Prague January 20th, 2020

Master thesis opponent's review

Master thesis: Multi-agent MPC protocols for micro-grid energy management and optimization

Author: Bc. Pavel Elis

Thesis supervisor: Kristian Hengser-Movric, Ph.D.

Thesis opponent: Doc. Ing. Zdeněk Müller, Ph.D.

	Rating (1 – 5) (1 = best; 5 = worst):
1. Fulfillment of assignment requirements:	1-
2. Systematic solutions of individual tasks:	1
3. Ability to apply knowledge and to use literature:	1
4. Thesis formal and language level:	1-
5. Thesis readability and structuring:	1
6. Thesis professional level:	1-
7. Conclusions and their formulation:	1-
8. Final mark evaluation (A, B, C, D, E, F):	B very good

Brief summary evaluation of the thesis (compulsory):

The thesis could be divided into 4 parts:
• In the first one the author describes microgrids (scattered RES resources, BESS energy storage, Consumers, Users), available control methods managing dispersed ESS (central energy storage management, decentralized management, multi-agent approach). This introductory part also include description of 3 different multi-agent communication models.
• The second part of thesis is in fact description of the SIMRIS test network located in Sweden (E.ON).
• The third part is detailed specification of the control structure and control parameters of the SIMRIS test network.
• The fourth part consist of analysis of the results obtained by various controller settings and their impact on the energy balance (kWh) and the price balance (EUR).

The thesis is highly topical. Authors own contribution is energy optimization of the operation of individual sub-elements based on use of predictive controller (MPC) and combination with multi-agent approach applied to measured data of real SIMRIS network. The list of references is appropriate. The thesis meet high graphic standards with minor notes only.

Notes:
Page 13, Fig. 2.3. –no description of axes (quantities or units)
Page 21, Fig 2.6 c) - why there is no "connection" of all agents, compare with text in last paragraph Page 21)
Page 22 - misprint in equation numbering (2.2 vs. 2.3)
Page 27- missing description – parameters Φ,Ψ,Q,R,Θ,S_Q,S_R
Page 30 - description of all the signals in figure is missing.
Page 39 - what is "a" and "b" in the matrix?
Page 50 - why there is no higher number of prediction horizons?

Questions:

1. Is it possible to minimize the overall network losses through multi-agent control?
2. Please create formulae F and G (page 26).

Date: 20.1.2020 Signature:

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Notes:

1) The total thesis evaluation needn't be determined by the partial evaluations average.
2) The total evaluation (item 8) should be from the following scale:

excellent	very good	good	satisfactory	sufficient	insufficient
A	B	C	D	E	F

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