Abstract

Due to an increase in catastrophic events disrupting energy supply, demand for resilient energy systems is increasing worldwide. Microgrids are described by several studies as a possible solution to enhance the resilience of the energy distribution system. The key question while designing a microgrid is the level of resilience it should possess as it directly affects the net gain from running a microgrid. This can be found out by evaluating the economic value of microgrid resilience. There is not much literature available regarding the economic evaluation of microgrid resilience from business and social welfare perspective and, this thesis aims to fill a part of the gap in the literature.

A catastrophic event causing significant loss of power will be simulated in an electrical simulation model of the microgrid. Various scenarios (e.g. increasing storage, monitoring of grid) to enhance resilience will be investigated. The resilience of the grid investigated in various scenarios will be quantified using alternative resiliency indices and economic value indicators of resilience will be evaluated. The marginal cost and benefit analysis for various scenarios of enhanced resilience will be performed and marginal cost will be compared with the customer's willingness to pay for additional resilience. This will facilitate optimal investment decisions regarding microgrids. The societal cost of added resilience will also be addressed.