

COORDINATION OF TARIFF AND RESIDENTIAL CONSUMPTION ON ELECTRIC POWER DISTRIBUTION BY GENETIC ALGORITHM

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Abstract

Electricity network operators are very interested by consumers' behaviour for better managing their system. On their side, the consumers want to preserve their comfort and their cost saving.

The electricity demand on residential sector has increased with the new developments in the world. The electricity distributor operators must to reinforce the power system capacity for meet this demand.

However, this solution need not only expensive investments but also increases the cost per for the costumers. Thus, the load management strategy is an innovative way for better managing their system.

Our last work [1] described a new approach to study the residential reaction for optimising the load curve on rural electric power distribution in terms of peak load reduction. A “ bi-objectif ” optimisation method has used to shift the electric heating consumption from on-peak periods to off-peak periods. With this method, the consumer reaction is to mitigate their comfort and their energy cost. The reaction of the consumers is fonction of hourly tariff variation (during one day). Then, the optimisation of this tariff variation is very important for the electric operators.

This present approach consists in optimizing the electric tariff that takes into account two news following objectifs: consumers saving (energy costs and comfort) and the network distribution profit (benefit).

Two levels optimisation are dealt simultaneously: a better consumption of consumers and the optimal tariff suggested by the electricity distributor operators.

To solve this optimisation problem, a Genetic Algorithm (GA) is used. It enables us to separate the local and total optimal solutions.

The results consist to compare consumers and operator profits with and without this optimisation of tariff. Supposing various types of consumers group (flexible, normal, not flexible) are tested on several examples.

References

[1] Gino Hadjee, Daniel Sadarnac, Frédéric Rosenstein « peak load reduction on electric power distribution by coordination of residential load management », 28 th International conference of IEAA, Taiwan, June 2005

[2] Hämäläinen R.P., Pineau P-O, Mäntysaari, Ruusunen J « Cooperative consumers in a deregulated electricity market- dynamic consumption strategies and price coordination », Energy 25 857-875, April 1999

[3] Teive, R.C.G. Vilvert, S.H.,” Demand side management for residential consumers by using direct control on the loads, Power System Management and Control, 2002. Fifth International Conference, (Conf. Publ. No. 488)

[4] Jorge, H. Antunes, CH Martins,” a multiple objective decision support model for selection of remote load control strategies” IEEE Transactions on Power Systems, 2000

[5] Jason W Black, “ Demand response as a substitute for electric power system infrastructure investments”