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**Implemented Operational Functions of GCCIA HVDC toward Reliable and
Sustainable Grid between GCC Member States**

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Abstract;

GCCIA (Gulf Cooperation Council Interconnection Authority) own and operate the 400-220kV electrical transmission 'backbone', that interconnect the power systems of the Arabian Gulf Cooperation Council (GCC) countries of Bahrain, Kuwait, Qatar, Oman, United Arab Emirates (UAE) and Kingdom of Saudi Arabia (KSA). The Interconnector includes 900 km of overhead lines, seven 400kV substations, one 1800MW three-pole back-to-back HVDC converter station and a submarine cable to Bahrain. Unlike most HVDC systems, which are designed to be used more or less continuously for economic transmission of power, the GCCIA system is additionally capable of transmitting power between the two systems after a major loss of generation on any side of the HVDC link. The control system of the converters continuously monitor the frequencies of the two grids and, upon detection of a change of frequency, deblock one or two poles as needed to arrest the fall in frequency and restore the shortage of power. This allows Spinning reserve to be shared between the two system and as a result the concept is known as Dynamic Reserve Power Sharing (DRPS).

The purpose of this presentation is to explain key features of the dynamic HVDC frequency converter functions particularly with regard to slow Frequency Control (FC) and fast Dynamic Reserve Power Share (DRPS). The presentation discusses the FC augmentation of DRPS controller for the HVDC converters and frequency controller actions and strategies used for these applications.

The assessment is to test the reliable operation of GCCIA network with HVDC in different scenarios. The analysis will test HVDC on solving different failure challenges expected to occur on both sides of the link. Dynamic analysis with an onerous fault case will investigate if the HVDC assists in angular stability. The case study will compare the operation response of HVDC with frequency drop or rise. The PSS[®]E software will be used for modelling the HVDC equipment as part of GCCIA network. Both the FC and DRPS control philosophy and design with their coordinated operational concept will also be explained.