# Real Time Reconfiguration and Multi-Level Control for Microgrid

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## Motivation
- To maintain the availability of energy to the connected loads and to interrupt the smallest portion of the microgrid under any abnormal conditions
- To minimize problems due to relatively slow reconfiguration algorithms that cannot overcome real-time dynamics following any disturbance/fault
- To improve power system reliability for sensitive loads by better multi-level control mechanism for different operating scenarios
- To optimize renewable energy and local power resources to supply local load demand

## Objectives
- To design a reconfiguration algorithm that can provides solution to maintain power to key loads
- To validate developed reconfiguration algorithms in real time before implementation using hardware in the loop setup and commercial automation controllers
- To model a microgrid that consists of DER as well as sensitive and non-sensitive loads
- To design controller that can regulate power sharing among DGs in an islanded and connected microgrid
- To design controller that can manage power exchange between grid and microgrid as well as among adjacent microgrids

## Real-Time Reconfiguration of Microgrid

### Intelligent Reconfiguration Algorithm (IRA)
- Using graph theory and genetic algorithm
- Graph Theory  
  - Model system and utilizes required matrices
- GA
  - Find optimal solution for breaker status in order to maximize served load w.r.t. load priority

### Hardware Setup
- RTDS

### 8-BUS System

### Graph Representation
- **Real-Time Result**

### Multi-Level Control for Multiple Microgrids

### Control Implementation

### Example of Simulation Results

### Summary
- Reconfiguration algorithm is fast enough in real-time to maintain maximum load under all possible conditions
- IRA can handle multi-objective functions and successfully implemented in real-time
- Droop control can share power between two parallel DGs based on their rated powers and local measurement only

## References


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