

## Hybrid Wind Solar Gas Reliability Optimization Using Harmony Search under Performance and Budget Constraints

**Authors :** Meziane Rachid, Boufala Seddik, Hamzi Amar, Amara Mohamed

**Abstract :** Today's energy industry seeks maximum benefit with maximum reliability. In order to achieve this goal, design engineers depend on reliability optimization techniques. This work uses a harmony search algorithm (HS) meta-heuristic optimization method to solve the problem of wind-Solar-Gas power systems design optimization. We consider the case where redundant electrical components are chosen to achieve a desirable level of reliability. The electrical power components of the system are characterized by their cost, capacity and reliability. The reliability is considered in this work as the ability to satisfy the consumer demand which is represented as a piecewise cumulative load curve. This definition of the reliability index is widely used for power systems. The proposed meta-heuristic seeks for the optimal design of series-parallel power systems in which a multiple choice of wind generators, transformers and lines are allowed from a list of product available in the market. Our approach has the advantage to allow electrical power components with different parameters to be allocated in electrical power systems. To allow fast reliability estimation, a universal moment generating function (UMGF) method is applied. A computer program has been developed to implement the UMGF and the HS algorithm. An illustrative example is presented.

**Keywords :** reliability optimization, harmony search optimization (HSA), universal generating function (UMGF)

**Conference Title :** ICPSE 2014 : International Conference on Power Systems Engineering

**Conference Location :** Vancouver, Canada

**Conference Dates :** August 07-08, 2014