State Estimation with Exogenous Information for Grids with Large Renewable Penetration

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This document represents an online appendix from the homonym paper. Hereby, the profiles of input demands and wind energy generation are shown. Demand active power profile is shown as follows in figure 1 and each demand is assumed to have a constant power factor.

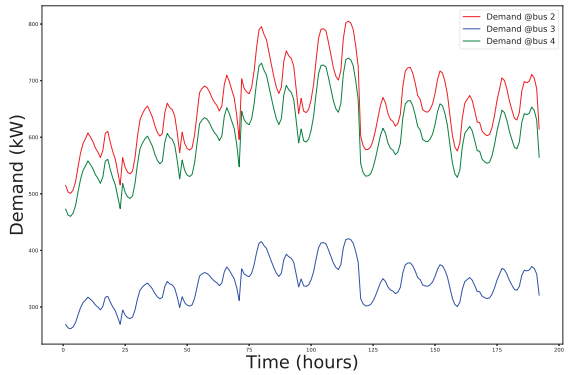

Fig. 1. Load profile for the 3 loads within the system

As seen in the above figure, demand profiles are actually scaled profiles of the same profile. The profile used is actual historical data. The reason of using historical data instead of generating some random data is to test the simulation environment in a realistic scenario.

Following in figures 2 and 3 are the wind speed profile and generated wind power respectively.

Wind speed profile used is also a historical profile. In fact, the use of historical profiles within the local scope of this work will not affect results too much, but it is useful to feed the simulation environment with realistic data in order to make easy, convenient and reasonable if dynamic state estimation (DSE) is investigated, which is something intended.

The power generation from the wind turbine data was generated to be as realistic as possible, so it can be seen that there are some constant regions within the generation profile. These regions were at wind speeds higher than 12 m/s. This resembles the pitching out that takes place with the turbine chosen as mentioned in the assumptions section.
Also it is useful to have an insight of how much wind power contribute to the total demand, this can be seen in the following figure 4

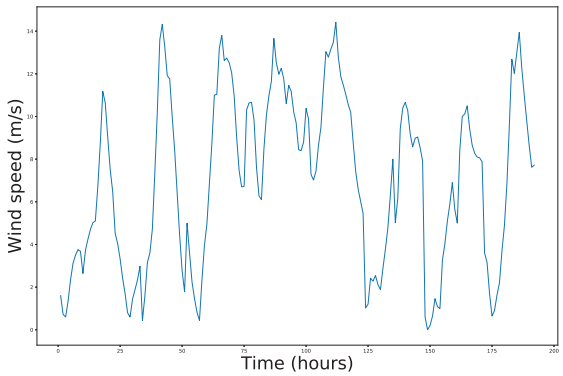

Fig. 2. Wind speed profile

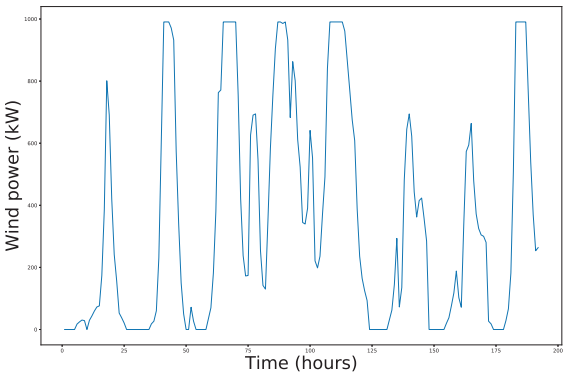

Fig. 3. Wind power profile

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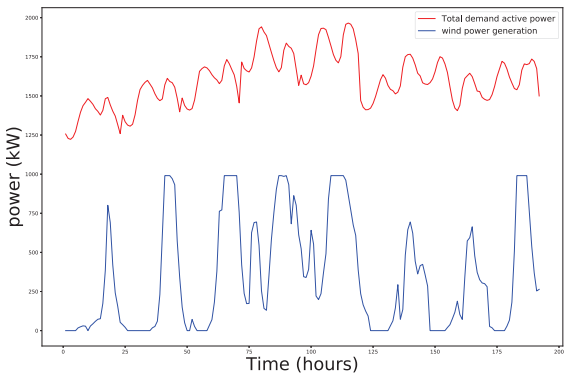

Fig. 4. Wind power and total demand