

## “New Paradigm of Power System Operation and Control”

Power systems are undergoing the greatest transformation since the War of Currents (DC vs AC) was won by AC at the end of the 19<sup>th</sup> Century. Since then, power systems have been powered by large, centrally-controlled, thermal/hydro/nuclear power stations and their technical characteristics were determined by physics of synchronous machines (SM) used to convert mechanical/thermal energy into electricity. However the combined drivers of decarbonisation and reduced costs of renewables result in an increasing penetration of smaller wind/solar stations and battery energy storage systems (BESS) (jointly referred to as Inverter-Based Resources (IBRs)) which are connected to the grid asynchronously by means of power electronics (controllable inverters). This means that the overall system technical characteristics and behaviour are no longer determined by physics of SM but by control algorithms of inverters which has profound consequences for power system operation and control. The presentation will discuss those changes and compare the way Grid Following Inverters and Grid Forming Inverters can be used to address the needs of IBR-based systems. The new challenges of modelling and analysing stability of the IBR-based grid will also be discussed.