

**The Hashemite Kingdom
Of Jordan**

**Electricity Sector Regulatory
Commission**

**The Annual Report
2005**

Board of Directors (until 15/10/2005)

Chairman: H. E. Engineer Azmi Al-Said Khreisat
Minister of Energy and Mineral Resources

Vice Chairman: H. E. Dr Hisham Al-Khatib

Members: Mr. Ahmad Abdul Fattah
Dr. Nazem Aref
Engineer Yousef Abu Jamous

Director General: Engineer Rashad Abu Ras

Council of Commissioners (since 15/10/2005)

Chairman: H. E. Dr Hisham Al-Khatib

Vice Chairman: Mr. Adeb Tahboub

Commissioners: Dr. Galeb El-Maabreh
Dr. Kamal Al-Qudah
Dr. Imad Nejdawi

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Overview

ERC has sustained during the year 2005 its mission towards achieving its declared objectives on the bases of justice, balance, promoting the investment in the different fields of electricity sector, issuing licenses to the electricity companies and monitoring their performance. ERC has also continued its collaboration with "Atos-Origin-Nexant-Tagi", the consultancy firm that has been appointed by the European Union since the beginning of 2004, in the process of preparing codes, regulations, directives, draft licenses and performance standards in such a manner leading to a comprehensive and efficient regulation of the electricity sector in Jordan.

Electricity, Energy and National Economy

The steep growth in economy that reached about 7.2% was accompanied by a steep growth in the demand for electrical energy with an average of 7.7%. Such a growth was considerably high approaching three times the world wide average. The consumption of electricity per capita has exceeded for the first time 1500 kWh annually to reach 1530 kWh indicating positively the economical and social development in Jordan.

However the vast advance in economy has gone along with an even steeper demand on prime energy that was accounted 7 million tons of equivalent oil with an increase of 8.3% above the demand in the year 2004. The flexibility on energy demand with reference to economy has exceeded 1.2 constituting more than double the world figures. This vast demand on energy is caused by: the nature of the Jordanian economy that is characterized by an extensive usage of energy, the location of Jordan in the hart of transit among the surrounding countries, the government subsidies on oil products, the pure strategies on load managements and the low efficiency on energy handling. All these factors have a negative impact on demand for energy; it is however hoped that the major increase on the oil products prices would hold up the steep increase on energy demand and improve energy application efficiency.

The electricity sector consumes more than a third of the total demand on prime energy in Jordan that is equivalent to about 2410000 BTU oil. On the other hand, the electricity sector currently relies heavily on the Gas imports from Egypt to meet its needs for prime energy; this should positively be reflected on the national economy.

The technical performance indices of the electricity sector were satisfactory during the year 2005. No major blackouts have been registered during this year; however partial disconnections remain high and need improvement. It has also been noticed an increase in the losses, which might be due to weaknesses in metering procedures and some electricity abuse by customers. The electricity generation sector has suffered the outages of two major generating units at Aqaba thermal power station resulted in a shortage in the generation availability; this has however been successfully compensated for through the interconnection links with Egypt and Syria.

The financial performance of the electricity companies was generally good and none of them has experienced losses this year; the Jordan Electricity Company has even made good profits. The performance of electricity companies is expected to remain positive during the year 2006 despite the expected increase in oil prices that is because of the constant price of natural gas, which is currently the main prime energy for electricity generation in Jordan.

The general maximum load of the integrated electrical system in 2005 was recorded 1710 MW, compared to 1515 MW recorded in 2004, i.e. the growth in the maximum load was 12.8%. The total generated energy in 2005 amounted 9654 GWh compared to 8968 GWh generated in 2004 that amount to a 7.7% raise in this year. The electricity imports from Egypt and Syria in 2005 amounted 982 GWh compared to 825 GWh imported in 2004. the total available energy in the kingdom (generated + imported – exported) for the year 2005 comprised 10636 GWh that is 8.7% higher than a 9791 GWh recorded for the year 2004 and the load factor for the available energy was 71% in 2005 compared to 74% in 2004. the slight decrease in the load factor was due to the spread of seasonal air-conditioning loads.

The total consumed energy in 2005 has reached 8713 GWh compared to 8090 GWh consumed in 2004, which indicates a growth of 7.7%. The final energy consumption per capita was about 1530 kWh in 2005 compared to about 1460 kWh in 2004. Finally, the electricity sector share from the total prime energy consumed in Jordan in 2005 represented 34.3%.

Commission's establishment

Lined up with the government attitude in promoting private sector investment and complying with the electricity sector restructuring that gives the ministry of energy and mineral resources the powers to set and prepare the general policies of the sector in accordance with the needs of economic and social development in the Kingdom and to transfer the responsibilities for monitoring and regulation of the sector to an independent commission, whereas the electrical companies to be the investors and operators of the electrical system, the government established the electricity regulatory commission in 15/1/2001 to bring about the specific objectives affirmed by the General Electricity Law (GEL).

According to the GEL No 64 of year 2002, a council of commissioners was appointed on 15/10/2005.

Commission's Objectives

The GEL has assigned the commission to achieve the following main objectives:

- 1- To safeguard and maintain an efficient structure for the sector as well as to guarantee its economic feasibility
- 2- To encourage investment in the sector in addition to improving the operational efficiency and sale of electric power at reasonable prices.
- 3- To ensure the provision of safe, secure, reliable and high quality services in all electric sector fields.
- 4- To insure the compliance of the activities in the sector with applicable environment protection standards and general public safety conditions enforced in the Kingdom.
- 5- To ensure that sufficient supply of electric power is being provided to costumers
- 6- To ensure that prices charged by electric companies are sufficient to finance its activities and allow it to earn a reasonable return on its investment.
- 7- To protect the interests of consumers.
- 8- To ensure that the regulation of the sector is fair and balanced to consumers, electric companies, investors and other stakeholders.

Commission's Functions

In order to achieve its objectives the commission undertakes the following functions:

- 1- License those persons engaged in generation, transmission, supply, distribution and system operation.
- 2- Regulate persons engaged in generation, transmission, supply, distribution and system operation in the Kingdom so as to provide reliable electricity service to consumers in an efficient manner.
- 3- Determine the electric tariff, subscription fees, services fees, disbursements, royalties and the connection charges to the transmission system and distribution system.
- 4- Participate in determining the technical standards relating to the electric appliances and electrical installations, by way of collaboration with other concerned parties in order to have such standards issued by the Standards and Meteorology Corporation.
- 5- Participate in determining the necessary requirements for the Implementation of the environmental standards to which electrical installations ought to conform to have them issued according to the legislations in force.
- 6- Render expert advice and opinion on any issue that is related to the sector in a way that fulfils the commission's purposes and objectives.
- 7- Make recommendations to the ministry to switch from the single buyer model to a competitive electricity market structure in accordance with the GEL.
- 8- Any other activity or mandate pertaining to the functions of the Commission pursuant to the provisions of the GEL.

Commission's Achievements

ERC has sustained during the year 2005 its mission towards achieving its declared objectives. It has successfully accomplished a number of important achievements, namely:

- **Standard Generation License:** the commission has prepared a final draft of a Standard Generation License and has been presented to and discussed by the previous council. It has also been presented and explained to the generation companies, revised according to

companies' comments and made ready for approval by the council of commissioners.

- **Standard Distribution and retail supply Licenses:** the commission has prepared a final draft of this document and has been presented to and discussed by the previous council. It has also been presented and explained to the distribution companies, revised according to companies' comments and made ready for approval by the council of commissioners.
- **The electric tariff:** the commission in collaboration with the its consultancy firm has prepared the general methodologies for electricity tariff that promotes profitable investments and guarantees high quality electricity services. The following tariffs has been prepared particularly:
 - **Retail Supply Tariff Methodology:** the final draft of this document has been prepared, presented to and discussed by the former council of directors, commented by the distribution companies, approved and finally implemented.
 - **Bulk Supply Tariff Methodology:** the commission has prepared the final draft of the bulk supply methodology and is currently in the process of discussion and approval by the council of commissioners.
- **The Grid Code:** It was developed by the Consultants working with the National Electric Power Company (NEPCO), then upon a request from NEPCO and other concerned users, the commission has granted a one year extension for the implementation of the Grid Code in a transitional period ending 1/4/206; that is to allow these parties congregate their obligation.
- **Metering Code:** NEPCO has prepared the metering code and the commission has revised it; then the council of commissioners has approved it temporarily for six months to allow the code users for further revision before it is finally approved.

- **Distribution Code:** The first draft of the Distribution Code developed by the ERC; it has been discussed with the distribution companies and it is currently in the process of approval by the council for initial implementation within a trial period.
- **Performance Standards for Distribution and Retail Supply:** ERC has developed the distribution performance standards and handed them to the distribution companies for comments, then revised and the final draft has been approved by the Board and has been in application since 1/7/2005.
- **Performance Standards for Generation:** ERC has drafted the performance standards for generation and shall be forwarded soon to the generating companies for remarks.
- **Transmission License and Operation License Drafts:** ERC has prepared these drafts and it shall soon present them to and discuss with the concerned companies leading to their approval and implementation.
- **The Master Plan:** the commission in collaboration with the generation, transmission and distribution companies has made a study for the future expansions in generation and transmission sectors with the objectives of meeting the expected growth in demand for the next 15 years.
- **Systems Operation Performance Standards:** ERC has prepared the system operation performance standards and is awaiting for NEPCO comments on it.

Energy and Economy

The Gross Domestic Product(GDP) has witnessed during the year 2005 a boost of 7.2% on constant price basis and has reached about 6.5 milliard JD compared to about 6 milliard JD reached during 2004, which also has increased by 7.7%. On the other hand, the GDP has grown during 2005 to about 8.03 milliards JD on current prices basis, with a boost up of 11.7%

that is compared to 7.27 milliard JD during 2004, which it self has grown by 13.3% with reference to the figures for the year 2003.

Based on constant prices, the contribution of the economical sectors in the total GDP comprised as follows: the industrial sector has the highest contribution that reached about 18%, the construction sector 4.9%, supply distributors and restaurants 9.7%, the financial and insurance sectors about 16%, the transport and communication sectors have contributed by 16.1%, whereas the social services 3.3%, the agriculture sector by 3.3% and other services by 28.7%.

The growth in Jordan's economy has reflected on an increased demand on prime energy reaching 7.028 million tons ptu that is compared to 6.1 million tons ptu needed for 2004, that is, a growth of 8.3%. The energy consumption per capita was about 1234 kg ptu compared to 1171 kg ptu in 2004.

The rapid growth in Jordan's economy has also reflected on the demand on electrical energy. The maximum load in 2005 has reached 1710 MW compared to 1515 MW reached in 2004, reflecting a growth of 12.9%. The consumed electrical energy has grown from 8090 GWh in 2004 to 8713 GWh in 2005, with a growth of 7.7%. Finally, the consumption average was 1530 kWh per capita compared to 1460 kWh per capita in 2004.

It is noticed that the growth in the demand for prime energy was in 2005 higher than the growth in the GDP, whereas, the growth in the demand for electrical energy was comparable to the growth in the GDP.

Essential developments in the electricity sector

In conformity with the demand for electric energy in the country, sector entities have prepared and executed several projects. The most important projects are the following:

Generation activity

Generation companies continued to develop the main power stations working in the country; CEGCO converted the steam boilers in Aqaba to work on combined cycle. The expansion of the Rehab station has begun by adding a steam turbine with (100) MW installed capacity to operate in a

combined cycle system. The unit was synchronized with the system and started its commercial operation on 1/6/2005. A new gas turbine with a capacity of 30 MW has been added to Al Risha power station. The unit was connected to the system on 4/2/2005 and started its commercial operation on 9/3/2005. The Samra power company started operating its first gas turbine generating unit with a capacity of 100 MW on 1/11/2005 and expected to put in operation two more units with a total capacity of 200 MW during the year 2006. Hence, the total available generation capacity in the Jordanian electrical system by the end of 2005 has reached about 1912 MW, whereas, the total installed capacity in the country amounts 2014 MW. Table (4) demonstrates the historical development of the generation installed capacity in the Kingdom.

Transmission activity:

The National Electricity Power Company has continued to maintain and develop the national transmission grid and the electricity connection grids with neighboring countries. NEPCO has accomplished the installation of the 27 km, double circuit transmission line between Samra Station and North Amman substation and it has issued new tenders for the construction of other new lines, which includes:

- Subiehi – Amman North 132 kV, 34 km, double circuit OHL
- The Salt branch project comprising a Quadra-circuit, 132 kV, 43 km OHL to link Salt Substation with the national grid.
- Dulail branch project with a Quadra-circuit, 132 km OHL to link Dulail Substation with the national grid.
- El-Hashmiah Substation branch project consisting of a 132 kV, 6.2 km, double circuit OHL to connect El-Hashmiah Substation with the national grid.
- 132 kV ground cable projects:
 - To connect El-Bayader Substation with Tareq Substation via a 14 km , double circuit, 132 kV ground cables.
 - To connect Abdoon Substation with Amman South substation by a 7.5 km, double circuit, 132 kV ground cables.

Table (9) demonstrates the historical development of the transmission in Jordan.

NEPCO has also completed during 2005 the installation of new substations and the expansion works in other main substations, whereby the totally

added transformation capacity has reached (496) MVA, as depicted in Table (8), which also shows the development of substations in the transmission system.

Distribution activity

All three distribution companies continued to work on developing the secondary substations, where the added substations capacity reached (639) MVA in 2005. These companies expanded the medium and low voltage lines where about (1296) km were accomplished of overhead lines and around (699) km of underground cables. Table 10 and Table 11 demonstrate the development in the capacities of substation and lengths of distribution line.

Demand for electric energy

The total peak load of the interconnected system amounted to 1710 MW in 2005, against 1515 MW in 2004, with a growth rate of 12.9%. The above mentioned peak load occurred in the morning. The highest evening peak load was 1665 MW; the lowest load was 721MW in 2005 against 644 MW in 2004 with a growth rate of 12%. The load factor reached 71% in 2005 against 74% in 2004. Table 3 shows the development in load demand historically.

Electrical energy generation

The electrical energy generated in the country in 2005 was 9654 GWh in opposition to 8968 GWh generated in 2004 with a growth rate of 7.7%. CEGCO provided 9086 GWh that was 94.11% out of the total energy generated. El-Samra Generation Company participated with 29 GWh, that was 0.3%. The industrial sector contributed with 514.4 GWh which equivalents to 5.33%. The remaining share came from renewable sources, e.g. King Talal Dam, wind plants and the biogas generation station.

The year 2005 was unfortunate for the Aqaba thermal power station, whereby two generating units have experienced serious faults in late December, resulted of them going of service. Fortunately, the shortage due to these faults has been compensated for by the import from Egypt and Syria and the power supply to customers has not been affected at all. The incidents

have meantime proven the importance of the interconnection with the neighboring countries.

Efficiency of generating units and their production cost

The overall efficiency of CEGCO's generating units during year 2005 was 32.6% compared to 32.2 during the year 2004, with an increase of about 0.4%. The rate of fuel consumption was 272 g (heavy fuel equivalent) per kWh exported energy, compared to 275.7 g (heavy fuel equivalent) per kWh exported energy during 2004, showing a decrease of 3.7 g (heavy fuel equivalent) per kWh that is equivalent to 31546 tons of heavy fuel. The decrease is explained by the new high efficiency gas turbines being put in service during year 2005.

The average cost of fuel used for CEGCO's generation has increased to 24.02 files per kWh (exported) compared to 23.89 files per kWh (exported) in year 2004; this corresponds to an increase by 0.13 files per kWh; consequently, the difference in total cost has amounted to 1.1 millions JD. This increase has been due to the operation of Rehab units in a combined cycle mode that consumes the diesel fuel in the process. The average cost of fuel used for gas turbines, which operate on diesel has also increased during 2005 by 2.69 files/kWh above the cost during 2004, corresponding to an increase in cost equals to 0.823 million JD; whereas the amount of generation from gas turbines that operate on natural gas has decreased this year by 128.5 GWh lower than 2004, contributing in an increase in the general cost by 0.677 million JD. Controversially, increasing the generation from steam turbines by 337.9 GWh in 2005 resulted in lowering the cost of fuel by an average of 0.98 files/kWh (exported) that is equivalent to 7.855 million JD, moreover, decreasing the amount of generation from gas turbines that operate on diesel by 152.1 GWh in 2005 compared to what was reported in 2004 has helped to decrease the general cost by 8.216 million JD.

It is worth noting that the price on the fuel used for generation has risen twice during year 2005, as shown in following table:

	Price early 2005	Price on 9/7/2005	Price on 21/9/2005
Heavy fuel (JD/ton)	74.5	99.5	99.5
Diesel (JD/m ³)	132.05	176.56	215.87
Resha gas (files/m ³)	47.08	50	50
Egypt gas (USA\$/????)	2.4	2.4	2.15

Electrical energy consumption

The electrical energy consumption in the country, during 2005, was 8713 GWh against 8090 GWh in 2004 with a growth rate of 7.7%; divided into sectors, the consumption comprised: the domestic sector consumption was 2547 GWh, constituting 29% of the total consumption, the industrial sector consumption was 2707 GWh, 31% of the total consumption, the commercial sector consumption was 1256 GWh, 14% of the total consumption, the water pumping consumed 1299 GWh, 15% of the total consumption, the government facilities consumed 417 GWh, 5% of the total consumption, while the street lighting accounted to 248 GWh, 3% of the total consumption, and others consumed 240 GWh, that was 3% of the total consumption.

The per capita consumption of electric energy in 2005 was 1530 KWh against about 1465 KWh in 2004, with a growth rate of 4.4%.

Fuel consumption in Electricity Generation

The fuel used in electricity generation in 2005 amounted to (2410) thousand TEO, against (2252) in 2004, with a growth rate of 7%. The electricity sector constituted 34.3% of the total fuel consumption in 2005 against 34.7% in 2003. CEGCO consumption was about (2241) thousand TEO in 2005,

while the industrial sector consumption reached a total of (160) thousand TEO and Al-Samra used (9) thousand TEO .

Electrical Loss

Electrical energy losses on the transmission system have reduced during 2005 to about 3.4% of the total transmitted energy compared to 3.6% energy losses during 2004 that is due to the operation of the new generating units close to load centers. Whereas, the energy losses in the distribution networks has been 11.7% of the total distributed energy compared to 11.1% reported in 2004. The total losses in the electrical system have amounted to 15.1% compared to 14.8% of the total handled energy in 2004. Table 14 summarizes the history of energy losses along the past ten years.

It can be noted that energy losses in the electrical system tends to increase despite the continuous enforcements to the national grid. This probably indicates some abuse and illegal connections to the network, which demands more effective monitoring plans.

Electricity Outages

The number of electric outages during 2005 on the transmission and distribution networks was 3819, of which 3802 were on the distribution networks and 17 on the transmission network. The total scheduled outages on the distribution networks were 1954 while the unscheduled outages were 1729. The transmission system outages were 119 outages.

The total average outages through 2005 were 448.1 minute/consumer, with a monthly average of 37.3 minute /consumer. The average scheduled outage per consumer was 271.1 minute/consumer, which means a monthly average of 22.6 minute/consumer. The average unscheduled outage per consumer was 167.7 minute /consumer which mean a monthly average of 14 minute/consumer. The average outage caused by NEPCO was 9.33 minute/consumer which means a monthly average of 0.8 minute/consumer.

The outages are very high and unacceptable especially the scheduled outages which could be decreased by using the live – line – working

method which is to be implemented after training is completed, and by faster response to outages to reduce the adverse effect they caused.

Number of consumers

The number of electricity consumers in 2005 was about 1.130 million compared to 1.067 million in 2004, with a growth rate of a 5.9%. Most of the increase was in the domestic sector. The by sector breakdown of consumers was as follows: domestic sector 82.9%, industrial sector 1.3%, commercial sector 13.7%, government facilities 0.6%, water pumping 0.4%, and others 1%.

Electricity Tariff

As a consequent of the rise in oil prices in 2005, the electricity tariff has been increased for all consumer categories except the first category that concerns low income consumers.

In order to promote load management and cost effective consumption, the tariff for agriculture consumers has been modified to allow for an optional choice that is similar to the tariff of three phase consumers. In this way, such consumers should benefit from off peak tariff during night hours. Table 17 demonstrates the historical development of electricity tariff in Jordan.