## SUMMARY

This is the final report of the project entitled *Electric and Magnetic Field* Guideline Evaluation and Magnetic Field Exposures for Live-line Workers. The project was funded by Saudi Electricity Company (SEC), Riyadh, and was initiated on March 1, 2003. The major objective of the study was to assess the safety of live-line worker exposed to high voltage low frequency transmission line electromagnetic field.

Existing scientific studies and literature which are concerned with the effect of extremely low frequency electric field on live line worker were reviewed. Possible precautions and standard protective techniques to improve safety levels are surveyed and summarized. The existing international standards which deal with safety assessment are thoroughly reviewed, and discussed. Based on this review, the maximum allowable limits for exposure to power line frequency electromagnetic field were extracted.

To conduct safety assessment study for SEC live line worker, a double circuit transmission line is selected in consultation with SEC. The selected line spans from substation 8114 (Qortoba Area) to substation 8079 (Alhamra Area-Khorais) in Riyadh region. Its nominal voltage and power ratings are 132 kV and 293 MVA respectively. Eleven practical exposure scenarios which represent actual working conditions for live-line worker has been identified in consultation with SEC.

The charge simulation method was adopted to compute the external electric field around the selected 132 KV transmission line; a method based on Biot-Savart law was chosen to compute the external magnetic field around the transmission line. Electric EMF WORKSTATION software, which is based on charge simulation method and Biot-Savart law, was adopted to calculate the external electric and magnetic field due to 132 KV High Voltage transmission line. Comparison of the values of external electric and magnetic field, with the allowable limits set by the international standards and guidelines reveals that the levels of workers exposures to extremely low frequency electromagnetic field are below the recommended international standards and guidelines limits for the eleven exposure scenarios representing actual working conditions.

After a thorough literature investigation, it was found that the Finite Difference Time Difference computational algorithm is the most suitable candidate to calculate the induced electric field and induced current densities inside the human body. EMPIRE software, along with a 3 mm and 6 mm resolutions model for the human body in standing position and 5 mm resolution model for sitting position, have been utilized to calculate the internal electric field and induced current densities inside the human body model generated by the external electric and magnetic fields for the for the eleven exposure scenarios.

Finally, a through comparison was conducted between the induced current densities and electric field inside human body model with the allowable limits set by the international standards and guidelines. The comparison indicated that the induced current densities and the electric fields inside a human body model are well below the allowable limits as recommended by the international standards and guidelines for the eleven scenarios representing actual working conditions.