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IMPACT OF A MANDATORY TIME-OF-USE TARIFF ON THE ITALIAN RESIDENTIAL CUSTOMERS

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Overview

Flat rate and real time rate are two opposite methods to bill electricity consumptions: the former is very simple because it minimizes the costs of metering and billing, but it does not encourage customers to lower their consumption during high demand hours; the latter requires a complex metering infrastructure, needed to effectively link the price paid by customers in each period (e.g. hour) to the corresponding wholesale electricity market prices: this will advantage those who can respond to price signals, while other customers will face higher costs. Time-of-Use (ToU) tariffs stand in between, being based on a few time intervals, in which the price paid by the customers is fixed a priori and periodically updated (for example, in Italy, every three months). This reduces complexity, allowing at the same time a certain degree of “demand-response”.

Methods

A ToU tariff with price differentiated in two time periods was introduced in Italy in July 2010 as the standard tariff for residential users that, not having signed a contract on the free market, are supplied at the conditions set by the Italian Authority for Electric Energy and Gas (AEEG). It is characterized by variable prices of electricity depending on the hour of the day: the price is higher during “peak hours” (working days from 8:00 to 19:00) and lower during “off-peak hours” (all remaining hours).

In order to assess the impact of the new tariff on the Italian consumers (20 millions of families are currently paying their electricity consumptions according to this tariff), RSE has started a national research project on residential consumption, in collaboration and under the patronage of AEEG.

To this aim, a group composed of about 28.000 household users, statistically representative of the whole Italian population, has been selected and analyzed: their electricity consumptions have been measured by smart meters during both peak and off-peak hours and the relevant data have been acquired and made available by the corresponding DSOs with a monthly frequency. Data collection started on July 2009 (i.e. one year prior to the introduction of the mandatory ToU tariff), so as to allow for the comparison of peak and off-peak consumptions before and after the introduction of the ToU tariff.

Results

The results of the analysis show that, even if there has been a limited shift of consumption from peak hours to off-peak hours, the change in the behaviour of the users is not negligible, meaning that the ToU tariff in Italy has been capable of changing users' electricity consumption habits to a certain extent, according to the initial goal of its implementation. The values of the elasticity of consumption vs. price we have estimated are, in fact, higher than those usually found in literature, showing an unexpected attitude of users to positively respond to very small price signals.

The results also show a huge variety of customer behaviours, from those who have radically changed the timing of their consumption in order to comply with the price signals of the ToU tariff, to customers so unconcerned as to move their consumptions in the opposite direction. Several causes have contributed to limit the amount of energy shifted from peak hours to off-peak hours and this has been deeply analyzed.

Conclusions

The mandatory ToU tariff in Italy has contributed to improve the efficiency of the electricity system, moving part of the residential consumptions from peak to off-peak hours. In particular, it has shown the role of the customers in shaping their energy consumptions as active users in order to face time-dependent electricity prices.

There are, however, some aspects which should be improved, in order to make the tariff more effective: in particular the splitting between peak and off-peak hours should be revised, also considering a new time period, intermediate between peak and off-peak, and the “strength” of the price signal increased: this will induce greater flexibility in the users, encouraging them to shift more consumption towards the time when the price is lower.

References

- Borenstein, S. (2005) "The Long-run Efficiency of Real-Time Pricing", *The Energy Journal*, 26(3): 93-116.
- Jessoe, K. and Rapson, D. (2011) "Commercial and Industrial Demand Response Under Mandatory Time-of-Use Electricity Pricing", UC Center for Energy and Environmental Economics Working Paper Series, WP-023.
- Aigner, D. and Hirschberg, J. (1985) "Commercial/Industrial Customer Response to Time-of-use Electricity Prices: Some Experimental Results", *Rand Journal of Economics*, 16(3): 341-55.
- Aigner, D., Newman, J. and Tishler, A. (1994) "The Response of Small and Medium-size Business Customers to Time-of-Use (TOU) Electricity Rates in Israel", *Journal of Applied Econometrics*, 9(3): 283-304.
- Faruqui, A. and Palmer, J. (2011) "Dynamic Pricing and Its Discontents", *Regulation Magazine*, 34(3): 16-22.
- Federal Energy Regulatory Commission Staff report (2009) "A National Assessment of Demand Response Potential", prepared by The Brattle Group, Freeman, Sullivan & Co and Global Energy Partners, LLC.
- Faruqui, A. and Sergici, S. (2010) "Household Response to Dynamic Pricing of Electricity – A Survey of 15 Experiments", *Journal of Regulatory Economics* 38(2): 193-225.