SUMMARY

This is the final report of the project entitled Power Quality Standards. The project was funded by Saudi Electricity Company (SEC), Riyadh and was initiated on March 1, 2003. The major objectives of the study is to review various PQ standards, evaluate the potential PQ monitoring schemes and suggest the available most effective countermeasures to mitigate power quality problems.

The report summarizes the power quality terminology as defined in the Institute of Electrical and Electronics Engineers Inc. (IEEE) standards, the International Electrotechnical Commission (IEC) standards, and other international standards. Various standards, which are dealing with power quality (IEEE) and electromagnetic compatibility (IEC), are also specified. Power quality disturbances are discussed and defined in the light of the existing standards. Typical system operation conditions that cause power quality problems are also addressed.

The report provides an up-to-date analysis of the available power quality monitoring devices along with the suitable monitoring strategies. The report analyzes and assesses the different power quality indices, and also provides a comprehensive list of the available commercial power quality monitors and its sensitivity to different factors. Moreover, the report discusses the sensitivity and disturbance localization schemes involved in such instruments. The various factors, which contribute to continuous power quality monitoring, are also discussed.

Customer side solutions and utility side solutions that can be effectively utilized to mitigate different power quality problems and improve the quality of power to its standard level are demonstrated in the report. The issues discussed include a survey of the devices used for compensating the power quality problems, classification of Active Power Filters (APF) based on their circuit topology and functionalities, a survey of the methods of control and compensation of power quality problems using different type of APF, different current control techniques for the Voltage Source Inverter VSI, and evaluation of different factors affecting the operation of mitigation equipment.

Based on the information presented in this report, cross reference link between IEC and the corresponding IEEE is established. Differences between the structure of the IEC and IEEE standards are discussed. Moreover, available IEC and IEEE standards for immunity, limits, monitoring, and mitigation are tabulated in a way which clearly portrays the link between the available standards. Limits imposed on harmonic voltage and current are thoroughly discussed. To conclude the work of this report, a comparison between the existing monitoring and mitigation equipment, which shows the capability of the equipment, is detailed.

Recommendations to boost interactions between different entities are presented and an initiative concerning the contribution of these entities in improving supply power quality is also presented. Administrative recommendations are also provided, which will increase the interaction between different market players and will help in achieving power supply quality. The role of competent/regulatory authorities, industrial customers, equipment manufacturers, and oil companies are also discussed. Finally recommendations regarding the power quality data collection are provided to the utility.