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OPPONENT STATEMENT

FOR THE DISSERTATION

"Demand Side Management for Optimizing Operation of Power Grids with Renewable Energy Sources"

BY

ONDŘEJ MALÍK

Mr. Ondřej Malík has presented on the Faculty of Electrical Engineering of the CTU, Department of Control Engineering his dissertation titled "Demand Side Management for Optimizing Operation of Power Grids with Renewable Energy Sources".

The dissertation fulfills all formal requirements necessary for the defense. Especially I would like to point out the extent (161 pages including annexes and author's presentation).

It meets also publication criteria and I am pleased to see that the research of the supervisor Ing. Havel continues in projects concerning basic problems of power systems. The increase of renewable energy sources in the power balance is the phenomenon of last years and it is crucial to define the optimal way of their integration into the power grids.

The dissertation presents a new three-level management system based on the control and use of electric water boilers in households. It optimizes the power transmission and consumption in periods when this helps to improve the overall efficiency of power grids on different tension levels. The first level concerns low voltage grids, the second level – high voltage grids. The third level combines different high voltage grids in order to help the operator in load-frequency control. The objective of the control system is to improve parameters on all power grid levels and to minimize negative impacts of renewable energy sources on power systems.

This subject is very timely since the penetration of renewable energy sources has negative impact of different factors of power supply and it concerns all power grids. This is reflected among other in the bibliography of the author. The importance to solve these issues will only increase.

The goal of the dissertation is accomplished. Both in theoretical part (management system on different levels) and in presentations on international conferences. The goal of the dissertation is based on the possible move of the tariff policy into lower levels. This I consider as the crucial point since consequent measures then result from the realized power volume move. The contributions might be considered as characteristically allied and with relatively better solution in economics and technics. This field offers a lot of possibilities, including heat generation.

Its significance for research is also factual. One of the most distinct element will be exploitation of Smart Grids that will help to solve local elements of power systems. And in partial problems solving is the main contribution of the new concept.

I would like the candidate to reply the following question during the dissertation defense:

- What is the idea for continuation of sciëntific work in this field in the conditions of the Czech Republic and, more generally, in conditions of Smart Grids?
- Is the system able to integrate other DSM or other energy forms?
- What is the future of combining the DSM with technical factors of the control (quality, reliability, ...)?
- What do you think about the power accumulation? Do we pay enough attention to this feature?

Based on the above mentioned, I recommend this doctoral dissertation for defense and I recommend, after the successful defense, to award the Ph.D. title.

In Prague, December 27, 2016

Prof. Ing. Jiří Tůma, DrSc.