Indian Institute of Technology (IIT) Roorkee
Department of Electrical Engineering
EET-110: Power & Energy Management-II
Lab Exercise (Spring 2025–26)
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Timing: 2 hrs Date: Mar 17, 2026

Multi-Period DCOPF Code

The Northern Regional Load Despatch Centre (NRLDC) in New Delhi is preparing the optimal dispatch schedule for a critical 3-hour evening peak window ($t \in \{1, 2, 3\}$). As the sun sets, solar generation drops rapidly, and the grid demand surges due to lighting and residential loads.
To meet this demand, the grid relies on a combination of generation fleets across the $\mathcal{N}$-bus network. On one hand, massive pit-head coal thermal plants (e.g., NTPC Singrauli) provide cheap base-load power but possess highly restrictive mechanical ramp rates, meaning they cannot change their output quickly. On the other hand, Himalayan hydro stations (e.g., NHPC Bhakra) can ramp up and down almost instantaneously to meet sudden load changes, but they carry a higher dispatch opportunity cost to conserve reservoir water.
Formulate the complete Multi-Period DCOPF for NRLDC optimization problem to minimize the total generation cost over the 3-hour window. **Given Data:**

- $\mathcal{G}$: Set of all generators, with each generator i located at a specific bus.
- $\mathcal{L}$: Set of all transmission lines; c_i: Linear generation cost coefficient for generator i (₹/MW).
- $D_{n,t}$: Forecasted active power demand at bus n during time period $t \in \{1, 2, 3\}$.
- $P_i^{\min}, P_i^{\max}$: Minimum & maximum generation capacity of generator i (MW).
- RU_i, RD_i: Ramp-up & ramp-down limits of generator i between consecutive hours (MW/hr).
- $P_{i,0}$: The known, fixed initial generation of generator i exactly at $t = 0$ (before peak window starts).
- B_{nm}: The DC power flow susceptance parameters between buses n and m.
- $F_l^{\max}$: Thermal capacity limits of transmission line $l \in \mathcal{L}$.

Now assume that the NRLDC has made a model same as case30.m `https://github.com/MATPOWER/matpower/blob/master/data/case30.m` where ramp rates are given as 1% of $P_i^{\max}$ per min. Additionally, daily demand profiles (unscaled) can be found `https://psquare-lab.github.io/assets/pdf/EET110/Daily_Demand_Profile.xlsx`