



# **EFFICIENCY IMPROVEMENTS IN POWER PLANTS**

**An E7 Activity  
Implemented Jointly  
(AIJ) in Jordan**

**Central Electricity Generating  
Authority (CEGCO)**

JORDAN

## Efficiency Improvements in Power Plants - Jordan

Since 1996 Ontario Power Generation (OPG), on behalf of the E7, has been managing E7 Project 82, an initiative to reduce greenhouse gases. The specific objective of Project 82 was to investigate the feasibility of developed countries carrying out emission reduction projects in developing countries. OPG's E7 partners in this project were EDF (supporting training and a computer monitoring system), ENEL of Italy (supporting combustion testing), Hydro Quebec (additional funding) and RWE (supporting air heater improvements).

The Central Electricity Generating Company (CEGCO) of Jordan is an independent company which has emerged from the privatization of the former public utility. CEGCO has two major oil fired fossil stations, Hussein Thermal Power Station at Zarqa, near the capital city of Amman, and Aqaba TPS, on the shore of the Gulf of Aqaba, Jordan's outlet to the Red Sea. Hussein TPS has seven oil-fired generating units - three 33MW (U1-3) and four 66 MW (U4-7). Aqaba TPS has three 130MW units. E7 Project 82 targeted efficiency improvements at these stations as a means of reducing CO<sub>2</sub> emissions.

Phase 1 involved assessment and testing of some of the units at the two stations, at a cost of approximately \$195,000US. More than a month of boiler and turbine tests were carried out by OPG, supported by ENEL and EDF. ENEL also conducted combustion tests to evaluate burner performance in order to advise on the potential for cost-effective improvements to burners.

In addition, OPG conducted a workshop on water chemistry at both stations and carried out a study of the water processes at Hussein TPS. EDF, assisted by OPG, carried out two weeks of training of CEGCO personnel at EDF facilities in France.

Instrumentation used in the Phase I testing was provided to CEGCO to assist in setting up a central team to continue Performance testing in the future. Changes made to the operation of the units during and immediately following the Phase I performance test program resulted in an

immediate improvement in unit performance and a reduction in emissions. These changes included boiler tube washes at Hussein TPS and new air preheater seals at Aqaba TPS.

Phase I identified shortfalls that provided opportunities for projects which could be carried out to improve efficiency and reduce CO<sub>2</sub> emissions at a total cost of about \$760,000US. E7 agreed to carry out some of these projects at Hussein TPS. The Phase II work involved air heater upgrades (coordinated by RWE), instrumentation and emission monitoring (OPG), computer monitoring system (EDF), and final testing (ENEL).

In June and July 2000 improvements were made to the air heaters on Units 2, 3 and 4. In August, OPG personnel went to Zarqa to work with the Jordanians as they installed the required instrumentation and new gas analyzers on Units 4 and 5. The E7 Project 82 was completed in October 2000.



OPG's Joe Giunta (r) and EDF's Fabrice Chopin go over instrument assignments at a meeting in France prior to the final stage of Phase 2 work U4 and U5.

In September OPG staff returned to Hussein station to work with EDF personnel as they connected their computer system to the instruments installed previously on Units 4 and 5. Finally, in early October, Project

Manager Ron Wilson and representatives of EDF, ENEL and RWE spent a week at Hussein TPS overseeing final tests on the whole installation and auditing results.

CEGCO are very pleased with E7 Project 82 results. Company representatives noted that, of a number of similar projects, this was the most successful in providing tangible results. CEGCO officially recognized E7's contribution at the recent climate change workshop held in The Hague, Netherlands. CEGCO has indicated that they hope to repeat the work on their own initiative on Hussein TPS Units 6 and 7. E7 Project 82 was completed under budget and deliverables have been documented in a previous report.

Conservative efficiency savings estimates of up to 1.5 % from E7 Project 82 are expected to produce five-year emission reductions of 172,000 Mg of CO<sub>2</sub> and 4,100 Mg of SO<sub>2</sub>. EDF has also noted that these savings could be as high as 6% with optimal and continued use of their performance monitoring system.

In addition, considering CEGCO's favourable response to this project, there is a high potential that this project may see similar reductions on additional units.



CEGCO personnel training on EDF's computer system in the Hussein TPS Control Room (l to r: Saleh El-Katib, Instrumentation and Control Supervisor, Nadim Kifaiah, Instrumentation and Control Section Head, and Mohammed Banna, Instrumentation Technician)

Hussein TPS, Zarqa, Jordan

