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Tight and compact MILP formulation of start-up and shut-down ramping in unit commitment

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Abstract-

This paper presents a Mixed-Integer Linear Programming (MILP) formulation of Start-Up (SU) & Shut-Down (SD) power trajectories of thermal units. Multiple SU powertrajectories and costs are modeled according to how long the unit has been offline. The proposed formulation significantly reduces the computational burden in comparison with others commonly found in the literature. This is because the formulation is i) tighter, i.e. the relaxed solution is nearer to the optimal integer solution; and ii) more compact, i.e. it needs fewer constraints, variables and non-zero elements in the constraint matrix. For illustration, the self-Unit-Commitment problem faced by a thermal unit is employed. We provide computational results comparing the proposed formulation with others found in the literature.

Index Terms- Mixed-integer linear programming, start-up & shut-down ramps, thermal units, unit commitment.

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