

The CrocodileAgent 2012: Negotiating Agreements in a Smart Grid Tariff Market

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Abstract. Power Trading Agent Competition (Power TAC) is a recently developed smart grid power market simulator that represents one competition scenario of the Trading Agent Competitions (TAC) international forum. According to the recent liberalization of power systems, the idea of Power TAC is the development of agent-based architectures which will provide realistic tests for the creation of future electric power markets. In this paper, we summarize the analysis of i) negotiating agreements in the Power TAC Tariff Market; and ii) approaches and methods that the CrocodileAgent uses to maximize its profit and balance its portfolio.

Keywords: smart grid, electric power retail, reaching agreements, power tariffs

Smart grids enable active involvement of customers in the electric power provisioning process which results in i) delivery of new end services to electric power customers, ii) increased reliability of continuous energy supply; and iii) decentralization of an electric power generation process. Consequently, smart grids should provide more sustainable and environment friendly electric power production and delivery, higher level of adjustment to customers' interest (e.g., reduction in power bills by introducing a rich set of available tariffs with different rates and various options) as well as improve electric companies' profits. However, efficient smart grid policy design is a prerequisite which will enable that the introduction of smart grids results in a winning situation for all stakeholders involved. More specifically, well-organized and robust retail market design is one of crucial challenges when creating an efficient smart grid policy. In this paper we summarize the *Tariff Market* activities of the software agent CrocodileAgent 2012, our entrant in the smart grid power market simulator Power Trading Agent Competition (Power TAC) [1].

A Power TAC broker (e.g., CrocodileAgent) makes trading decisions on the Power TAC *Tariff Market* based on the data about power consumption/production of customers in its portfolio. The CrocodileAgent 2012 models power usage (i.e., consumption, production, interruptible) for all customer types as a function of weather forecast (e.g., sunny or windy) and time information (e.g., time of day, day in a week, season, popular holiday period).

Tariff Manager, CrocodileAgent’s module responsible for *Tariff Market* activities (Figure 1), continually monitors power and cash flows and evaluates the received data to create *Tariff Specifications* which are then offered to customers on the *Tariff Market*. The CrocodileAgent 2012 replaces (i.e., supersedes) tariffs that are not profitable enough (i.e., with low or even negative difference between revenue received for selling power to tariff subscribers and cost generated by buying energy on wholesale market from generating companies and other brokers) with tariffs that have higher utility. Tariffs that show insufficient utility (e.g., tariffs with the smallest profitability) over time are revoked completely.

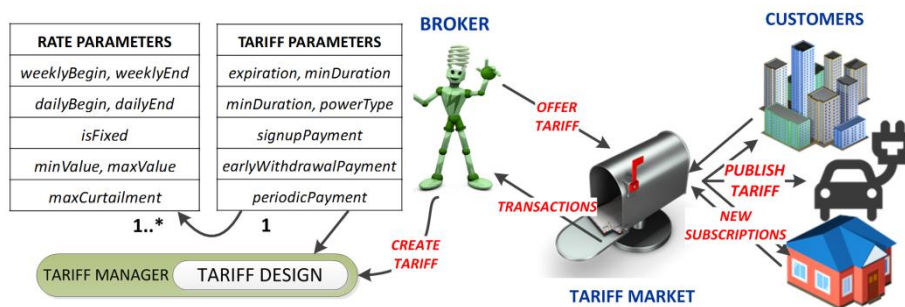


Fig. 1. CrocodileAgent 2012 activities on the Power TAC *Tariff Market*

CrocodileAgent 2012 offers four types of tariffs with different *rates* and required *parameters*: i) fixed rate during the whole day; ii) three-part rates during different parts of the day (i.e., 00-06h, 06-18h, 18-24h); iii) three-part rates with fixed daily rate that depends on the current weekday; and iv) tariffs with fixed rate during the whole duration of the tariff, but with specific, fast-profit generating parameters (i.e., periodic payment). More detailed description of the CrocodileAgent 2012 can be found in [2].

For future work we plan to improve CrocodileAgent’s customer relationship management by i) identifying different regimes (e.g., scarcity, balance, oversupply) on the *Tariff Market* in order to adjust tariff offerings to current market conditions; and ii) using reinforced learning in assessing tariff offerings.

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References

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