Distribution System(DS) and Transmission System(TS) Bilevel Optimization

This work compares the ISO’s approach to optimize the system with the bilevel optimization approach.

**ISO’s approach**: the distribution system and transmission system is optimized together, specifically all the cost terms are in one objective function, the objective is to optimize the total cost of the whole system.

**Bilevel approach**: the transmission system and distribution system are two optimization problems with their own objective functions. It is like a leader-follower game. The TS(upper level problem) is the leader and set the DS energy import and demand response(DR) price. The DS(lower level problem) responds to the price by specifying the energy import and DR quantity.

Preliminary results:

Case 1: “bilevel” is the bilevel optimization

Case 2: “traditional” is the ISO’s current approach

Case 3: “traditional with network” is the ISO’s approach with the DS network

As we could see, the bilevel approach s