Voltage instability in microgrids with large proportion of induction motors

Vasily Chirkin

Supervisors – Federico Ibanez, Janusz Bialek

(Center for Energy Systems, Skoltech)

When power networks are stressed, much attention must be given to voltage stability problem. Voltage problems are mainly 1) voltage instability; 2) fault-induced delayed voltage recovery (FIDVR). Both are often observed in networks with significant portion of induction motors in local load. Voltage instability can evolve to the voltage collapse due to the system outages or lack of reactive power generation. FIDVR is caused by constant-torque induction motor loads, which are the single-phase motors in residential air conditioners. In microgrids, this effect is more evident due to the limited apparent power of the sources. Thus, for example, in oil rigs, start of the large machines causes voltage dip that can disturb normal motor start and lead to the outage of power supply.

In this presentation, voltage collapse phenomena will be described, state of the art in voltage instability in power networks will be discussed, and methods to detect and mitigate voltage instabilities will be shown. Skoltech Microgrid Laboratory facilities will be presented and experimental research directions will be highlighted.