Inelligent Unified Control of Unit Commitment and Generation Allocation

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Abstract

Effective power system operation requires well-planned commitments of generating units in a planning phase combined with responsive real-time dispatching of power in an operational control phase. Typically, the unit commitment plan is determined by an optimization model that considers a single forecast for demand, fixed security constraints, and known unit availabilities. The operational controller considers actual random demand, varying security reserves, and unforeseen unit losses.

This project provides procedures that combine these tasks by integrating the planning and operating phases in a unified control framework. The emphasis in the planning phase is on considering random effects, contingencies and the values attributed to potential ending states. The emphasis on the operating phase is on considering longer term effects, recognizing conditions requiring corrective actions, searching for similar situations and potential actions and learning from both practical experience and simulated events. This report describes the general framework of this process, provides new methods for finding solutions that include uncertain loads and unit availabilities, and provides results that substantially improve upon the standard approach.
optimization routines in conjunction with intelligent searches to determine whether fundamental parameters may have changed.

In comparison to current systems, the on-line control does not simply follow a hierarchy of unit allocations in a myopic procedure. It involves a more comprehensive set of system wide responses depending on current information. These responses are built over time by searching off-line to determine the possible effects of different decisions for similar information states. Actual experience is enhanced by simulated conditions that are also consistent with given information states. As the system evolves, progressively improved decision sets form the basis of secure and efficient real-time generation.

These searches of possible on-line responses also feed into a longer term unit commitment planning part of the system. In this way, both on-line and off-line decision levels are simultaneously improved. The result is a system that is most robust to changing conditions and more efficient in its allocation.

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13 References

Bibliography


