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REVIEW OF ACTION TAKEN IN THE FIELD OF ENERGY SINCE THE FIFTH SESSION OF THE COMMITTEE ON ENERGY

REVIEW OF PROGRESS MADE IN THE COOPERATION PROGRAMME WITH QATAR IN RESPECT OF IMPROVING ENERGY EFFICIENCY IN THE QATARI ELECTRICITY SECTOR

Summary

The Economic and Social Commission for Western Asia (ESCWA) is eager to support the endeavours of member countries to strengthen the contribution of the energy sector to the achievement of sustainable development. In the context of the desire of the Qatar General Electricity and Water Corporation to improve the performance of the Qatari electricity sector and its energy efficiency, in February 2006 the Corporation and ESCWA signed a technical cooperation agreement. The aim is to formulate a national plan for the improvement of energy efficiency in the Qatari electricity sector. The agreement is being implemented in the form of a fully coordinated partnership between the Corporation and ESCWA, represented by the Sustainable Development and Productivity Division.

As part of its general framework, the agreement includes such activities as studies and field surveys of the current status and future prospects of the Qatari electricity sector, an evaluation of the possibilities for improving energy efficiency in the sector and, in particular, the management of demand, and the preparation of a national plan for that purpose. Upon completion of the aforementioned study, a seminar will be held, to be attended by experts and those involved in the various sectors, with a view to considering and discussing the most important procedures and priority techniques for the application of the aforementioned plan for the improvement of energy efficiency in the Qatari electricity sector.

This report sets out the general framework and scope of the agreement, the planned stages for implementation and the progress that has been made. It will also review the most significant preliminary outcomes that agreement-related work has achieved, with a view to acquainting the members of the Committee on Energy and member country experts with the elements of the agreement, thereby allowing them to consider ways of implementing similar programmes in other countries and making use of the national and regional expertise that is available in that field.

I. GENERAL FRAMEWORK AND SCOPE OF THE AGREEMENT

A. GENERAL FRAMEWORK

1. The purpose of the general framework of the agreement is to formulate a programme for the improvement of energy efficiency in the Qatari electricity sector, to be implemented in two stages by a partnership between the Qatar General Electricity and Water Corporation (KAHRAMAA) and ESCWA.

2. Implementation of the first stage will take five months. It includes the following elements:

(a) A study incorporating an analysis of the current status of energy consumption in Qatar and an evaluation of the possibilities for improving energy efficiency;

(b) Formulation of a plan of action for energy audits in selected locations and proposal of guiding principles for implementation of study outcomes;

(c) Organization and convening of a seminar to be attended by experts and those involved in various sectors in Qatar, with a view to considering and discussing the most important procedures and priority techniques for the application of the plan proposed for the improvement of energy efficiency in the Qatari electricity sector.

3. On the basis of the outcome of the first stage, the two parties to the agreement intend to implement a second stage, which will involve the formulation of a plan for a national programme for the improvement of energy efficiency in the Qatari electricity sector, and the identification of mechanisms and priorities for implementation of programme activities.

B. SCOPE OF THE AGREEMENT

4. In accordance with the articles of the agreement, the general scope of the activities required will focus on the following:

(a) Estimating current and future supply and demand for electricity in Qatar during the period 2005-2015;

(b) Reviewing and evaluating the characteristics of electricity loads and analysing patterns of electricity consumption in every sector;

(c) Carrying out energy audits in a selected sample of sites in the main energy-intensive sectors, with the aim of identifying priority areas for improving energy efficiency in those sectors;

(d) Identifying procedures and technologies for and possible practical applications of increasing energy efficiency and carrying out a preliminary evaluation of the expected outcomes of implementation at the Qatari national level;

(e) Providing guidance and recommendations on the appropriate re-structuring of electricity tariffs; evaluating levels of electricity pricing in various economic sectors and the impact thereof on the national economy and society as a whole; identifying practical procedures for implementation; and evaluating the impact of changed tarrifs on consumption;

(f) Identifying requirements for putting in place an energy efficiency programme at the national level and, in particular, programmes aimed at reducing peak loads and improving the load factor; studying appropriate ways and techniques of meeting institutional demand and the feasibility of establishing electricity service companies;

(g) Evaluating the environmental impact of the proposed energy efficiency programme and the possible contribution of the programme to the sustainability of the Qatari electricity sector;

(h) Formulating a national plan of action for making more efficient use of electrical power in the various economic sectors;

(i) Convening a seminar to be attended by experts and those involved in various sectors in Qatar, with a view to considering and discussing the most important procedures and priority techniques for the application of the plan proposed for the improvement of energy efficiency in the Qatari electricity sector.

5. It should be noted that the volume of technical work needed to carry out the work related to the first phase of the agreement is estimated as 35 expert months, including ESCWA experts and regional experts under contract to ESCWA and auxiliary services. The total cost of implementation will be US$ 437,573, of which KAHRAMAA will pay 48.7 per cent, namely, $213,073, while the remaining 51.3 per cent, amounting to $224,500, will be paid by ESCWA.

II. PLAN OF ACTION FOR IMPLEMENTATION OF THE AGREEMENT

6. As per the agreement, a plan of action was formulated which was set forth in detail in the first report on the agreement and adopted by ESCWA and KAHRAMAA in April 2006. The plan comprised six main undertakings, under which were grouped 36 sub-items. The following are the six main undertakings:

(a) To formulate the implementation plan for the agreement and the preparatory procedures;

(b) To undertake energy reviews in the selected locations in various sectors in Qatar and collect data on electricity loads and expected future demand for energy;

(c) To prepare analyses and accounts and an interim report on management of demand for electricity;

(d) To identify the requirements for developing an energy efficiency programme at the Qatari national level;

(e) To prepare a final report on the project that covers all activities, analyses and outcomes;

(f) To organize and convene a seminar to which will be invited the interested parties for discussion of the outcomes of and recommendations made by the study, of which the most important concern procedures and priority techniques for the application of the plan proposed for the improvement of energy efficiency in the Qatari electricity sector.

III. THE PROGRESS MADE IN IMPLEMENTING THE AGREEMENT

7. In accordance with the agreement timetable, the first three undertakings of the plan of action, which covered the first four items of the framework, were completed. A summary of the progress made is set forth below.

A. PROGRESS MADE IN CARRYING OUT UNDERTAKINGS

1. *To formulate the implementation plan for the agreement and the preparatory procedures*

8. This undertaking covered the following steps:

(a) *The formulation and adoption of the implementation plan*

9. Using the MS Project computer program, a plan was formulated for implementation of the agreement, which included a plan of action and a schedule for the main undertakings and sub-items. The plan assigned duties and required actions, identified task forces, and estimated financial reserves and the time needed for each undertaking. The first report on the agreement was prepared, and contained elements of the implementation plan that were reviewed and adopted by the two parties.

(b) *The completion of preparatory measures*

10. The task force completed the preparatory measures for energy audits, which included the following:

- The amassing of all the relevant documents, studies and reports available to KAHRAMAA, with a view to reviewing all the information contained therein and identifying all the essential data;
- The preparation of guidelines for implementation of the consultancy services required, selection of experts and consultants, in coordination with KAHRAMAA, and completion of contractual procedures for implementation of those services;
- The identification of requirements from the comparison mechanism that will be used in the energy audits and the computer programs necessary to carry out the required analyses and calculations, and the preparation of questionnaire forms to collect data needed for the study.

(c) *Field visits*

11. In order to carry out the above-mentioned duties, ESCWA experts made two visits to KAHRAMAA.

12. The first of those visits was in order to consult with the relevant parties on the general framework for beginning implementation and to gather the reports and documents of relevance to the study, with a view to considering them for the purpose of identifying the information available or still required.

13. The second visit was in order to discuss and adopt the first report on the agreement and the plan of action contained therein, and to select the locations in which energy audits would be conducted. The visit covered 23 sites that satisfy certain agreed criteria, of which 10 were selected for energy audits. Of those 10, six were in the buildings[1] sector, while the remainder were in the industrial sector.[2]

2. *Field work: energy audits and data collection*

14. A team of ESCWA and KAHRAMAA energy experts and ESCWA consultants undertook field visits to the selected locations and undertook the following:

(a) *Conducting energy audits in the selected locations*

15. That exercise comprised the following measures:

- A preliminary collection of data for each site, based on the outcome of the questionnaires that had already been sent to the site;
- Familiarization with the energy systems in each location and the tools employed thereby, patterns of consumption and electricity load distribution;
- Consultations at each location with officials and technicians on the status of energy and opportunities for optimizing its use, based on the data collected;
- Carrying out the measurements necessary in order to understand the efficiency with which electrical power was used in the targeted processes or applications at each site. Measurements included electrical capacity, electrical power consumed, voltage and current, intensity, voltage and current fluctuation, and relative atmospheric temperature and humidity.

[1] Selected sites in the buildings sector included a villa, a residential apartment, a hotel, a commercial centre, and two locations in the Government buildings sector.

[2] Selected sites in the industrial sector included two large companies (cement and a refinery) and two medium and small scale companies.

(b) *Consultations with specialist staff*

16. Meetings were held with officials and specialists in several institutions and, in particular, KAHRAMAA, the Planning Council, the Qatar General Organization for Standards and Metrology, Qatar National Bank and Qatar Petroleum, in order to sound their views and gather data on the supply of and demand for electrical power and the characteristics of electricity loads at the national and sectoral levels.

3. *Preparation of the interim report on management of demand for electrical power*

17. The aim of this stage of the operation was to evaluate the opportunities available for improving electrical power efficiency with respect to current and future supply and demand, and the economic and environmental dividends of such improvement. Accordingly, an analysis was conducted of the data and measurements that had been obtained, using special energy-related computer programs. The interim report on the agreement comprised three parts, containing all the data and measurements, an analysis of the measurements that had been taken at earlier stages and expectations for the future.

18. The first part reviews the current situation of the Qatari electricity sector, based on an analysis of the documents provided by KAHRAMAA and the data contained therein, and deduces the most significant indicators relating to the Qatari electricity sector in previous periods. Such indicators include total consumption and consumption in the buildings, industry, lighting and street sectors; compound capacity; energy generated; distribution losses; electrical power used in generating stations; electricity generation stations and systems; evaluations of daily and annual loads; and the budget for electrical power in Qatar.

19. The second part deals with the opportunities for improving energy efficiency and managing demand, and includes activities that were carried out in the course of energy audits and the outcome of the analysis of data collected and measurements taken. This part contains the following:

(a) An evaluation of current electricity consumption, specifying quantities and methods of consumption in various mechanisms and divisions of each of the 10 selected locations;

(b) A review and analysis of the measurements that were taken and the data that were collected at each site;

(c) The monitoring and technical, economic and environmental evaluation of the opportunities available for optimizing electricity consumption and increasing the efficiency of each site: there were a total of 30 opportunities at the 10 sites;

(d) An estimation of the expected decrease in demand for electricity and electrical loads at the sectoral level as a result of the proposed optimization measures.

20. The third part of the report deals with expectations for the electricity sector in Qatar to the year 2020, and includes an analysis of the data supplied by KAHRAMAA and derived from the activities that were undertaken with a view to gauging future demand for electricity supplies on the basis of specific standards and assumptions, including levels of population growth and GDP. For that purpose, three scenarios were adopted with relation to the application of energy demand management measures.

(a) The first of those scenarios estimates the normal growth of the sector without giving consideration to the opportunities available for applying energy demand management measures;

(b) The second scenario estimates the growth of the sector if 50 per cent of the opportunities available for energy demand management measures proposed in the study are applied;

(c) The third scenario estimates the growth of the sector if 80 per cent of the opportunities available for energy demand management measures proposed by the study are applied.

21. It should be noted that the estimates derived in all cases include total and sectoral demand for electricity, the energy generated and consumed by stations, distribution losses, capacity that is expected to be added or taken out of service over the years and the investment required in order to cover those needs to the year 2020.

IV. THE O0TCOMES AND PRELIMINARY INDICATORS OF THOSE OUTCOMES

22. So far, the study has produced a number of results and preliminary indicators with respect to the possibilities for improving the efficiency of energy equipment and systems and related savings in electricity consumption. Those results include the following:

(a) The overall possibilities for improving energy efficiency in the residential, commercial and Government buildings sector in Qatar exceed 16 per cent of total sectoral electricity consumption, while in the industrial sector the comparable figure is more than 12 per cent. That average of 15 per cent for each sector amounts to some 1,540,000 megawatt hours (MW/h) per annum. Similarly, it would be possible to reduce electricity loads in both those sectors by some 15.5 per cent, the equivalent of 412 megawatts;

(b) In accordance with the scenarios outlined above, the possible savings to be made in those two sectors amount to 1,230,000 MW/h per annum if 80 per cent of the available opportunities for increasing energy efficiency are applied. If only 50 per cent of those measures are applied, that figure decreases to 770,000 MW/h per annum. Electricity loads can be reduced by 12.4 and 7.8 per cent respectively;

(c) Air conditioning is the most energy-intensive equipment in the Qatari buildings sector, using some 55 per cent of all electricity consumed and accounting for 59 per cent of the total electricity load. Lighting accounts for some 28 per cent of consumption and 15 per cent of loads. Domestic and electronic generators and equipment consume a mere 17 per cent of all electricity used, representing 36 per cent of the total sector load.

23. It should be noted that the above-mentioned estimates are based on the assumption that energy efficiency improvement techniques and measures are applied, and do not include consumption behaviour or general measures for optimizing consumption, which could naturally lead to an increase in the savings referred to. The study sets out the following options for techniques and measures to be taken in the two sectors:

(a) The most important techniques and measures that could be applied in the buildings sector include the use of high-efficiency lighting systems; the implementation of simple, low-cost or cost-free measures, the most important of which is the improvement of operation, maintenance and periodic follow-up system measures; the application of high-cost, wide-ranging measures, the most important being the rehabilitation of electricity-powered equipment and, in particular, central air conditioning systems; the use of high-efficiency generators which are electronically controlled; the improvement of capacity; the organization of peak loads; and the raising of public awareness of optimum energy use;

(b) The most important techniques and measures that could be applied in the industrial sector include the use of high-efficiency generators which are electronically controlled; is the improvement of operation, maintenance and periodic follow-up system measures and systems for energy management, particularly the redistribution of loads in industrial sites from peak to other times, and the use of emergency generators at various sites at peak load times; the use of high-efficiency lighting systems; the improvement of air conditioning system efficiency, particularly in small and medium-sized industries; and the improvement of capacity.

24. This issue is presented to the Committee in order to bring to its attention the elements of the agreement and its implementational stages, and to prompt the discussion of possibilities for developing and implementing similar programmes in member countries, using the expertise available in those countries and interchanging such expertise in order to extend its benefits to the countries of the region.