

# Optimal subscription of electricity contract

David Wu<sup>1,3</sup>, Viet Hung Nguyen<sup>1,2</sup>, Michel Minoux<sup>1</sup> and Hai Tran<sup>3</sup>

<sup>1</sup> LIP6, Sorbonne University, 4 place Jussieu, 75252 Paris, France

<sup>2</sup> LIMOS, Université Clermont Auvergne, 1 rue de la Chebarde, 63178 Aubiere, France

<sup>3</sup> Energisme SAS, 88 avenue du Général Leclerc, 92100, Boulogne-Billancourt, France

*{david.wu, hung.nguyen, michel.minoux}@lip6.fr*

*{david.wu, hai.tran}@energisme.com*

**Abstract:** The use of connected meters for electricity consumption opens many possibilities of exploiting the collected historic data. In this paper, we consider the problem of finding the best subscription of electricity contract for a client based on her historic electricity consumption over a fixed period, typically a year. The monthly electricity bill is composed by some fixed cost, the cost of the subscription of the electricity contract and the penalty due to over-consuming.

The considered problem can be cast into a problem of finding the minimum of a convex separable function subject to a totally unimodular constraint matrix. The latter can be solved in polynomial time by a generic algorithm (Chubanov S., SIOPT., 26.1 (2016) pp.856-889). In this talk, we propose a special purpose iterative dual algorithm called Optim.SP which has a better time complexity than the generic algorithm. Moreover, we present numerical results showing that Optim.SP meets our industrial requirement, namely optimal solutions should be computed instantly for real-world data. For the latter, we observe an average gain of about 4% on electricity bills. Finally, we present a tentative of applying Optim.SP on a prediction of consumption based on the historic data. To obtain this prediction, we consider data as time series on a model using the Loess Seasonal and Trend decomposition (Cleveland R. B. et al., JOS, 6.1 (1990): 3-73.). We also discuss the robustness of the solutions given by Optim.SP in this case.