This file provides a guide of initialization for dynamic simulations.

We first run the load flow provided by Simulink to obtain the steady-state solution, then apply the steady-state solution as the initialization state for the dynamic simulation. The procedure is detailed below:

1. Run load flow

"Powergui" is a Simulink toolbox which allows user to run load flow and apply the obtained steady-state solution as the initialization state for dynamic simulation. Before running the load flow, we have to specify the followings:

a. Specify the bus type and load flow power for synchronous machines

- Set one of the synchronous machine bus as swing bus and the other 9 synchronous machine buses as PV-type buses. In our simulations, we set the Generator 2 as swing bus, and the rest 9 synchronous machine buses as P-V type buses.
- Afterwards, we set the load flow power for the P-V type synchronous machines, while the swing bus synchronous machine is not required to set load flow power.

b. Specify the load flow power for asynchronous machines

To initialize the wind power plants is basically to initialize the asynchronous machines of the wind farm subsystem. However, for the type-3 DFIG wind power plants, the rotor type of the asynchronous machine has to be wound, which is not allowed when run load flow in Simulink. Here below we introduce our solution to this dilemma:

- When run load flow we changed the rotor type of the asynchronous machine to the type of squirrel-cage, which is allowed for running load flow. Thereafter, we are able to set the load flow power for the asynchronous machine. It is worth to note that the value of the load flow power should be set as negative, as it represents producing active power.
- In addition, we increase the reactive power produced by the capacitor connected with the asynchronous machine. By this means, we can make the total reactive power output of wind power plant close to zero, thus we are able to represent the characteristic of the type-3 DFIG wind power plant when execute load flow. In this context, the bus type of wind power plant is similar to P-Q type.

Note: after running the load flow and applying the steady-state as initialization state, the rotor type of the asynchronous machines should be changed back as wound. As well as for the reactive power generated by the capacitor, it should be changed back to the original value.

c. Specify the initialization load flow power for dynamic loads

The adopted dynamic load buses are P-Q type buses and are enabled to set initial active and reactive power. We specify the initialization load flow power for all the 19 dynamic loads.

2. Apply the Load Flow result (i.e., steady-state solution) as initialization state.

After obtaining the load flow steady-state, we directly apply the steady-state to the model through the "Powergui Load Flow Tool". It worth noting that in the "Powergui Initial State Tool", "force initial electrical state to steady state" must be selected.

Then you can execute the simulation model. Within 10 to 20 seconds, the simulation should gradually get into steady-state.