Optimal Network Islanding & Restoration

The power systems are usually subject to disturbances which may lead to loss of synchronization between groups of generators and possibly blackouts. The system islanding refers to the condition in which some areas of the transmission or distribution system are disconnected from the main grid however the power supply continues in that region by local generating facilities. It may automatically happen after some transmission lines are tripped by local relays [1] to isolate the faulted region. The role of system operator is to optimally maintain the balance between the generation and demand in each island. The main idea is to reduce the total amount of load shedding to maintain such a balance and avoiding the blackout. There are two types of islanding namely intentional and unplanned islanding as follows:

**Intentional islanding**

It is done to determine optimal splitting points (or called splitting strategies) to split the entire interconnected transmission network into islands ensuring generation/load balance and satisfaction of transmission capacity constraints when islanding operation of system is unavoidable [1]. It is considered as an emergency response for isolating failures that might propagate and lead to major disturbances [2].


Model: **DC-based islanding + AC-load shedding**

Class: MILP

Software: CPLEX + PSAT


Model: **Piecewise linear AC islanding**

Class: MILP

Software: CPLEX


**Unplanned islanding**

This is an unplanned condition which should be avoided [7]. The islanding detection techniques are applied to reduce the risk of this event. This phenomena is due to line tripping, equipment failure, human errors and so on [8].

Morphology-based islanding detection


Optimal Network Restoration

The optimal network restoration is called to a class of actions taken by network operator to bring back the power system into its normal condition following a complete or partial collapse. Intentional system islanding can one of these actions.

Model: **Robust restoration approach**

Class: MIQCP
Class: MILP
Software: IBM ILOG CPLEX 12.5


Mixed integer second-order cone programming problem
Modelled in AMPL
Software: CPLEX


**Heuristic algorithms**

A greedy algorithm


**Particle Swarm Optimization**


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