



# Energy-policy Framework Conditions for Electricity Markets and Renewable Energies

## 23 Country Analyses Chapter Jordan

Eschborn, September 2007

**gtz**

commissioned by:



Federal Ministry  
for Economic Cooperation  
and Development



**Energy-policy Framework Conditions for  
Electricity Markets and Renewable Energies**

**23 Country Analyses  
Chapter Jordan**

**Eschborn, September 2007**

**Published by:**

Deutsche Gesellschaft für  
Technische Zusammenarbeit (GTZ) GmbH  
Division Environment and Infrastructure  
PO Box 5180  
65726 Eschborn  
Germany  
Internet: <http://www.gtz.de>

**Edited by:**

Angelika Wasielke  
Tel. +49 (0)6196 79-1224  
Fax +49 (0)6196 7980-1224  
E-mail: [angelika.wasielke@gtz.de](mailto:angelika.wasielke@gtz.de)

**Authors:**

Projekt-Consult GmbH  
Dipl.-Ing. Detlef Loy

**Design:**

Open Ffm.  
[www.open-agentur.de](http://www.open-agentur.de)  
Verena Siebert

## New Edition of the TERNA Country Survey

Since the first edition of the TERNA country survey appeared in 1999, there has been a distinct heightening of public and political awareness of the consequences of climate change and of energy provision as a key factor in sustainable development. In Germany and other industrialised countries, a political tailwind, effective promotion mechanisms and rising energy prices have created the conditions for a dynamic market in which renewable forms of energy are exhibiting high growth rates within the energy mix. In 2006, global new investment in renewables amounted to US\$ 70.9 billion – an increase of 43 % over 2005.

Strong economic development in many emerging countries has triggered rapidly rising demand for energy and competition on the international oil market. Against the background of the rising cost of fossil fuels, supply risks and damage to the environment, the significance of renewable energy as a means of generating electricity is growing – also in developing and emerging countries: according to analyses conducted by the Renewable Energy Policy Network for the 21<sup>st</sup> Century (REN21), 39 countries have set expansion targets for renewable energy sources and introduced promotion mechanisms, nine of which are developing or emerging countries. Of total new investment in renewable energy around the world, US\$ 15 billion was invested in developing and emerging countries. Nevertheless, the majority of countries still have a long road ahead of them before they overcome existing barriers to the successful introduction of renewable forms of energy.

The German and European market acts as the driving force for the wind energy industry and provides an indispensable background of experience. However, growth in the industry is also increasingly apparent in developing and emerging countries. It is the successes in countries such as India, China and Brazil which encourage commitment beyond the borders of industrialised nations. In those three countries there is a growing proportion of local content in the systems and equipment they produce – and not only for supply to their own domestic markets.

A number of other countries though, too, are erecting their first wind farms, thereby establishing the basis for gaining experience to be utilised in future markets.

To help interested players gain access to the new markets, this survey provides detailed descriptions of the framework conditions for electricity markets and renewable energy in 23 developing and emerging countries.

Latin America	Africa/Middle East	Asia
Argentina	Egypt	Bangladesh
Brazil	Ethiopia	China
Caribbean States	Jordan	India
Chile	Morocco	Indonesia
Colombia	Namibia	Pakistan
Costa Rica	South Africa	Philippines
Dominican Republic	Tunisia	Viet Nam
Mexico		
Nicaragua		

This latest country survey and the previous editions are available on our homepage: [www.gtz.de/wind](http://www.gtz.de/wind). For the first time, the publication is also available on CD-ROM. For information on how to obtain this, again, go to the homepage.

Our grateful thanks go to a large number of GTZ staff members and other experts in the field for their help in putting this information together.

Eschborn, September 2007

## Legal Information

1. The data used in this study is based on both publicly accessible sources of information (publications, specialist articles, internet sites, conference papers etc.) and non-public papers (for example internal expert reports from promoting institutions), as well as personal interviews with experts (for example officials at energy ministries in the investigated countries and project staff at promoting institutions). Although all information has been checked as far as possible, errors cannot be ruled out. Neither the GTZ nor the authors can therefore provide any guarantee of the accuracy of the data included in this study; no liability can be accepted for any loss or damage resulting from use of the data included in the study.
2. The sole authorised user of this study for all forms of use is the GTZ. Duplication or reproduction of all or part of the study (including transfer to data storage media) and distribution for non-commercial purposes is permitted, provided the GTZ and the TERNA Wind Energy Programme are named as the source. Other uses, including duplication, reproduction or distribution of all or part of the study for commercial purposes, require the prior written consent of the GTZ.

## The TERNA Wind Energy Programme

There is great potential for generating electricity from renewable energy sources in many developing and emerging countries. Obstacles to the exploitation of such sources include a lack of knowledge of framework conditions in the energy industry and insufficient transparency with regard to the prior experience and interests of national actors.

The purpose of the TERNA (Technical Expertise for Renewable Energy Application) wind energy programme, implemented by GTZ on behalf of the Federal German Ministry for Economic Cooperation and Development (BMZ), is to assist partners in developing and emerging countries in planning and developing wind power projects. Since 1988 the TERNA programme has pursued the twin goals of laying the foundations for sound investment decisions while at the same time enabling partners to assess wind energy potentials, plan wind energy projects and improve energy-policy frameworks for renewable forms of energy.

The TERNA wind energy programme's partners are institutions in developing and emerging countries that are interested in commercial exploitation of wind power. These include, for example, ministries or government institutions which have the mandate to develop BOT/BOO projects, state-owned or private energy supply companies (utilities) and private enterprises (independent power producers).

TERNA offers its partners expertise and experience. In order to initiate wind power projects, favourable sites must be identified and their wind energy potential ascertained. To do this, wind measurements are normally taken over a period of at least twelve months and wind reports are drawn up. If promising wind speeds are found, the next step is to conduct project studies investigating the technical design and economic feasibility. TERNA also provides advice to partners on matters of finance, thus closing the gap between potential investors and offers of funding from national and international donors.

If required, CDM baseline studies can be prepared and advice can be offered to potential operators on setting up an efficient operator structure. In order to ensure as much transfer of know-how as possible, efforts are made to ensure cooperation between international and local experts, for example when preparing the studies.

In successful cases, TERNA initiates investment-ready wind farm projects by this method. TERNA itself is not involved in financing. In addition to the activities that are tied to specific locations, TERNA advises its partners on how to establish suitable framework conditions for the promotion of renewable energy sources.

Up until 2007, TERNA has been active in over ten countries around the world.

Further information on GTZ's TERNA wind energy programme, the application procedure etc. is available at [www.gtz.de/wind](http://www.gtz.de/wind) or directly from:

Deutsche Gesellschaft für Technische  
Zusammenarbeit (GTZ) GmbH  
Postfach 5180  
65726 Eschborn  
Germany

Dr. Rolf Posorski  
Tel. +49 (0)6196 79-4205  
Fax +49 (0)6196 7980-4205  
E-Mail: [rolf.posorski@gtz.de](mailto:rolf.posorski@gtz.de)

Angelika Wasielke  
Tel. +49 (0)6196 79-1224  
Fax +49 (0)6196 7980-1224  
E-Mail: [angelika.wasielke@gtz.de](mailto:angelika.wasielke@gtz.de)

Tim-Patrick Meyer  
Tel. +49 (0)6196 79-1374  
Fax +49 (0)6196 7980-1374  
E-Mail: [tim-patrick.meyer@gtz.de](mailto:tim-patrick.meyer@gtz.de)



## 12 Jordan

### 12.1 Electricity Market

#### Installed capacity

In 2005 the Jordanian interconnected power grid was supplied by an installed power station capacity of 1,873 MW. Compared with the previous year (1,643 MW), this was a capacity increase of 14%. The total power station capacity available nationwide, including the agreed import capacities, amounted to 2,019 MW in the same year (Tab. 1).

In addition to the power stations operated by the two state-dominated power producers, there are also a number of industrial enterprises that generate electricity in their own plants. Some of these also feed excess electricity into the Jordanian interconnected grid. Apart from these power sources, additional capacity can be called up when required from the Egyptian and Syrian grids. The four largest power stations are the station in Aqaba (656-MW steam power plant), the Hussein power station in Zarqa (396-MW steam power plant), the plant in Rehab (353-MW diesel-fired gas turbine) and a new combined-cycle power plant in Al-Risha.

	2001	2002	2003	2004	2005
<b>MW</b>					
Steam power plants	1,013	1,013	1,013	1,013	1,013
Diesel generators	43	43	43	43	43
Gas turbine (diesel)	353	353	353	353	353
Gas turbine (natural gas)	120	120	120	120	150
CCPS*					300
Hydropower	10	12	12	12	12
Wind	1.4	1.4	1.4	1.4	1.4
Biogas	1	1	1	1	1
Installed capacity (total)	1,541	1,643	1,643	1,643	1,873
Available capacity, incl. imports	n.a.	1,788	1,788	1,789	2,019

\* CCPS = combined-cycle power station

**Tab. 1: Installed power plant capacity and available capacity (incl. imports) in Jordan; 2001-2005; MW<sup>1</sup>**

#### Power generation

Of the roughly 9,650 GWh of electricity generated in Jordan in 2005<sup>2</sup>, 82.5% came from steam power plants. 6.7% was generated in gas-turbine power stations fired with natural gas and a further 3.5% came from diesel-fired power stations and diesel generators. Just under 6% was generated at what is to date the country's only combined-cycle power plant located in Al-Risha.

Renewable energy sources account for only a minimal share of the electricity generated. In 2005, just 0.6% (57 GWh) of the electricity generated was sourced from hydropower. Biogas (5 GWh) and wind power (3 GWh) each accounted for less than 0.1%. The amount of electricity generated throughout the country by diesel generators (73 GWh or 0.7%) exceeds that generated from hydro, wind and biogas together (65 GWh).

	2001	2002	2003	2004	2005
<b>GWh</b>					
<b>Electricity sector</b>	<b>7,144</b>	<b>7,630</b>	<b>7,489</b>	<b>8,471</b>	<b>9,138</b>
Steam power plants	6,240	6,771	6,430	7,168	7,524
Diesel generators	1	3	1	1	2
Gas turbines (diesel)	83	115	262	464	341
Gas turbines (natural gas)	769	680	746	776	648
CCPS					558
Hydropower	43	53	41	53	57
Wind	3	3	3	3	3
Biogas	5	5	6	6	5
<b>Industrial sector<sup>3</sup></b>	<b>405</b>	<b>502</b>	<b>505</b>	<b>496</b>	<b>516</b>
Steam power plants	364	434	428	422	445
Diesel generators	41	68	77	74	71
<b>Total</b>	<b>7,549</b>	<b>8,132</b>	<b>7,994</b>	<b>8,967</b>	<b>9,654</b>

**Tab. 2: Electricity generation in Jordan according to type of generation; 2000-2005; GWh<sup>4</sup>**

1 Source: NEPCo.

2 Power generated for the interconnected grid by the power stations of the national power producer plus that generated by self-generators for their own needs plus the excess electricity of self-generators fed into the grid.

3 This covers both power producers from industry who feed electricity into the interconnected grid and pure self-generators.

4 Source: NEPCo.

Since the amount of electricity generated in Jordan has for some years been insufficient to cover the country's needs, additional power is imported from Egypt and Syria. In 2005, 982 GWh was bought in, which was a good 9% of the electricity available in Jordan overall.

Inside the country itself, electricity is generated by the two state-owned power producers, CEGCo and SEPGCo, by industrial self-generators and industrial enterprises. The amounts of electricity imported and generated in Jordan by the various market actors between 2001 and 2005 are listed in the table below.

	2001	2002	2003	2004	2005
<b>GWh</b>					
Interconnected system - total	7,616	8,150	8,651	9,483	10,314
CEGCo	7,132	7,615	7,468	8,449	9,086
SEPGCo					30
Potash Co.	115	95	96	96	101
Cement Factory	25	10	10	10	6
Indo-Jordan Chemicals Co.	65	93	84	80	87
King Talal Dam	7	10	15	16	17
Jordan Biogas Company	5	5	6	6	5
Electricity imported from Egypt	267	322	972	788	741
Electricity imported from Syria				38	241
Other industrial enterprises - total	200	304	315	310	322
Refinery	87	93	92	83	91
Fertilizer Co.	97	153	156	163	166
Hussein Iron Factory	16	15	16	16	15
United Iron & Steel Manufacturing Co.		43	51	48	50
<b>Total</b>	<b>7,816</b>	<b>8,454</b>	<b>8,966</b>	<b>9,793</b>	<b>10,636</b>
<b>Growth rate</b>	<b>5.3%</b>	<b>8.2%</b>	<b>6.1%</b>	<b>9.2%</b>	<b>8.6%</b>

**Tab. 3: Electricity generated and imported in Jordan; 2001-2005; GWh<sup>5</sup>**

### Fuel supply

Jordan has not been able to open up any notable oil reserves of its own. Up to the beginning of the third Gulf War (2003), the country purchased fuel oil from Iraq on very favourable terms.<sup>6</sup> Once these preferential terms were no longer available, Jordan was forced to import oil at world market prices. Since 2003, Kuwait and Saudi Arabia have been the main suppliers to Jordan. Since refinery products are still being supplied to the end consumers at subsidised prices, Jordan's national budget is subject to a very heavy burden.<sup>7</sup>

Jordan's only occurrence of natural gas is to be found in Al-Risha in the northeast of the country on the border with Iraq. The gas extracted there (currently approx. 700,000 m<sup>3</sup> per day) is primarily used to fire the neighbouring combined-cycle power station, which went into service in 2005. Since 2003, Egypt has been supplying Jordan with additional natural gas via a pipeline that runs through the Gulf of Aqaba. In the meantime, a large number of the country's power stations previously fired with heavy fuel oil have been converted to natural gas. This is without doubt the main reason why Jordan's consumption of natural gas has risen to around 1.5 billion cubic metres per annum in the period from 2003 to 2005.

The shares taken in 2005 by the three fossil fuels used for electricity generation were as follows: natural gas 58%, heavy fuel oil 32% and diesel 10%. The table below presents the share of Jordan's total consumption of fossil fuels used to generate electricity.

<sup>5</sup> Source: NEPCo.

<sup>6</sup> Some of these oil imports from Iraq were at very favourable prices, while others were actually free.

<sup>7</sup> In 2005, these costs amounted to roughly 7% of gross national product.



	2001	2002	2003	2004	2005
toe x 1000					
Electricity sector	1,701	1,802	1,845	2,113	2,249
CEGCo	1,701	1,802	1,845	2,113	2,240
SEPGCo					9
Industrial sector (incl. self-generators)	119	145	141	139	144
For electricity generation overall	1,820	1,947	1,986	2,252	2,393
National fossil fuel consumption	5,150	5,299	5,774	6,489	7,008
Share of total fossil fuel consumption used to generate electricity	35.3%	36.7%	34.4%	34.7%	34.1%

Tab. 4: Fossil fuels combusted to generate electricity; 2000-2005; in toe x 1000<sup>8</sup>

### Power transmission and distribution

The Jordanian national interconnected grid transmits electricity from the power stations to the distribution substations and transformer substations in the various regions of the kingdom via 400-kV and 132-kV power lines. The star topography of the grid has a clearly identifiable north-south axis, along which the only 400-kV power line runs, from Aqaba in the south via Amman and up to the Syrian border. The only area in which the grid has a ring-shaped configuration is around the capital city.

In the north, the power grid is connected to the Syrian grid by means of a 230-kV and a 400-kV power line. In the south, there is a 400-kV connection to the Egyptian grid. The interconnected grid feeds the local distribution systems via which almost the entire population of Jordan receives its electricity. The overall length of the installed high voltage power lines (132 kV and 400 kV) is around 3,400 km.

The following table shows the level of expansion of Jordan's transmission network in 2000 and 2005.

Power line ratings	2000	2005
km		
400 kV	809	871
230 kV	17	17
132 kV	2,200	2,512
66 kV	17	17

Tab. 5: Level of development of Jordan's transmission network; 2000, 2005; km<sup>9</sup>

Table 6 lists the power losses that occur during the generation of power for the Jordanian interconnected grid, during transmission throughout the country and during distribution to the electricity customers (excluding self-generators).

	2000	2005
GWh		
Generation losses		
Electricity generated	7,125	9,332
Electricity fed from power stations into grid	6,639	8,756
Losses [%]	6.8	6.2
Transmission losses <sup>10</sup>		
Electricity fed into grid (incl. imports)	6,535	9,557
Electricity sold (to distribution companies)	6,321	9,221
Losses [%]	3.3	3.5
Distribution losses <sup>11</sup>		
Electricity supplied	5,646	8,416
Electricity sold (to end customers)	5,038	7,431
Losses [%]	10.8	11.7
Losses throughout the entire grid		
Electricity generated and bought in	7,170	10,314
Electricity used	5,872	8,417
Losses [%]	18.1	18.4

Tab. 6: Losses in the Jordanian electricity sector (interconnected power grid); 2000, 2005; GWh<sup>12</sup>

8 Source: NEPCo; toe = tonne(s) of oil equivalent (1 toe = 41.87 GJ = 11.63 MWh).

9 Source: NEPCo.

10 High voltage lines, 400 kV and 132 kV, including imports.

11 Not including the networks of industrial enterprises.

12 Source: NEPCo.

### Electricity consumption and peak load

Peak load in the national grid (including self-generators) in 2005 amounted to 1,751 MW. Compared with the previous year (1,555 MW), this was an increase of 12.6%. In 2005, Jordan's interconnected grid reached a peak load of 1,710 MW, which corresponds to an increase of just under 13% compared with the year before (1,515 MW).

In the same year, the load – at the time the peak load in the grid of 1,710 MW was reached – was distributed among the various types of power station as follows: steam power plants 57%, diesel turbines 22%, natural gas turbines 4%, others 2%, imports from Syria and Egypt 15%. Between 2000 and 2005, peak load increased by an average of 7.7% each year.

In 2005, electricity consumption nationwide amounted to 8,712 GWh and was consequently almost 8% higher than in the year before. The rate of increase the year before that (2003 to 2004) was a good 10%. Average per capita consumption in 2005 was 1,939 kWh (2004: 1,830 kWh).

Broken down according to sector, the consumption of electricity in the country looks as follows:

	House-holds	Industry	Trades/crafts	Water pumps	Street lighting	Others	Total
	GWh						
2000	1,981	1,974	805	990	173	210	6,133
2001	2,110	2,024	880	981	178	219	6,392
2002	2,270	2,193	971	1,045	190	237	6,906
2003	2,471	2,294	1,047	1,104	201	213	7,330
2004	2,745	2,479	1,190	1,261	213	201	8,089
2005	2,989	2,659	1,316	1,298	247	201	8,712

Tab. 7: Development of electricity consumption in Jordan according to sector; 2000-2005; GWh<sup>13</sup>

Forecasts by the state power producer NEPCo predict demand for electricity of around 20,700 GWh for 2020, which would equate to double the 2005 level.

	2008	2009	2010	2015	2020
Electricity demanded [GWh]	12,887	13,608	14,299	17,739	20,697
Annual rate of increase [%]	6.2	5.6	5.1	4.4	3.1

Tab. 8: Development of the demand for electricity in the Jordanian power market; estimated; 2008-2020; GWh<sup>14</sup>

Jordan's national power provider, NEPCo, is working on the assumption that the level of demand for electricity will develop roughly as below by 2020:

	2008	2009	2010	2015	2020
Max. demand for electricity [MW]	2,112	2,230	2,339	2,856	3,289
Annual rate of increase	6.0%	5.6%	4.9%	4.1%	2.9%

Tab. 9: Development of the demand for capacity in the Jordanian power market; estimated; MW; 2008-2020<sup>15</sup>

### Electricity prices

In June 2002, electricity tariffs in Jordan were raised slightly for the first time since May 1996. 2003 and 2004 saw further moderate price increases. The last adjustment of tariffs took place in July 2005. The price structure is divided roughly into two segments: major customers (large power users) and end customers. The major customers grouping – which, in addition to industrial enterprises, also includes local power providers – pay a demand charge for every kilowatt of their maximum consumption. On top of this is a kilowatt-hour rate, which is lower at night than during the day.

The tariffs for end customers make a distinction between commercial customers and private households. The price of electricity for households rises progressively with the amount of electricity consumed. The two groups of end customers pay two different minimum monthly payments: for households 1.10 euro, for commercial customers 1.37 euro.

13 Source: NEPCo.

14 Ibid.

15 Ibid.

	1996-2002	2002-2003	since 2005
<b>Major customers</b>			
Power providers			
Demand charge (€/kW/month)	2.63	2.63	2.63
Day-time tariff (€/kWh)	0.032	0.034	0.037
Night (off-peak) rate (€/kWh)	0.021	0.023	0.026
Large-scale industry			
Demand charge (€/kW/month)	2.63	2.63	2.63
Day-time tariff (€/kWh)	0.052	0.053	0.053
Night (off-peak) rate (€/kWh)	0.035	0.037	0.037
<b>End customers (excl. major customers)</b>			
Private households			
1-160 kWh (€/kWh)	0.033	0.034	0.034
161-300 kWh (€/kWh)	0.057	0.060	0.065
301-500 kWh (€/kWh)	0.066	0.070	0.073
Over 500 kWh (€/kWh)	0.082	0.088	0.090
Trades and crafts	0.066	0.068	0.069
Light industry	0.040	0.042	0.045
Hotels	0.066	0.066	0.066
Water pumps	0.037	0.042	0.044
Street lighting	0.022	0.027	0.033

**Tab. 10: Development of electricity prices in Jordan; 1996-2005; prices in euros<sup>16</sup>**

## 12.2 Market Actors

In view of the annually increasing demand for electricity<sup>17</sup> and the central role of electricity supply for economic development as a whole, the Jordanian Government decided back in 1997 to embark on a restructuring of the sector. The main objective of this reform was to increase the efficiency and performance capability of Jordan's electricity sector, a goal that was to be achieved by among other things opening up the country's electricity market and enabling private investors to participate in the expansion of the power sector. In the course of these measures, the power generation, transmission and distribution segments went through a process of unbundling. In place of the state authority, JEA<sup>18</sup>, which until then had borne responsibility at all levels, separate businesses were formed, each of which operates in just one area.

### Power generating companies

#### Central Electricity Generating Company (CEGCo)

This joint stock company, which has existed in its present form since 1999, operates the majority of Jordan's power stations. In 2005, 94% of the electricity generated inside Jordan came from CEGCo power stations. All of the electricity the company generates is sold to NEPCo, which, alongside the Jordanian Government that itself holds 75% of CEGCo's shares, is the only other shareholder of the national power provider.

#### Samra Electric Power Generating Company (SEPGCo)

This joint stock company was founded in 2003 and is 100% owned by the Jordanian state. It is responsible for running the combined-cycle power station in Al-Risha. In 2005, the Ministry of Energy and Mineral Resources awarded SEPGCo the contact to build another 100-MW steam power plant. The Jordanian Government is planning to privatise the company as part of an international tendering process.

<sup>16</sup> Source: NEPCo.

<sup>17</sup> In the period from 1977 to 1997, the amount of electricity generated rose by an annual average of 12%. In 2006, the Ministry of Energy and Mineral Resources (MEMR) was working on the basis of an annual growth rate of more than 5% up to 2010.

<sup>18</sup> The Jordan Electricity Authority (JEA) has been the national electricity authority since 1967.

## Power transmission companies

### National Electric Power Company (NEPCo)

The national power company, National Electric Power Company (NEPCo), is a joint stock corporation whose capital is completely in the hands of the Jordanian state. It is responsible for expanding and operating the nationwide transmission network. NEPCo purchases the electricity from the producers as the sole buyer, in order to sell it on to the operators of the distribution networks. The company operates a national load-dispatching centre to coordinate the demand for and the supply of power.

## Distribution companies

### Jordan Electric Power Company (JEPCo)

In 2005, the distribution company supplied power to around 739,000 end customers in the four governorates Amman (capital), Zarqa, Madaba and Balqa. This added up to 4,793 GWh or 55% of the electricity consumed nationwide. The company was founded in 1947 as a joint stock company. The 50-year concession to generate and distribute electricity for the above-mentioned governorates, on which JEPCo's business is based, is due to expire in 2012.

### Irbid District Electricity Company (IDECO)

In 2005, this distribution company supplied power to around 251,000 customers in the four governorates Irbid, Mafraq, Jerash and Ajlun in the north of the country (1,210 GWh). Around 14% of the electricity consumed in Jordan was distributed to end customers via IDECo's network. IDECo's concession runs out sooner than JEPCo's, in 2011. IDECo was established in 1961 as a privately owned power supply (distribution) company. So far, NEPCo still holds 55% of the shares in the company, but it wants to sell these as part of a further phase of privatisation of the power supply sector.

### Electricity Distribution Company (EDCo)

In those regions of the country for which neither JEPCo nor IDECo have a concession, end customers are supplied with their electricity by EDCo. In 2005 this amounted to 139,000 customers, receiving 1,427 GWh or just over 16% of Jordan's total consumption. EDCo came into being as a power supply company when the Jordanian electricity authority began to be unbundled. The company is state owned and is intended to be sold off within the scope of privatisation of the sector.

## Other Actors in the Energy Sector

### Ministry of Energy and Mineral Resources (MEMR)

The Ministry of Energy and Mineral Resources (MEMR) lays down the goals and political framework conditions for development of the energy market. Its core task is to facilitate continuing development of the country by ensuring adequate availability of energy. This is meant to be brought about with as little expenditure as possible, but while maintaining high standards. To this end, the ministry also intends inviting foreign investors in the fields of power generation, oil production and the development of other locally available sources of energy.

### Electricity Sector Regulatory Commission

This independent institution established in 2001 has a whole range of tasks. On the one hand it fixes the electricity tariffs and the charges for services related to the sale of electricity. On the other hand it awards licences to power providers and distributors and monitors compliance with the terms of the licences. Furthermore, the commission has been set up to arbitrate between operators and electricity customers in order to find solutions that are as amicable as possible. It also has the job of mediating between power generators or operators of distribution networks in the event of disagreement.

The overriding principle to be followed by the commission in all matters relating to the electricity sector is to ensure the interests of the public at large are looked after. To this end, it can both assume an advisory role as well as make public statements.

### National Energy Research Center (NERC)

The NERC was established in 1998 with the goal of promoting scientific research in the fields of renewable energy sources and efficient energy use. Furthermore, the centre also has the task of exploring possibilities of using the oil shale that is readily available in Jordan to produce energy. And the final responsibilities of this establishment are in the fields of training and the transfer of technology in the above-mentioned research areas. The NERC cooperates with among others the Ministry of Energy and Mineral Resources (MEMR), the Royal Scientific Society and the Natural Resources Authority. The energy minister also holds the position of chairman of the centre.

## 12.3 Legal Framework

### Development of the electricity sector

Since 1967, the Jordan Electricity Authority (JEA) has been responsible for the generation and transmission of electrical energy throughout Jordan. In those regions whose power supplies were provided by neither of the two power distributors with a concession to supply end customers (JEPCo and IDECo), it was the JEA that also held responsibility for distributing power to end customers.

A lack of financial and administrative independence, autonomy and free-market orientation, as well as an inadequate tariff structure, led to a number of problems. Investment decisions were taken by a government commission and not in accordance with commercial criteria. Personnel policy was dictated by state targets, which did not meet the needs of the electricity sector. Moreover, the state's tariff policy resulted in annual losses, because the electricity prices were too low to cover costs. At the same time, the tariff structure fostered considerable cross-subsidisation between various customer groups. In turn, these subsidies sent out the wrong price signals and led to distortions in the electricity market.

The rapid growth in the demand for power every year meant large-scale investments<sup>19</sup> were necessary to expand the number of power stations and the power grid. The level of these investments, however, would have been a very heavy burden for the Jordanian national budget alone.

### Deregulation

#### Aims

In the mid-1990s, the Government decided to embark on a restructuring of the electricity sector, a process that was to be conducted in several stages, which have not yet been completed. This restructuring has the following aims:

- Efficient and reliable electricity generation, which supports general long-term development of the country by providing electricity at affordable rates.
- The electricity sector is to no longer burden the national budget through annual losses and is to provide or raise the capital necessary to maintain, develop and expand plants and networks itself.
- Operation and regulation of the electricity sector are to be reorganised in such a way that competition is fostered and private investors can be attracted into entering the Jordanian power market.

To achieve these aims, the reform programme has been set up in line with the following principles:

- To give high priority to recruiting private investors willing to participate in the expansion of the electricity sector. These investors are to help satisfy a growing need.
- To restructure and privatise state-owned companies wherever it makes sense, in order to create independent and economically viable facilities.
- To bring independent power producers into the sector.
- To set up a regulatory system that establishes reliable, transparent and comprehensible basic rules for all participants in the electricity sector.
- To promote environmental and safety standards as well as energy efficiency.

19 Studies conducted in 1997 envisaged an investment volume of between US\$ 65m and US\$ 156m per annum up to 2015 depending on the scenario chosen.

## Implementation

This restructuring took place in three phases.

In Phase 1 (1994 to 1996), the following measures were implemented: amendment of legislation to enable deregulation of the electricity sector; separation of legislative formation, regulation and operation of the electricity sector; transformation of the electricity authority, JEA, into a joint stock company (NEPCo) that operates according to free-market principles; establishment of the regulatory authority for specifying electricity tariffs; and finally, introduction of a legal framework for independent power producers.

The following measures were implemented in Phase 2 (1996 to 2001): unbundling of NEPCo into separate companies for power generation (CEGCo), transmission (still NEPCo) and distribution (EDCo), whereby NEPCo is still state owned and retains and operates the facilities for transmitting electricity and distributing the load nationwide; extension of the tasks of the regulatory authority to include the issuing of licences to operators of power plants and distribution networks, protection of the rights and interests of electricity customers, the setting-up of quality standards and the approval of investment programmes.

Phase 3 (running since 2001) comprises the privatisation of NEPCo and its power generation and distribution subsidiaries. This is to be achieved either by issuing shares or by selling off stakes to strategic partners.

In March 2004, the Jordanian cabinet passed a resolution under which the state's shares in the distribution companies EDCo and IDECo are also to be sold off, as are 51 % of the shares in the national generation company, CEGCo, which has until now been wholly owned by the state. The first attempt in 2005 to sell these shares within the framework of an international tendering process failed due to the lack of a suitable bidder. Following a renewed call for tenders, negotiations were started with investors from Amman (JD Capital), Kuwait (Kharafi National) and Dubai (Abraaj Capital). In January 2007, 64 members of the Jordanian parliament issued a memorandum opposing the sale of

CEGCo. Instead, they demanded an increase in the electricity prices of 0.54 euro cents/kWh (5 fils) to bale out the loss-making public corporation.

The Government has been attempting for a long time now to conclude contracts with independent power producers with the aim of expanding the number of power stations in Jordan's electricity generating system, but it is made only very slow progress. A number of potential projects have been abandoned. The Jordanian Government is currently searching for private investors willing to invest in the construction and operation of new power plants up to 2015, plants that together will offer an additional 1,500 MW or so of capacity.

At the end of 2005, Jordan awarded the first concession for a privately funded power plant project. A combined-cycle power station with a planned capacity of 280-400 MW is being built in the vicinity of the capital, Amman. The US\$ 280 million project, which is being financed and conducted by AES Oasis headquartered in Dubai<sup>20</sup> and its Japanese partners (Mitsui & Company), is to come on stream in 2008. According to the Government, there are plans for a second project to be conducted by an independent power producer, with another 280-400-MW power station that is to commence generating electricity as of 2010.

As a general rule, the issuing of licences is regulated by the General Electricity Law<sup>21</sup>, Article 28 onwards. In conformance with this law, the regulatory authority issues licences to firms that wish to generate, distribute or sell electricity. Generating plants with a capacity of up to one megawatt are allowed to operate without a licence. Local supply networks with a capacity of max. 100 kW can be operated without a licence, in the same way as power plants that are used solely to generate electricity for self-consumption. Power supply companies or middlemen who want to purchase electricity from a power station with a capacity greater than 5 MW may conclude appropriate supply contracts only after competing in a public tendering process (Article 35). These rules apply equally to conventional thermal power stations and stations that generate electricity from renewable energy sources.

<sup>20</sup> Subsidiary of the AES Corporation of the United States.

<sup>21</sup> Temporary Law No. (64) for the Year 2003/General Electricity Law.



## 12.4 Policy Promoting Renewable Energy Sources

### Responsible institutions

The Jordanian Government has publicly expressed its intention to promote the use of renewable energy sources and has regulated the associated responsibilities in its General Electricity Law passed in 2003. According to Article 3, the Ministry of Energy and Mineral Resources (MEMR) has the task and the necessary powers to promote the use of renewable energy sources for power generation in Jordan. Within the MEMR, the departments for renewable energy sources and for energy conservation and environmental protection are responsible for planning and implementing projects that utilise renewable energy resources at a commercial level.

1998 saw the creation of the National Energy Research Center (NERC), which is responsible for R&D, conducting studies, implementing pilot installations, standardisation, technology transfer and training. The power companies conduct their activities in the field of renewable energy sources autonomously. The same applies to the country's universities.

### Long-term planning

In December 2004, the Jordanian Government passed a long-term development plan relating to energy supply for the nation. This plan makes provision for investments of around US\$ 3 billion in the energy sector over the period up to 2025. It also envisages greater use of renewable resources in the energy industry, with particular emphasis being given to the use of wind power and solar power as well as the generation of energy from biomass. To achieve the planned share of 2% for renewable energy sources in the national energy balance, the development plan sees the need for investments to the tune of US\$ 480 million. The plan does not specify how big the share private investors are to take is to be and to what extent the Government will contribute funds required.

According to its own information, the Ministry of Energy and Mineral Resources is planning a series of measures intended to speed up the development of renewable energy sources in Jordan. This includes a new law on renewable energy resources, so far unspecified incentive mechanisms and new maps showing where potential lies for wind and solar energy. Also under discussion is a proposal to redesignate a special charge that has until now been levied to promote rural electrification.

Jordanian Law No. 16 (the "Investment Promotion Law") offers a number of concessions for investors who build industrial facilities – such as wind farms – in Jordan. This includes a 100% exemption of installation components and spare parts from customs duties, charges and taxes. Depending on the location of the facility, tax concessions of between 25% and 75% are possible on income tax and social services tax over a period of ten years.<sup>22</sup>

### International promotion measures

In 2004, the Jordanian Government submitted an application<sup>23</sup> for a US\$ 6 million grant from the Global Environment Facility (GEF/World Bank) for a development project in the field of wind power. Part of the remit of this "Promotion of a Wind Power Market Project" is to eliminate obstacles that stand in the way of the commercial use of wind power in Jordan. The aim on the one hand is to improve the legislative and administrative preconditions for the use of renewable energy resources. On the other hand, the project is also to comprise the construction of a 60-MW wind farm that is to be financed by private investors. So far, however, only US\$ 350,000 has been approved for feasibility studies.

<sup>22</sup> Further information is available on the Internet at [www.jordan-explorer.com/Investment/Investment\\_Promotion\\_Law1.asp](http://www.jordan-explorer.com/Investment/Investment_Promotion_Law1.asp).

<sup>23</sup> GEF Council Work Program Submission, Jordan, Promotion of a Wind Power Market, GEFSEC Project Id: 2555.

Since 2005, the Japanese Government, together with the Jordanian Government, has been sponsoring<sup>24</sup> four studies investigating the potentials of renewable energy resources in Jordan within the framework of the “Policy and Human Resources Development Fund” (PHRD) of the World Bank. The Japanese share amounts to US\$ 1 million, while Jordan is contributing a further US\$ 312,000. One particular focus here too is on the wind power segment. Furthermore, the United States Trade and Development Agency (USTDA) is funding (US\$ 180,000) a feasibility study into the expansion of the existing wind farms in Hofa and Al-Ibrahimiya.<sup>25</sup>

### Clean Development Mechanism

In January 2003, Jordan became the third Arab country to sign the Kyoto Protocol and declared its responsibility to pay due attention to the prevention of climate change while furthering the social and economic development of the country. By February 2007, Jordan had yet to submit any climate protection projects under the UNFCCC.

The Designated National Authority (DNA) for CDM answers to the Ministry of Environment. The latter is currently looking for investors for two potential CDM projects. In both cases, the goal is to reduce the emission of gases harmful to the climate by converting and upgrading existing power stations to combined-cycle and natural-gas technology, respectively. The extent to which these projects amount to “additional” measures within the meaning of the CDM rules has, however, not been made clear by the ministry.

One indicator of the fact that Jordan has not as yet fully laid down the preconditions for its participation in the international climate protection mechanisms is an additional grant to the tune of US\$ 100,000, which Jordan’s Ministry of Environment received from GEF funds in 2005. The aim of this grant is to create further capacities so that Jordan is in a position to meet its obligations to notify within the framework of the UNFCCC.

## 12.5 Status of Renewable Energy Sources

The use in Jordan of renewable energy sources has until now been marginal, accounting for a share of less than 1 % of electricity generation. Potentials for generating power from renewable energy resources in the country are to be found primarily in the areas of wind and solar energy.

### Hydropower

Jordan has no notable bodies of flowing water suitable for the construction of hydroelectric power stations. The only such plant is at the King Talal dam on the Az Zarqa River, with a capacity of 5 MW. Another hydroelectric generating facility employs a turbine to exploit the head of the cooling water taken from the sea to cool a thermal power station in Aqaba as it flows back to the sea. In 2005, these two stations together generated 57 GWh of electricity and were therefore the source of 0.59% of the electricity generated in the country as a whole.

### Wind energy

#### Wind power potential

Jordan has a number of regions that enjoy wind speeds suitable for generating electricity. Those regions with the greatest potential are located in the north and south of the country. Each region can be placed in one of three categories depending on the wind speeds that prevail: under 4 m/s, between 4 and 6 m/s and above 6 m/s. Particularly attractive locations in the third of these categories can be found in Hofa in the northwest of the country, in Fjeij near Shawbak (Shobak) and in Wadi Araba near Aqaba in the south.

24 Project name: Jordan Sustainable Development of Renewable Energy Resources and Promotion of Energy Efficiency, Project ID: Japanese PHRD Grant/TF052920.

25 Source: REN 21 IAP Actions and Report, Accelerating the Development of Renewable Energy in Jordan, [www.ren21.net/iap/commitment2.asp?id=93](http://www.ren21.net/iap/commitment2.asp?id=93).

### Wind measurements

A wind atlas<sup>26</sup>, which was drawn up by the Danish Risø research centre in cooperation with the Jordanian authorities, has been available for Jordan since 1989. According to information provided by the Ministry of Energy and Mineral Resources, this wind atlas is in the process of being updated with results taken from recent measurements. The Jordan Meteorological Department operates fifteen permanently installed weather stations, whose measurements cover wind speeds and directions and are made available online.<sup>27</sup>

The Deutsche Gesellschaft für technische Zusammenarbeit (GTZ) has conducted its own wind measurements at two potential locations for wind farms (Aqaba and Shawbak) in Jordan and published the results of these studies at the end of 2001. Average wind speeds of more than 6.5 m/s at a height of 50 metres were measured at both of these sites.<sup>28</sup> There has also been a CDM baseline study<sup>29</sup> (conducted on behalf of GTZ) available since 2002 for a privately financed wind farm at Aqaba with a capacity of 25 MW. GTZ has also commissioned another study<sup>30</sup> for the Shawbak location, which investigates the suitability of the facility planned for there with respect to the CDM. Here, too, the plans are for a privately financed 25-MW wind farm.

A Swiss company, interwind, has been conducting wind measurements at fourteen locations in rural regions of Jordan since June 2003. These studies are being carried out on behalf of a Canadian company, RSW International, and are aimed at determining the extent to which wind power is suitable for providing decentralised power supplies in rural regions. 50 metre-high masts are being used to take these measurements. The results<sup>31</sup> of wind measurements conducted in Tafila were published in 2004. Average wind speeds of only 4.4 m/s<sup>32</sup> were measured here.

### Wind farms

So far, two wind farms have been built and come on stream in Jordan, both of which feed into the national grid. The first of these farms has a generating capacity of 320 kW (4 x 80 kW) and was constructed in 1998, in cooperation with a Danish company, in Ibrahimyya near Hofa, as a pilot project. The second was completed in 1996 in Hofa (financed with funds from the German Eldorado programme) and has a capacity of 1.2 MW (5 x 225 kW). Both wind farms are operated by CEGCo and together they generated around 3 GWh of electricity in 2005.

### Expansion plans

The Ministry of Energy and Mineral Resources has been searching since 2002 for investors for the two highly promising locations in Fjeij near Shawbak and Wadi Araba near Aqaba. The intention is for these projects to be built and operated by independent power producers (IPPs) on the basis of BOO (Build-Own-Operate) contracts. A wind farm with a capacity of 25 to 30 MW to be fed into the interconnected power grid is to be built at each of these two locations. The level of capital expenditure is estimated at US\$ 60-70 million. The projects were put out to public tender in 2005, but have so far attracted no potential investor.

26 Højstrup, J. (1989): Wind Atlas for Jordan. Risø National Laboratory, Ministry of Energy and Mineral Resources, Jordan Electrical Authority, and Jordan Meteorological Department.

27 See: [met.jometeo.gov.jo](http://met.jometeo.gov.jo).

28 However, due to the indefinite nature of the data measured, the authors of the report recommended further studies be carried out before a final decision on locations can be made.

29 Wartmann 2002, "TERNA Wind Energy Project, Jordan – Wind Park Aqaba".

30 Wartmann 2002, "TERNA Wind Energy Project, Jordan – Wind Park Shawbak".

31 Eyad S. Hrayshat, Wind availability and its potentials for electricity generation in Tafila, Jordan, Al-Balqa Applied University, Tafila, Jordan.

32 No reference was made in the source to the height at which these wind speeds were measured.

### **Biomass**

Due to the arid climate, there is not a great deal of vegetation in Jordan. This obviously limits the potential use of vegetable biomass. The burning of vegetable biomass serves to a limited extent in rural regions for cooking and heating and is the main source of energy of the Bedouin in the desert. Great energy potential is to be found in household wastes (municipal solid wastes), which has an organic content of roughly 60%, and is estimated to add up to an annual total of 1.1 million tonnes. This equates to a daily per capita figure of between 0.35 and 0.95 kg of waste with a gross calorific value of 7-11 MJ/kg. The figures vary depending on the time of year and also differ between urban and rural regions.

### **Biogas**

In cooperation with the United Nations Development Programme (UNDP), a project has been developed for utilising the methane gas that arises at the municipal waste disposal site in Amman. With the aid of the Global Environmental Facility (US\$ 2.5 million) and the Danish development agency DANIDA (US\$1.5 million), a biogas facility has been financed that captures the gases that arise at the landfill and uses a 1-MW generator to generate electricity for the interconnected power grid. The facility has been in service since 2000 and generates some 5 GWh of electricity annually. The installation is run by the Jordan Biogas Company, a joint stock company that is owned by the Central Electricity Generation Company (CEGCo) and the Greater Amman Municipality (GAM).

### **Solar energy**

Jordan is a very sunny country. Average daily solar irradiation is 5.5 kWh/m<sup>2</sup>, while the sun shines approximately 2,900 hours per annum. Despite this, apart from for heating water for some households, solar energy is scarcely being used.

### **Photovoltaics**

According to the Jordanian Ministry of Environment, there is a multitude of potential applications – such as for supplying electricity to small settlements and tourist facilities, as well as in agriculture – in which, thanks to the high level of solar irradiation, PV systems could be employed as an economically viable alternative to connecting to the grid. Despite this, very little use is being made of photovoltaics in Jordan. Across the country, there are only around 100 PV systems installed as stand-alone systems in remote areas. These are used to power water pumps or supply electricity for telecommunication systems, schools and other facilities. All in all, these systems have a total capacity of 184 kW<sub>p</sub>.

### **Solar thermal energy**

Jordan has a fully developed market for solar water heaters. The majority of solar systems in use function according to the thermosyphon principle and are manufactured locally by more than 20 companies. A typical system comprises three solar panels with a surface area of three to four square metres and storage tanks with a capacity of between 150 and 1,000 litres. Roughly a quarter of Jordanian homes (around 220,000 units) are fitted out with a solar thermal water heating system. According to estimates of the Ministry of Energy and Mineral Resources, the total surface area of solar panels in use in the country amounts to approximately 1 million square metres, a large proportion of which was installed back in the 1980s. Around 10,000 square metres are being added every year. A national plan to further develop solar thermal energy – which has been formulated within the framework of the Euro-Mediterranean Partnership (MEDA Programme) – envisages an annual increase in new solar panels installed of 44,000 square metres. Included in this plan is the increased use in future of solar thermal energy to assist in the heating of buildings.

### Geothermal energy

Geothermal resources in Jordan have been identified mainly in two regions. That said, both the sources on the eastern banks of the Jordan Valley and those on the plateau to the east of Madaba offer comparatively low temperatures below 100 °C. This means they cannot be used to generate electricity and will continue to be used for thermal purposes only, such as for heating swimming pools and greenhouses.

### Desalination of seawater with renewable energy

In 2003, the National Renewable Energy Laboratory (NREL) of the US Department of Energy, together with the Jordanian Ministry of Water and Irrigation, the Palestinian Water Authority (PWA) and the Israeli institute of technology, Technion, implemented a pilot scheme for mobile seawater desalination. Two systems that consist of a mobile trailer with a membrane filter and storage tanks mounted on it were put into service. These systems can be supplied with power either from the grid, by a diesel generator or via a 16-kW photovoltaic system specifically adapted for this purpose.

## 12.6 Rural Electrification

### Degree of electrification

The well developed supply network in the country also supplies a large proportion of the population in rural regions with electricity. There are now only a few remote settlements that still do not enjoy the benefits of a grid connection.

Year	Total population [x1000 inhabitants]		Population with power connection [x1000 inhabitants]		Share of population with power connection [%]	
	Nation-wide	Rural regions	Nation-wide	Rural regions	Nation-wide	Rural regions
2000	4,820	1,743	4,815	1,736	99.9	99.6
2001	4,940	1,737	4,935	1,732	99.9	99.7
2002	5,070	1,854	5,065	1,850	99.9	99.8
2003	5,200	1,908	5,195	1,904	99.9	99.8
2004	5,350	1,970	5,345	1,966	99.9	99.8
2005	5,485	2,019	5,480	2,015	99.9	99.8

Tab. 11: Development of electrification in rural Jordan; 2000-2005<sup>33</sup>

### Programme for rural electrification

The Rural Electrification Project (REP) is a department of the Ministry of Energy and Mineral Resources and was set up in 1992. At that time, the Government had decided to introduce an additional charge of 0.11 euro cents (1 fils) on every kilowatt-hour consumed. In 1997, this charge was increased to 0.22 euro cents (2 fils). The money levied through this charge is being used for rural electrification.

A programme aimed at promoting the provision of power to those people who live in remote regions far from the national power grid with the aid of PV systems has been running since 2002. In particular, low-income population groups living in the countryside are to be given access to electricity through this programme. Within the scope of this programme, nine PV systems (solar home systems) have been installed in a small village, which are used to provide lighting and power radios and televisions in the households taking part.

Exchange rate (August 2007)

1 Jordanian dinar (JOD) = 1.03 euro (EUR)

1 EUR = 0.975 JOD

## 12.7 Information Sources

- Abdulla, F. et al: Status of Jordan Renewable Energy Sector: Problems, Needs and Challenges, Al-Nimr, School of Engineering, Jordan University of Science and Technology, Irbid, Jordan 2004
- Alnaser, W.E. et al: First solar radiation atlas for the Arab world, Physics Department, University of Bahrain, College of Science, Bahrain, 2003
- Arafeh, M., Aburas, R. & Kharbat, F.: The National Electric Power Company (NEPCO), The privatization of the electricity supply industry in Jordan, Amman, 1999
- Fayez Shridah, Eng. Khalid, Director of Renewable Energy Dept. Ministry of Energy and Mineral Resources: Policy Instruments for the Renewable Energy in Jordan, The Middle East and North Africa Renewable Energy Conference (MENAREC), Jemen, 2004
- Habali, S. & Ta'ani, M.: Renewable Energy Systems Application In Jordan, Mechanical Engineering Department, Faculty of Engineering and Technology, The University of Jordan, Amman Jordan, 2005
- European Commission: European Neighbourhood Policy – Country Report – Jordan, Brussels, 2004
- Ministry of Energy and Mineral Resources: Temporary Law No. (64) for the Year 2003 General Electricity Law, Jordan, 2003
- Ministry of Environment: National Capacity Self Assessment for Global Environmental Management (NCSA) – Jordan, Environmental Profile of Jordan 2006, Jordan, 2006
- Mönnich, K. & Strack, M.: Report on the Analysis of the Wind Conditions at the Site Aqaba, Jordan, Deutsche Gesellschaft für Technische Zusammenarbeit GmbH (GTZ), Eschborn, 2001
- Mönnich, K. & Strack, M.: Report on the Analysis of the Wind Conditions at the Site Shawbak, Jordan, Deutsche Gesellschaft für Technische Zusammenarbeit GmbH (GTZ), Eschborn, 2001
- National Electric Power Company (NEPCO): Annual Report 2005, Jordan, 2006
- Wartmann, S. Ch.: Fraunhofer Institute Systems and Innovation Research (ISI), Preliminary CDM and Baseline-Study for the TERN A Wind Energy Project, Jordan – Wind Park Aqaba, Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ), Eschborn, 2002
- Wartmann, S. Ch.: Fraunhofer Institute Systems and Innovation Research (ISI), Preliminary CDM and Baseline-Study for the TERN A Wind Energy Project, Jordan – Wind Park Shawbak, Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ), Eschborn, 2002



## 12.8 Contact Addresses

### Amman Chamber of Commerce

P.O. Box 287  
Amman 11118  
Tel. +962 (6) 566 61 51-4  
Fax +962 (6) 566 61 55  
E-mail: [info@ammanchamber.org.jo](mailto:info@ammanchamber.org.jo)  
[www.ammanchamber.org.jo](http://www.ammanchamber.org.jo)

### Electricity Regulation Commission

Postal address: P.O. Box 1865  
Amman 11821  
Office address: Amman  
Sweifieh – Building of Ministry of Energy and Mineral Resources  
5<sup>th</sup> & 6<sup>th</sup> Floors  
Tel. +962 (6) 580 50 00  
Fax +962 (6) 580 50 03  
E-mail: [webmaster@erc.gov.jo](mailto:webmaster@erc.gov.jo)  
[www.erc.gov.jo](http://www.erc.gov.jo)

### Ministry of Energy & Mineral Resources

General Secretary: Eng. Khaldoun Qutishat  
P.O. Box 140027  
Amman 11814  
Tel. +962 (6) 586 33 26  
Fax +962 (6) 586 57 14  
E-mail: [memr@memr.gov.jo](mailto:memr@memr.gov.jo)  
[www.memr.gov.jo](http://www.memr.gov.jo)

### National Electric Power Co. (NEPCO)

P.O. Box 2310  
Amman 11181  
Tel. +962 (6) 585 86 15  
Fax +962 (6) 581 83 36  
E-mail: [info@nepco.com.jo](mailto:info@nepco.com.jo)  
International Service: [Rkanaan@nepco.com.jo](mailto:Rkanaan@nepco.com.jo)  
[www.nepco.com.jo](http://www.nepco.com.jo)

### Ministry of Planning and International Cooperation

3<sup>rd</sup> circle, Zahran St. 1<sup>st</sup> turn on the right  
P.O. Box 555  
Amman 11118  
Tel. +962 (6) 464 44 66  
Fax +962 (6) 464 9341/464 22 47  
E-mail: [mop@mop.gov.jo](mailto:mop@mop.gov.jo)  
[www.mop.gov.jo](http://www.mop.gov.jo)

### Royal Scientific Society

P.O. Box 1438  
Al-Jubaiha 11941  
Hashemite Kingdom of Jordan  
Tel. +962 (6) 534 4701  
Fax +962 (6) 534 05 20  
E-mail: [rssinfo@rss.gov.jo](mailto:rssinfo@rss.gov.jo)  
[www.rss.gov.jo](http://www.rss.gov.jo)

### Natural Resources Authority

P.O. Box 7  
Amman 11118  
Tel. +962 (6) 585 76 00/585 76 12  
Fax +962 (6) 581 18 66

### National Energy Research Center

Postal address: P.O. Box 1945, Al-Jubaiha,  
Amman 11941  
Büroadresse: Campus of Royal Scientific Society  
Ahmed Tarawneh Street  
Amman  
Tel. +962 (6) 533 80 42  
Fax +962 (6) 533 80 43  
E-mail: [nerc@nerc.gov.jo](mailto:nerc@nerc.gov.jo)  
President Malek Kabariti: [malek.kabariti@nerc.gov.jo](mailto:malek.kabariti@nerc.gov.jo)  
General Information: [info@nerc.gov.jo](mailto:info@nerc.gov.jo)

### Central Electricity Generating Co. (CEGCO)

P.O. Box 2564  
Amman 11953  
Tel. +962 (6) 534 00 08  
Fax +962 (6) 534 08 00  
E-mail: [cegco@cegco.com.jo](mailto:cegco@cegco.com.jo)  
[www.cegco.com.jo](http://www.cegco.com.jo)

There is great potential for generating electricity from renewable energy sources in many developing and emerging countries. Obstacles to the exploitation of such sources and to the involvement of foreign investors include a lack of knowledge of framework conditions in the energy industry and insufficient transparency with regard to the prior experience and interests of national actors. This fourth, updated and expanded edition is aimed at overcoming barriers such as these.

The electricity markets and their respective actors are investigated for 23 countries in various regions: Latin America, Africa - Middle East and Asia. The country studies analyse the energy-policy framework conditions and closely examine the status of and promotion policy for electricity generation on the basis of hydropower, wind power, solar power, biomass and geothermal energy. The chapters on each country are rounded off by information about rural electrification.

Deutsche Gesellschaft für  
Technische Zusammenarbeit (GTZ) GmbH

Dag-Hammarskjöld-Weg 1-5  
Postfach 5180  
65726 Eschborn  
T +49 (0)61 96 79-1303  
F +49 (0)61 96 79-80 1303  
I <http://www.gtz.de>

