

A state-of-the-art review on modern and future developments of AGC/LFC of conventional and renewable energy-based power systems

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ABSTRACT

This paper presents a comprehensive literature review and an up-to-date bibliography on automatic generation control (AGC)/load frequency control (LFC) of interconnected power systems integrated with conventional, renewable and sustainable energy sources. The objective of AGC is to quickly stabilize the deviations in frequency and tie-line power following load fluctuations. Various state-of-the-art AGC strategies have not been reviewed so far, hence, an appropriate review on recent AGC mechanism is indispensable. Salient points discussed and highlighted in this survey include different power system models with/without renewable sources, and integration of sophisticated concepts such as microgrids (MGs), smart grids (SGs), distributed generations (DGs), high voltage direct current (HVDC) links, and power system after liberalization. Furthermore, various examined control approaches like traditional controllers, intelligent methods, adaptive, robust, optimal, variable, soft computing, centralized and decentralized methods with their advantages and disadvantages have been pondered and compared. Further, AGC challenges with incorporation of flexible AC transmission systems (FACTS), energy storage devices and high penetration of renewable sources for modern and future power systems have been addressed. This review concludes the new control schemes namely, electrical vehicles (EVs), fractional-order (FO) based controllers, fuzzy aided controllers, and cascaded controllers with case studies. Research gaps and directions for future developments AGC of power systems are also discussed.

KEYWORDS

Automatic generation control; Energy storage devices; EVs; FACTS; Frequency stabilization; Microgrids; Renewable energy sources

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