

## **Integrating Price Responsive Demand Into The Unit Commitment Problem**

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Abstract: This paper studies how a system operator can estimate the amount of demand which will be curtailed in each hour and that which will be shifted between any two hours based on the short-term price elasticities of the demand (PED) in each hour (i.e., own price elasticity and the associated cross price elasticities), besides finding near optimal unit commitment schedule for generators. Ideally, the system operator would want to curtail and/or shift out as much demand as possible from the hours where the generation is expensive. However, such an action may not be desirable for the demand side. In reality, the demand side suffers a penalty (e.g., cost of rescheduling a scheduled job in a factory) when the demand is curtailed and/or shifted. According to our formulation, the system operator constructs a social optimal solution based on the PED and the penalty information related to the demand side. In other words, the total utility of the demand side is maximized, while the sum of the total power generation costs and the total penalty incurred by the demand side are jointly minimized. The effect of the cross price elasticities and the penalty on the system performance will be shown through various simulations.