

## Abstract

## Introduction

General Explanation of the main problem and introduce the different approaches. Explaining the principal mathematics used in the paper to introduce the following sections properly. Explaining the Generous and Stingy versions of the spot price. (Generous — > dispatched generators are paid the unit price of the most expensive loaded generator = spot price, Stingy — > each competitor receives as a unit price for his services the amount charged by himself ?)

In a wholesale electricity market ruled by a bidding mechanism where all generators want to maximize their profit but are supervised by a system operator that wants to minimize social expenses, strategies optimising a companies' profit are complicated problems. In Fampa's paper, he presents two different approaches to the problem: The first is an heuristic technique considering a generous dispatching. The second is a MIP that he will use to find the optimal solution and validate the heuristic approach. In this paper we'll introduce a MIP variant which considers that a competitor can use his generators as a group instead of an instance and therefore translate the problem in a linear one. *Maths*

## Presentation of the different approaches

Present Fampa's approaches using heuristics and MILP and trying to summarize Main paperwork.

## New Formulation of the problem Fampa

Explain the main difference

## Proposition - optimal bid price

Short text introducing the proposition

## Proof

Introduction to the proof with the comparison of our price bid to the precedent and following one. Then explaining why the profit either increases or stays equal by comparing all the possibilities. Good idea to introduce graphics for better understanding ? Explaining the use of the two new binary variables to our model and rewrite the model with those variables. Showing that we face a problem with 2 of the inequalities (they are non-linear) and the solution (proof the solution with a matrix cf reunion Etienne). Finally give a quick conclusion to this formulation.

## Shortest Path Algorithm

Explain how it's a relaxation of the problem, introduce new variables needed

## 1st proposition - impact on profit

Short text introducing the proposition with the visuals to help understand

## Proof

For a given scenario, let's compare the of the 3 different possibilities. End with a short conclusion with the huge  $R$  function. Important Add graphics cf reunion Etienne

## 2nd proposition - Thresholds

Short text introducing the proposition and explaining the different thresholds.

## Proof

We start by explaining the thesis of the proof. We compare the 2 different cases where  $G_i$ , the cumulative bid quantities, are not at thresholds. For the second case we will discuss the dependency of increasing  $G_i$  to the next threshold with the spot price. Good idea to show the comparisons with graphs for better understanding. End with a conclusion.

## The shortest path

We will use the 2 precedent propositions to explain  $R_{max}$  solution. Explain the single bid profit function and its 3 regimes. End with a huge conclusion on the algorithm and its use. Use graphics to explain how this model can be seen as a shortest path and to explain the logic behind  $R_{max}$