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EVALUATING THE PERFORMANCE OF A NOVEL MARKET CLEARING MECHANISM FOR ANCILLARY SERVICES

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With the increasing penetration of renewable generation units, there is an increasing need for ancillary services. Furthermore, traditional resources are being replaced by renewable generation units, thus decreasing the available resources for AS provision [1]. In recent years, there has been an increasing interest in providing AS with non-traditional resources and often their performance is equivalent if not better than traditional resources. However, the requirements for ancillary services are often defined based on the assumption that only generators provide these services. These requirements often limit participation of non-traditional resources such as demand response even though these mechanisms offer services that are suitable to system needs. In our previous work [2], we removed such barriers in front of market participation and restructure the market in a resource-agnostic way. To ensure an unbiased evaluation of market participants, we devised a mechanism in which all resources are evaluated based on their ability to satisfy the system need measured by the quality of service definitions introduced in [3].

In this work, we apply the concepts developed in [2] and [3] to the Nordic frequency disturbance reserve in Western Denmark [4]. Doing so, we aim to show the effectiveness of the proposed methodology to capture participant performance in market clearing and remuneration. We demonstrate the market implementation in a laboratory setting at SYSLAB, DTU [5], coupling the information infrastructure and the actual physical environment. We specifically compare the market clearing results with a traditional merit-order approach and

evaluate resource selection efficiency.

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REFERENCES

- [1] EURELECTRIC, "A sector in transformation: electricity industry trends and gures," Tech. Rep., Jan 2015.
- [2] D. E. Bondy, J. S. Macdonald, E. C. Kara, O. Gehrke, K. Heussen, S. Kiliccote, and H. Bindner, "Redefining requirements of ancillary services for technology agnostic sources," Arxiv, 2016.
- [3] D.E. Bondy, A.Thavlov, and K. Tougaard, Heussen, "Performance requirements modeling and assessment for active power ancillary services in view of demand response," Transactions on Smart Grid, 2016.
- [4] "Ancillary services to be delivered in Denmark tender conditions," Tech. Rep., 2012.
- [5] DTU., "SYSLAB: Technical specifications," September 2016.