Unit Commitment under Uncertainty - GAMS Models

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I. Description of the Available Models

This repository contains GAMS code for the following day-ahead scheduling models:

- Deterministic unit commitment (file: Deterministic_UC.gms)
- Improved Interval unit commitment (file: Improved_Interval_UC.gms)
- Interval unit commitment (file: Interval_UC.gms)
- Robust unit commitment (file: Robust_UC.gms)
- Stochastic unit commitment (file: Stochastic_UC.gms)

All the formulations are lossless DC models and contain the following constraints:

- Generating unit minimum and maximum outputs, ramp limits, and minimum up and down times
- Transmission line constraints

The models are coded in GAMS environment [1]. Mathematical formulation of the constraints follows the findings on the most computationally efficient ones from paper [2].

II. Test Case Data

All the formulations has been tested using the IEEE RTS-96 [3]. The generator data, including cost curves and conditions prior to the optimization horizon, are from [2]. 19 wind farms with a total installed capacity of 6,900 MW have been added to this 73 buses, 96 generators, 51 loads, and 120 lines system shown in Figure 1. Table I lists the parameters of these wind farms. 3,900 MW of wind power capacity are located in the western subsystem, 2,400 MW in central subsystem, and only 600 MW in the eastern subsystem.

The line ratings can be changed in order to incur/relieve congestion. The models can be solved using different sets of generator constraints.

Deterministic, Improved Interval, Interval and Stochastic unit commitment models use input file Input_Data.gms, while the Robust model uses input file Input_Data_for_Robust.gms. All the input data is read from the provided input_UC_ii.xlsx file.

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TABLE I
WIND POWER PLANT DATA

Bus	Capacity (MW)	Annual utilization factor	Bus	Capacity (MW)	Annual utilization factor
101	300	35%	202	300	30%
114	300	33%	212	300	41%
116	600	35%	213	300	40%
117	600	33%	219	150	39%
118	300	26%	220	600	40%
119	600	37%	223	600	36%
120	600	38%	301	150	37%
121	300	27%	306	300	33%
123	300	36%	309	150	36%
202	150	33%			

References

[1] GAMS - A User's Guide. [Online]. Available: www.gams.com/dd/docs/bigdocs/GAMSUsersGuide.pdf.

[2] H. Pandžić, T. Qiu, and D. Kirschen, "Comparison of State-of-the-Art Transmission Constrained Unit Commitment Formulations," in *Proc. of IEEE PES General Meeting 2013*, Vancouver, Canada, July 2013, pp. 1-5.

[3] "The IEEE Reliability Test System - 1996," A report prepared by the Reliability Task Force of the Application of Probability Methods Subcommittee, *IEEE Trans. Power Syst.*, vol. 14, no. 3, pp. 10101020, Aug. 1999.

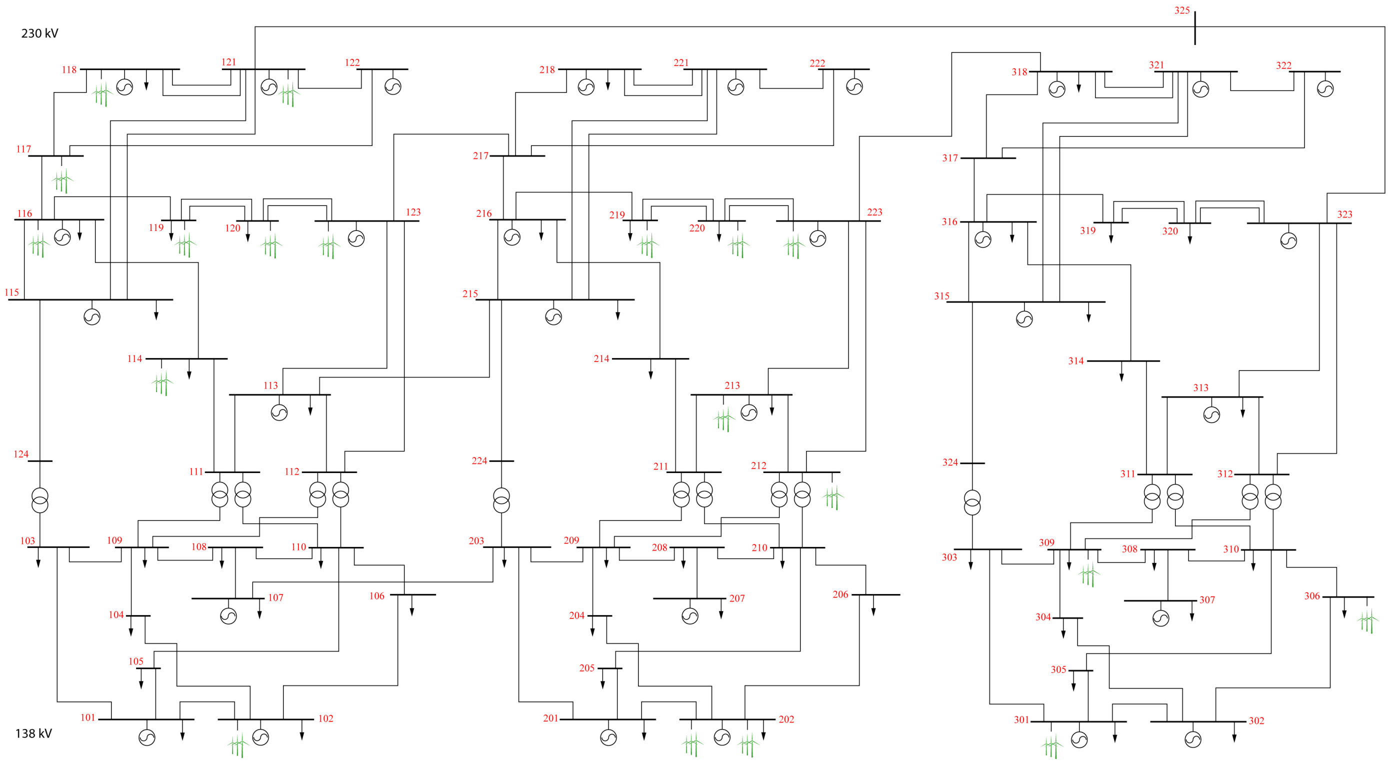

Fig. 1. Updated IEEE RTS-96.