export Development Project for Jordanian Enterprises (TATWEER):

TATWEER is an economic development project funded by the United States Agency for International Development (USAID) and managed by the Jordanian not-for-profit organisation, the Business Development Center (BDC), successor to the \$ 27 million Jordan-U.S. Business Partnership (JUSBP, 1999-2005). Established in 2005, Tatweer sustains the momentum begun by JUSBP by providing financial assistance to increase the competitiveness of private businesses in Jordan, targeting small and medium-sized enterprises (SMEs). Committed to strengthening companies across Jordan, Tatweer focuses most of its work at the “firm level” to improve the business capabilities of client enterprises. This involves direct support for improvements in management, marketing, technology, production methods, quality assurance, exports, financial management, and human resources, among other priorities, to ensure sustainable growth of Jordanian enterprises. Tatweer works with companies in a broad range of sectors with growth potential, including IT and services, furniture, stone, food, manufacturing, olive products, garments, pharmaceuticals and jewelry to help boost their competitive position. Tatweer also cooperates with private business support organisations (BSOs) to advance the commercial interests of Jordan in strategic sectors. Assistance to these associations includes business development, training, member services, trade enhancement, and networking with global associations and industry groups. Tatweer supports BSOs to enhance their self-sustainability and to secure linkages with international markets. This helps to accomplish another objective of Tatweer: enabling Jordanian companies to access and successfully compete in international markets.

Industrial Scientific Research & Development Fund at the Higher Council for Science & Technology:

This fund, which is affiliated to the Higher Council for Science and Technology, was established in 1994, with the objective of increasing the competitiveness of Jordanian industries through the utilisation of science and technology. It may also undertake energy audits.

National Fund for Enterprises Support (NAFES):

National Fund for Enterprise Support is done with the support of Japanese through using the interest of a deposit at the Central Bank of Jordan. NAFES provides assistance in consulting services through registered consultants. NAFES was established in 2001 to assist in the modernisation of Jordanian Small and Medium enterprises (SMEs) by providing financial

support to management development projects aimed at enhancing efficiency and competitiveness. The initial capital of NAFES is obtained from a counterpart fund on non-project cash grant donated by the government of Japan. This fund is one of the important outcomes of the Jordan-Japan Industrial Development Programme, the implementation of which was followed up by the General Secretariat of the Higher Council for Science and technology during the period 1998-2002.

8.3. Environmental Levies and Taxes

All RE & EE equipments are exempted from sales tax and custom duties. A technical committee is formed to oversee the implementation of the cabinet decision regarding this issue.

The government has formed the DNA for Clean Development Mechanism to approve and agree on the sustainability of proposed CDM projects submitted by developers via the technical CDM committee. Currently, Jordan has some registered projects such as fuel switching for Aqaba Power Plant, Biogas power plant.

The Ministry of Environment has recently established the Environment Fund. The financial resources come from penalties, donors, CDM Revenues (15%) and local contribution.

9. ASSESSMENT AND FUTURE PLANS

9.1. Improvements

On 9 November 2009, NERC and the Energy Charter Secretariat, with the generous assistance of the Netherlands Government, hosted a regional workshop on *Energy Efficiency: A Strategic Agenda for Government and Industry*. The workshop considered the current situation in Jordan and concluded with a Roundtable of experts from government, business and international organisations to identify practical steps that would promote energy efficiency in Jordan and the region. The workshop identified a series of priority and other actions for this purpose.

9.2. Priority Actions

The participants call on government, industry and the international community to support rapid and effective action in these priority areas:

Strengthened Institutions – Participants recognised the many useful energy efficiency activities already being undertaken by many government ministries and agencies. But they also called for a more structured and transparent statement of roles and responsibilities, as well as sufficient resources to achieve needed tasks. Major steps include:

- Facilitating access to information that outlines relevant ministries and agencies and their different responsibilities and activities, along with a listing of current and available international financial assistance sources together with their requirements. This could be achieved through a yearly published document and/or website, that could also set out the roles of non-government players, including universities and business.
- Clear sectoral strategies (e.g., residential, industrial, commercial, transport) identifying energy efficiency targets and responsibilities and a clear action plan to follow up on the required steps.
- Government commitment to continued and adequate funding to achieve required outcomes, allowing stable planning over the medium and long-term, together with ongoing information dissemination as part of a strategy to raise awareness of energy efficiency.
- Regular inter-ministerial discussions to coordinate activities and facilitate cooperation
- Strengthening the capacity and expanding the mandate of NERC to ensure it can act as a Champion for energy efficiency and contribute to raising efficiency across the economy.

Renewable Energy and Energy Efficiency Law – Participants recognised the importance of a sustainable energy law in Jordan. While a recent energy law did not pass in Parliament, participants called for the renewable energy and energy efficiency elements of this law to be reconsidered as a legislative priority to provide a strong basis for action. This could be achieved while discussion of other, more difficult energy policy issues continues.

Government-business dialogue – Given the central role of business in making energy efficiency investments, it is important that there be a formalised cooperative mechanism for government and industry to share experiences and develop joint objectives. A joint

government-business forum held regularly (say, every 6 months) would help to ensure policies are well-targeted and business progress is regularly monitored.

Link pricing reform to EE – Participants noted that removal of energy price subsidies was an important step in promoting energy efficiency. It was noted that strong action on energy efficiency can also offset any social challenges from the removal of subsidies, by reducing required volumes while prices rise, so costs do not rise so much. However, it was also noted that prices alone are not enough to address all the barriers to energy efficiency, so further direct incentives (carrots, sticks or tambourines) were needed.

Large-scale building project – while there were many examples of successful sustainable building projects throughout the region, these were generally at too small a scale to have a noticeable impact. Therefore, participants called for a project that would cover an entire development or larger scale and would include residential and commercial buildings, trial application of advanced building standards, innovative financing and capacity building for tradesmen and professionals. The project, which could take place in Jordan or elsewhere in the region, could be financed from international assistance and with multinational cooperation. It would demonstrate how different technical and policy elements could be combined to ensure wide application of sustainable building practices.

“Smart” financing – While financing of energy efficiency projects was seen as an important issue, participants indicated it was not just the availability of financing that was the problem. Rather, it was ensuring that banks and other financial institutions had the capacity to understand and meet the needs of energy efficiency projects. It was therefore important to build the understanding and capacity of the financing industry with targeted assistance.

Regional Standards and Labelling Programme for Appliances – Participants discussed the need for an effective standards and labelling programme for appliances as a key element of effective action in the residential and commercial sectors. While Jordan’s development of labelling was important, there was also recognition that a region-wide programme, linked with developments in the EU, was desirable. Therefore, participants called for a regional initiative to move toward harmonised labelling and standards; this initiative could be supported through use of national GEF funds coordinated with the UNDP.

Enhanced enforcement – While Jordan has developed good building codes and appliance labelling programme, these efforts are undermined by limited enforcement. Additional resources for compliance are needed which may require cooperation with municipalities and customs agencies. Consistent, high-level messages emphasising the importance of these measures are also required. There are also possibilities for regional cooperation to enhance compliance and enforcement.

9.3. Other actions

The following activities were also identified as important areas for action, but did not receive such general support as priorities:

Business/University Cooperation – An increasing focus on energy efficiency requires development of new skills and technologies. Businesses and relevant parts of universities could engage in regular discussions to ensure the necessary education and R&D is forthcoming.

Better statistics on EE – National statistics currently have many details on production of energy, but relatively little on use patterns and energy efficiency and energy intensity. National statistical offices could work with NERC and other experts to determine the most useful data on energy efficiency for policy makers (e.g., list energy conservation as a source of energy) and develop statistics on these. These could be done as a regional or even global project.

Energy regulation – As energy markets are opened up to more competition, it is important that market regulations are designed to provide appropriate incentives (or at the very least no barriers) to the use of demand side management (DSM). Infrastructure regulation, for example, should encourage conservation rather than maximising the volume of sales.

Link international assistance to achieving EE objectives – Participants noted that renewable energy was also an important area for development. However, investment in renewable energy production will be unnecessarily expensive when end users have not been first made as efficient as practical. Therefore, assistance on the supply side should focus carefully on ensuring efficiency on the demand side is fully exploited to avoid unnecessary investment.

Broad regional cooperation on energy efficiency – it was noted that many countries in the region face similar challenges and constraints. Therefore, a forum to engage in a more regular regional discussion of energy efficiency policies, technologies, and progress could be valuable. This could be the forum to manage more specific projects, such as the regional standards and labelling programme, or the large-scale building project mentioned above, could be managed.

Energy auditing – Participants expressed a view that most businesses are not aware of their energy use patterns or potential to save money and energy. While requirements for energy managers within larger firms was discussed, it was also recognised that information alone was not enough; it is also important that financial information related to energy use is brought to the attention of company decision makers, along with readily available options to improve efficiency.

9.4. Conclusions

Governments and businesses in Jordan have taken important steps to promote energy efficiency. However, concerns about energy security, economic competitiveness and environment all mean further action is required. Further action, such as, those identified above are needed in order to deliver the full energy efficiency potential in Jordan.

10.CONSULTED SOURCES

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- 3) www.memr.gov.jo.
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**Energy Charter Protocol on Energy Efficiency and
Related Environmental Aspects PEEREA**

**THE HASHEMITE KINGDOM OF
JORDAN**

REGULAR REVIEW 2010

Part II(a):

**Indicators on Energy, Energy Efficiency,
Economy and Environment**

Based on national data

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a. Introduction

This document is Part II of the Review Format of the Energy Charter Protocol on Energy Efficiency and Related Environmental Aspects (PEEREA). Part I covers qualitative data on energy and energy efficiency policies, measures and instruments, and actors. This part focuses on quantitative data.

The tables include data relevant to the use of energy. Furthermore information is asked on end-use energy prices and CO₂ emissions. Please complete all these tables as much as possible.

Conversion of units:

Units are converted to Mtoe using the general conversion factors for energy.

$$1 \text{ Mtoe} = 11.63 \text{ TWh}$$

$$1 \text{ Mtoe} = 4.1868 \times 10^4 \text{ TJ};$$

$$1 \text{ Mtoe} = 10^7 \text{ Gcal}$$

b. Macro-Economic Data

Table b.1. Gross Domestic Product

(billion US\$2000)

	1990	1995	2000	2001	2002	2003	2004	2005	2006	2007
GDP	3.889	6.640	8.449	8.963	9.569	10.181	11.395	12.611	14.818	16.509
GDP (PPP)										

Source: GDP: DOS, Gross Domestic Product and Expenditures at Current Market Prices

Table b.2. Number of Inhabitants

(million)

	1990	1995	2000	2001	2002	2003	2004	2005	2006	2007
Population	3.17	4.195	4.857	4.978	5.098	5.23	5.35	5.473	5.6	5.723

Source: DOS-Jordan

c. General Energy Data

Table c.1. General Energy Data

(Mtoe)

Indicators	1990	1995	2000	2001	2002	2003	2004	2005	2006	2007
Local Primary Energy Production	0.132	0.218	0.215	0.208	0.19	0.214	0.218	0.18	0.187	0.166
Oil & Oil Derivatives Imports	3.471	4.08	4.761	4.842	5.094	5.096	5.202	5.678	5.015	4.869
Total Primary Energy Supply (TPES)	3.259	4.293	5.114	5.15	5.299	5.774	6.489	7.028	7.187	7.438
Total Final Consumption (TFC)	2.31	2.9	3.688	3.692	3.811	4.04	4.526	4.802	4.889	5.027
TPES/GDP (toe/thous.US\$)	0.84	0.65	0.61	0.57	0.55	0.57	0.57	0.56	0.49	0.45
TFC/GDP (toe/ thous.US\$)	0.59	0.44	0.44	0.41	0.40	0.40	0.40	0.38	0.33	0.30
TPES/population (toe/capita)	1.03	1.02	1.05	1.03	1.04	1.10	1.21	1.28	1.28	1.30
TFC/population (toe/capita)	0.73	0.69	0.76	0.74	0.75	0.77	0.85	0.88	0.87	0.88
Total Electricity Consumption	0.29	0.44	0.57	0.59	0.64	0.67	0.74	0.82	0.91	0.96
Electricity produced from RES	-	-	-	-	-	-	0.082	0.083	0.11	0.118
Heat produced from RES	-	-	-	-	-	-	-	-	0.064	0.07

Source: MEMR, NEPCO – Websites

d. Sector Consumption: Parameters and Energy Efficiency Indicators

Table d.1. Total Final Energy Consumption (TFC), by End-Use Sector

Sectors	1995	2000	2001	2002	2003	2004	2005	2006	2007
Total (TFC)	0.44	0.57	0.59	0.64	0.67	0.74	0.82	0.91	0.96

(Mtoe)

Source: Jordan national statistics

Table d.2. Transport Indicators, 2007

Indicators transport sector	Freight	Travel	Total
Total Final Consumption (ktoe), incl.			1695.26
- road			1687.53
- rail			
- aviation			1.1
10 ⁹ Tonne-km		-	
TFC/10 ⁶ tonne-km		-	
10 ⁹ Person-km	-		
TFC/person-km (TFC/10 ⁶ person-km)	-		
Number of cars/1000 inhabitants			147

Source: Jordan national statistics

e. End-Use Energy Prices for Various Market Sectors

Table e.1. Energy Prices for End-Use Sectors (Latest Available)

Sectors	(USD per Unit)						
	Unleaded gasoline 95 RON (litre)	Unleaded gasoline 90 RON (litre)	Diesel (litre)	Heavy fuel oil (tonne)	Nat. Gas (10 ⁷ kcal GCV*)	Steam Coal (tonne)	Electricity (KWh)
Industry	0.93	0.77	0.683	521			0.079
Households (Incl. ...% VAT)	0.93	0.77	0.683				0.106
Electricity generation	-						-

* Gross Calorific value

Source: Jordan national statistics

f. CO₂ Emissions

Table f.1. CO₂ Emissions from Fuel Combustion

Indicators	1995	2000	2001	2002	2003	2004	2005	2006	2007
Total CO ₂ emissions (Mtonnes/year)	12.13	14.29	14.16	15.03	14.84	16.7	17.9	18.3	19.17
Share electricity and heat production (%)	35%	34%	35%	37%	34%	34%	33%	36%	38%
Share residential sector (%)	10%	13%	12%	12%	13%	12%	12%	11%	9%
Share industrial sector (%)	14%	15%	14%	14%	14%	15%	16%	16%	15%
Share transport sector (%)	24%	25%	26%	25%	25%	26%	27%	26%	26%
Share other sectors (%)	16%	14%	13%	13%	14%	12%	12%	12%	11%
Total CO ₂ /GDP (kg/USD 2000)	1.68	1.69	1.59	1.6	1.51	1.57	1.57	1.51	1.49
Total CO ₂ /capita (tonnes/inhabitant)	2.89	2.98	2.88	2.98	2.87	3.16	3.31	3.3	3.35
Total CO ₂ / TFC (tonnes/toe)	4.18	4.08	4.07	4.20	3.97	3.97	3.91	3.97	4.02

Source: IEA Energy Statistics 2009, Electronic version

**Energy Charter Protocol on Energy Efficiency and
Related Environmental Aspects PEEREA**

**THE HASHEMITE KINGDOM OF
JORDAN**

REGULAR REVIEW 2010

Part II(b):

**Indicators on Energy, Energy Efficiency,
Economy and Environment**

Based on IEA data

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a. Introduction

This Part II of the Regular Review of the Energy Efficiency Policies of Bosnia and Herzegovina under PEEREA is based on latest available IEA Energy Statistics.

Conversion of units:

Units are converted to Mtoe using the general conversion factors for energy.

$$1 \text{ Mtoe} = 11.63 \text{ TWh}$$

$$1 \text{ Mtoe} = 4.1868 \times 10^4 \text{ TJ};$$

$$1 \text{ Mtoe} = 10^7 \text{ Gcal}$$

b. Macro-Economic Data

Table b.1. Gross Domestic Product

(billion US\$2000)

	1990	1995	2000	2001	2002	2003	2004	2005	2006	2007
GDP	5.129	7.228	8.464	8.91	9.425	9.819	10.66	11.414	12.133	12.856
GDP (PPP)	12.209	17.207	20.148	21.21	22.437	23.375	25.375	27.17	28.882	30.605

Source: IEA Energy Statistics 2009, Electronic version

Table b.2. Number of Inhabitants

(millions)

	1990	1995	2000	2001	2002	2003	2004	2005	2006	2007
Population	3.17	4.195	4.798	4.918	5.038	5.164	5.29	5.412	5.538	5.719

Source: IEA Energy Statistics 2009, Electronic version

c. General Energy Data

Table c.1. General Energy Data

(Mtoe)

Indicators	1990	1995	2000	2001	2002	2003	2004	2005	2006	2007
Total Primary Energy Production	0.162	0.28	0.286	0.281	0.263	0.287	0.294	0.256	0.29	0.277
Net imports	3.51	4.138	4.839	4.941	5.199	5.191	6.284	6.989	6.909	7.328
Total Primary Energy Supply (TPES)	3.259	4.293	4.929	4.882	5.126	5.165	6.209	6.666	6.845	7.201
Total Final Consumption (TFC)	2.31	2.90	3.50	3.48	3.58	3.74	4.21	4.58	4.62	4.77
TPES/GDP (toe/thous.US\$)	0.64	0.59	0.58	0.55	0.54	0.53	0.58	0.58	0.56	0.56
TFC/GDP (toe/ thous.US\$)	0.45	0.40	0.41	0.39	0.38	0.38	0.39	0.40	0.38	0.37
TPES/population (toe/capita)	1.03	1.02	1.03	0.99	1.02	1.00	1.17	1.23	1.24	1.26
TFC/population (toe/capita)	0.73	0.69	0.73	0.71	0.71	0.72	0.80	0.85	0.83	0.83
Total Electricity Consumption	0.29	0.44	0.57	0.59	0.64	0.67	0.74	0.82	0.91	0.96
Electricity produced from RES	-	-	-	-	-	-	-	-	-	-
Heat produced from RES	-	-	-	-	-	-	-	-	-	-

Source: IEA Energy Statistics 2009, Electronic version

d. Sector Consumption: Parameters and Energy Efficiency Indicators

Table d.1. Total Final Energy Consumption (TFC), by End-Use Sector

Sectors	1995	2000	2001	2002	2003	2004	2005	2006	2007
Residential	624.03	884.12	850.86	890.39	965.69	1026.73	1080.39	1086.32	1074.18
Industry	679.17	842.69	816.07	833.23	861.44	1018.86	1145.95	1171.76	1182.37
Services	96.18	284.70	285.81	298.23	319.90	357.56	379.53	406.84	412.46
Transport	993.58	1191.48	1229.92	1250.58	1272.15	1456.45	1602.89	1576.84	1695.26
Agriculture	76.11	85.14	84.37	89.87	94.94	108.45	111.63	120.06	136.91
Other*	435.69	214.17	213.87	216.84	226.30	240.61	256.86	253.48	272.44
Total (TFC)	2904.75	3502.30	3480.89	3579.14	3740.41	4208.65	4577.25	4615.30	4773.63

* Other include Non-specified other sectors

Source: IEA Energy Statistics 2008, Electronic version

**Table d.2. Energy Efficiency Indicators for Households:
Final Consumption of the Residential Sector, by Energy Source**

Indicators residential sector	1995	2000	2001	2002	2003	2004	2005	2006	2007
Total Final Consumption	624.03	884.12	850.86	890.39	965.69	1026.73	1080.39	1086.32	1074.18
a. Electricity	122.29	170.37	181.46	215.00	230.31	252.84	273.91	313.99	345.46
b. Heat	0	0	0	0	0	0	0	0	0
c. Oil products	447.86	649.42	605.02	610.96	670.88	708.32	740.86	679.63	632.94
d. Gas	0	0	0	0	0	0	0	0	0
e. Coal	0	0	0	0	0	0	0	0	0
f. Combust. Renew. & Waste	1.86	2.34	2.39	2.44	2.51	2.58	2.63	2.70	2.79
g. Others*	52.01	61.99	61.99	61.99	61.99	63.00	63.00	90.00	92.99
Floor Area ('000 m ²)	87,80	93,80	99,80	105,80	112,05	118,75	123,96	87,80	93,80
No. of dwellings ('000)	1090.89	1128.73	1166.56	1204.39	1242.23	1279.95	1310.09	1090.89	1128.73
Residential use per dwelling (toe/dwelling)	0.779	0.788	0.827	0.852	0.874	0.849	0.819	0.779	0.788
Residential use per surface (toe/m ²)	0.0097	0.0095	0.0096	0.0097	0.0096	0.0091	0.0866	0.0097	0.0095

* Other include Solar/Wind/Other

Source: TFC – IEA energy Statistics 2009, Electronic version; Floor area and No of dwellings – Jordan national statistics

Table d.3. Final Consumption of the Industry Sector in 2007, by Energy Source

Indicators industrial sector	Mining	Manufacturing							Construction	Total
		Iron and steel	Chem. and petrochemical	Non-ferrous metals	Non-metallic minerals	Food and tobacco	Paper pulp and print	Other		
Coal	0	0	0	0	0	0	0	0	0	0
Petroleum products	0	0	0	0	0	0	0	940.36	0	0
Gas	0	0	0	0	0	0	0	0	0	0
Electricity	11.44	1.03	10.84	0	37.93	0	0	180.77	0	11.44
Heat	0	0	0	0	0	0	0	0	0	0
Combust. Renew & Waste	0	0	0	0	0	0	0	0	0	0
Total	11.44	1.03	10.84	0	37.93	0	0	1121.13	0	11.44
Value added per sector (2000 USDx10 ⁶)	-	-	-	-	-	-	-	-	-	-
Energy/value added (Mtoe/ 10 ⁶ USD)	-	-	-	-	-	-	-	-	-	-

Source: IEA Energy Statistics 2009, Electronic version

Table d.4. Energy Efficiency Indicators for Services (Commercial and Non-Commercial): Final Energy Consumption of Services, by Energy Source

Indicators services sector	1995	2000	2001	2002	2003	2004	2005	2006	2007
Total Final Consumption	96.18	284.70	285.81	298.23	319.90	357.56	379.53	406.84	412.46
a. Electricity	68.28	102.17	109.82	120.83	126.16	138.46	152.22	173.46	196.42
b. Heat	0	0	0	0	0	0	0	0	0
c. Oil products	27.90	179.53	172.98	174.39	190.72	215.09	223.30	228.38	209.04
d. Gas	0	0	0	0	0	0	0	0	0
e. Coal	0	0	0	0	0	0	0	0	0
f. Combust. Renew. & Waste	0	0	0	0	0	0	0	0	0
g. Other*	0.00	3.01	3.01	3.01	3.01	4.01	4.01	4.99	7.00
No. of employees (mil.)						1.250275	1.288056		1.464064
Floor area ('000 m ²)						-			
Value added (10 ⁶ USD)						-	-	-	-
Energy/value added (Mtoe/10 ⁶ USD)						-	-	-	-
toe/Employee						0.3	0.29		0.28
toe/m ²	-	-	-	-	-	-	-	-	-

* Other include Solar/Wind/Other

Source: IEA Energy Statistics 2009, Electronic version; Nr of employees – Jordan national statistics

Table d.5. Transport Indicators, 2007

Indicators transport sector	Freight	Travel	Total
Total Final Consumption (ktoe), incl.			1695.26
- road			1687.53
- rail			
- aviation			
10 ⁹ Tonne-km		-	
TFC/10 ⁶ tonne-km		-	
10 ⁹ Person-km	-		
TFC/person-km (TFC/10 ⁶ person-km)	-		
Number of cars/1000 inhabitants			

Source: IEA Energy Statistics 2009, Electronic version

e. End-Use Energy Prices for Various Market Sectors

Table e.1. Energy Prices for End-use Sectors (Latest Available)

Sectors	(USD per Unit)						
	Unleaded gasoline 95 RON (litre)	Light fuel oil ('000 litres)	Diesel (litre)	Heavy fuel oil (tonne)	Nat. Gas (10 ⁷ kcal GCV*)	Steam Coal (tonne)	Electricity (KWh)
Industry							
Households (Incl. ...% VAT)							
Electricity generation	-						-

* Gross Calorific value

Source: IEA Energy Statistics 2009, Electronic version

f. CO₂ Emissions

Table f.1. CO₂ Emissions from Fuel Combustion

Indicators	1995	2000	2001	2002	2003	2004	2005	2006	2007
Total CO ₂ emissions (Mtonnes/year)	12.13	14.29	14.16	15.03	14.84	16.7	17.9	18.3	19.17
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Source: IEA Energy Statistics 2009, Electronic version