

# Machine learning based algorithms to dispatch multiple rapid-start units in AGC of power systems

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**Abstract—** This paper proposes a set of different alternatives of machine learning based algorithms (MLBA) - based on decision trees, neural networks and clustering techniques - to start up multiple rapid start units in AGC operation of power systems. MLBA predict at each instant if the AGC area will fulfil AGC requirements to decide whether RS units should be connected. The operation costs of the RS units (RSOC), the non-compliance time (NCT) of the control area and the non-served secondary energy of the control area (NSSE), are used as key performance indexes of each MLBA. A complete methodology is developed to choose the best algorithm to be employed by a real AGC regulating zone, comprising three steps: (a) an AGC simulation model of the regulating area to test each MLBA, (b) an optimization model to compute a reference of the ideal start-ups of the RS units under perfect information of the regulating area requirements and (c) a normalization process to monetarize NCT and NSSE. The description and tuning of the algorithms to start up multiple RS units, together with the selection and comparison methodology, will be shown for a real secondary regulation zone corresponding to an important generation company of the Spanish power system.

## Index Terms—

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