Title: The Role and Possibility of Smart Transformer to Unlock the Potentials of Modern Power Grid

Abstract: The solid-state transformer-based Smart Transformer (ST) can provide multiple ac and dc connectivity and advanced services to support power grids, in particular for the modern distribution power grid, by integrating advanced control and communication technology. Since the ST is a new and effective paradigm of the electricity grid evolution to well understand the ST and its capability to unlock the potentials of modern power grids, this report systematically presents the basic architecture and the typical control schemes of the ST to enable the hybrid ac and dc grid operation as well as meshed grid operation, and then the advanced services that ST can provide to improve the electricity grids performances in terms of the power flow control, power quality improvement, active damping and active contribution to improve distribution grid resilience by means of enabling autonomous microgrids operation, as well as launching a restoration procedure following a general blackout. Hence, the ST can not only increase the penetration of power electronics interfaced resources (distributed renewable energy resources, vehicle charging station) in modern electricity grids, but also improve grid reliability and safety.