



energy in action

What is e7?

The e7 is a non-profit organization consisting of nine leading electric utility companies that spearheads projects and human capacity building activities in developing nations worldwide that exemplify e7's mission:

"To play an active role in global electricity issues and to promote sustainable development."

This diverse international group offers electricity sector expertise and practical competency in electricity generation, transmission and distribution. With field proven expertise in the planning, management, design, operation and maintenance of energy facilities, member companies together provide an all-encompassing scope of the global electricity industry to assist developing countries.

e7 members are:

American Electric Power (USA)

Electricité de France (France)

ENEL (Italy)

Hydro-Québec (Canada)

Kansai Electric Power Company (Japan)

Ontario Power Generation (Canada)

RWE (Germany)

ScottishPower (UK)

*Tokyo Electric Power Company (Japan).

**Observer status*

Improving the Energy Efficiency of Jordan's Power Plants



Hussein oil-fuelled station in Zarqa near Amman, Jordan

In February 1996 the e7 initiated a project to help the Hashemite Kingdom of Jordan to improve the efficiency of its oil-fuelled electricity generating units. Completed in 2000, the project has reduced both greenhouse gas and acid gas emissions. Sustainable energy is one of Jordan's priorities for its energy sector.

The Project

The host electric utility in Jordan, now known as the Central Electricity Generating Company (CEGCO), requested assistance from the e7 and agreed to register the project as an Activity Implemented Jointly (AIJ). CEGCO was concerned about heat rate and efficiency of its generating units. The Activity Implemented Jointly pilot program was the precursor to the Clean Development Mechanism and this AIJ project was one of the few completed worldwide.

The project was carried out at three units on two sites – the Aqaba oil-fuelled station in southern Jordan, and the Hussein oil-fuelled station near Amman.

Phase 1 – Assessment and Training

Phase 1 included assessing the performance of the selected generating units and operating practices and training. It consisted

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of five tasks. The E7 provided the equipment needed to test the units.

- Tasks 1 and 2 involved boiler combustion optimization and boiler and turbine heat rate and efficiency tests.
- Task 3 was a water chemistry workshop.
- Task 4 included training CEGCO employees in testing and analysis to improve plant efficiency.
- Task 5 involved assistance to CEGCO to establish an energy efficiency performance test team. This team helps to maintain the improvements in performance achieved with this project and to apply the knowledge and test equipment to other units.

Data collected as part of Phase 1 were used to define baseline performance. Changes to the operation of the units during performance tests and following the test program resulted in an immediate improvement in unit performance and a reduction in air emissions. These changes included boiler tube wash at Hussein TPS and new air pre-heater seals at Aqaba TPS.

As the program unfolded, CEGCO staff were eager to learn the procedures and technical skills required. CEGCO carried out all the work that was within their skill capability, such as instrument installation, and they offered services to ensure that E7 support was efficiently used where their own skills were less developed. The final audit of the project included interviews and reviews with operating staff to ensure that they could operate the new equipment and perform the performance monitoring. Results showed a high level of success and gave evidence that greenhouse gas reductions should be maintained and possibly even enhanced.

Phase 2 – Implementation of Recommendations

Following review of the results and recommendations from Phase 1 with CEGCO, the E7 and CEGCO selected three projects for implementation to make further efficiency improvements and reduce emissions at the Hussein Station. These projects were:

1. **Improvements to air pre-heaters** – Air pre-heater leakage was substantial on all units tested. Improvements were centered around improved cleaning and sealing equipment.
2. **Installation of a monitoring system and upgrades to instrumentation** – A basic computer-driven monitoring system to provide warning of any degradation in equipment performance or controllable operational efficiency losses was installed on two 66 MW units to reduce heat losses. In addition, new instrumentation was installed to ensure the monitoring system would perform properly.
3. **Installation of emissions measurement equipment to improve combustion instrumentation** – The tests carried out in Phase 1 found that the station oxygen analyzers were inaccurate, resulting in higher boiler losses. A system to monitor carbon monoxide, oxygen, and nitric oxide was installed in each of the two 66 MW units to provide monitoring data.

Results of the Project

Once the phase 2 installation projects were complete, the total emissions savings resulting from the two phases of this project, estimated over a three-year period, are 141,983 Mg of carbon dioxide (CO₂) and 3,420 Mg of sulphur dioxide (SO₂).

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Partnerships can help bring energy to two billion people worldwide who are without electricity. Governments, financial institutions and other organizations can

work with electricity companies to make it happen. Put energy into action for sustainable development around the globe.

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