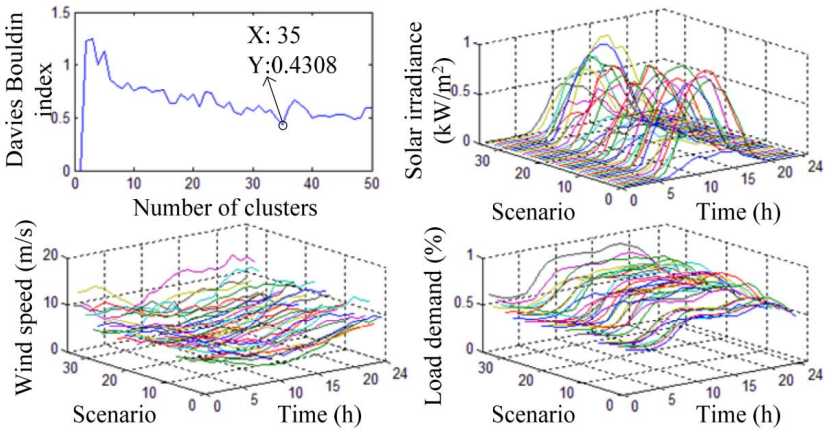
Institut für Automatisierungstechnik

Master Project
Bachelor Thesis

Multi-scenarios based stochastic models and scenario reduction for considering uncertainties in the planning of microgrids

Background Microgrids can be defined as active distribution networks that interconnect loads and distributed energy resources, and can operate in an autonomous controlled and coordinated way in either grid-connected or islanded modes. The planning problem for the size and location of distributed energy resources such as photovoltaics, wind turbines, micro-turbines, batteries etc. have to face high-level uncertainties, which have a great influence on the planning models and solving algorithms. Multi-scenario based approaches are popular techniques to deal with these uncertainties, where a number of typical scenarios are formed based on forecasting data to capture the combinations of different uncertainty factors.



Example of multi-scenario based approaches with Davies Boulding index [1]

The purpose of this master project/bachelor thesis is to crack and implement the multi-scenario modelling and backward scenario reduction techniques used in [2] and adapt the technique to known methodologies for the planning of microgrids. The master project is proposed as a pre-work for a master thesis with the used of the previously achieved knowledge and results. The products can be written down in English or German languages and the models should be developed in Matlab.

Tasks

- Study and crack the models and methodology in [2]
- Implement the scenario-based stochastic strategy to model the operation of renewable distributed generators and load demand proposed in [2].
- Implement the scenario reduction strategy proposed in [2] to reduce the computational burden.

Bibliography

[1] R. Li, W. Wang, Z. Chen, J. Jiang, and W. Zhang, "A review of optimal planning active distribution system: Models, methods, and future researches," Energies, vol. 10, no. 11, 2017.

[2] F. S. Gazijahani and J. Salehi, "Stochastic multi-objective framework for optimal dynamic planning of interconnected microgrids," IET Renew. Power Gener., vol. 11, no. 14, pp. 1749–1759, 2017.

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