A progressive contingency incorporation approach for stochastic optimization problems

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Abstract-

Reliability is a key objective in many optimal design problems. Very often this criterion is incorporated into stochastic optimization problems by introducing contingency evaluation scenarios. This results in a special problem structure where the stochastic scenarios used to describe reliability are linked to the failure of specific individual elements. This paper presents a progressive contingency incorporation (PCI) approach that takes advantage of this structure to increase efficiency. The algorithm is applied to the design of an offshore wind farm, where the electrical layout is decided, as representative of the possible advantages of PCI within power systems. The problem must determine the placement and type of cables in a collector system. Results show that time savings achieved by the PCI approach can be remarkable, reaching two orders of magnitude for the case study.

Index Terms- Circuit optimization, linear programming, power system reliability.

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