

# Test Systems Data for Paper “On the Feasibility Guarantees of Deep Reinforcement Learning Solutions for Distribution Grid Operation”

This file presents the description of three test systems, including IEEE 13-bus, 33-bus, and 123-bus test distribution systems, which are utilized in the simulation results section of paper “On the Feasibility Guarantees of Deep Reinforcement Learning Solutions for Distribution Grid Operation”. The original test systems are modified by adding distributed energy resources (DER) units on multiple nodes, as specified in Table 1, where photovoltaic (PV) units are non-dispatchable, with intermittent generation profiles.

Table 1: Specifications of added DER units to the test systems

	<b>13-bus Bus No.</b>	<b>33-bus Bus No.</b>	<b>123-bus Bus No.</b>	<b>max/min P (kW)</b>	<b>Capacity (kWh)</b>
<b>DG</b>	611	22	20,86,104	250/0	-
<b>ESS</b>	675	14,33	24,49,67,94,112	600/-600	3000
<b>PV</b>	-	18	39,59	150/0	-

Load and generation profiles are obtained as follows for a period of one year: For the real-time profile of demand and electricity price, the NYISO 2018 hourly data is obtained and mapped to each system by normalizing them to the total installed load. Also, the National Solar Radiation Database is used to extract hourly Global Horizontal Irradiation index in 2018 in Manhattan, NY, by which a normalized PV generation profile is created for each system. All data are provided in the accompanying database file *DB\_DRL\_Verification.xlsx*, which include the following data tabs:

- 123Bus Line Data
  - Resistance/reactance of line sections
  - Maximum power capacity of line sections
- 123Bus Load Data
  - Total active demand
  - Total reactive demand
- 33Bus Line Data
  - Resistance/reactance of line sections
  - Maximum power capacity of line sections
- 33Bus Load Data
  - Total active demand
  - Total reactive demand
- 13Bus Line Data
  - Resistance/reactance of line sections
  - Maximum power capacity of line sections

- 13Bus Load Data
  - Total active demand
  - Total reactive demand
- DER Specification
- Hourly profiles (used for all test systems)
  - Load factor (ratio of total demand in each hour of the day)
  - Energy price (c/kW)
  - Solar factor (ratio of maximum solar generation in each hour of the day)