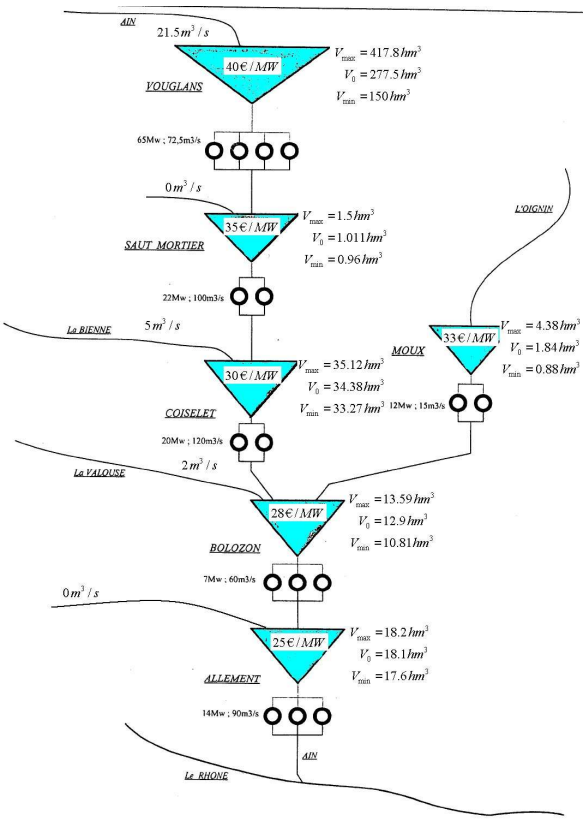
6-months internship for Master 2 students on

Decomposition and feasibility restoration for Cascaded Reservoir Management

Project topic:
The aim of the internship is to study a crucial problem in energy management: the Unit Commitment (UC) sub-problem dedicated to hydro valley management, see [1]. When continuous, such a problem is easily solved to optimality by any current LP solver. However, the introduction of combinatorial elements leads to far tougher hydro valley problems. This is especially true for some of the larger French Hydro valleys. Decomposition techniques could be employed to overcome the difficulties related to the size of the problems. However, the solutions of the resulting subproblems do not satisfy the so-called "linking constraints" that are relaxed in the decomposition step. Restoring feasibility starting from these solutions is typically a challenging task. We intend to investigate to what extent decomposition and the use of primal restoration through local branching constraints (see [2]) can be an effective tool for finding good feasible solutions for these problems. Local branching constraints are “neighbourhood” constraints that force to explore the feasible region “close” to the starting infeasible solution. For structured problems like the hydro UC a good feasible solution could lie very close to such an infeasible solution, thus this method could be very effective. Different versions of the feasibility restoration method will be studied and developed. The method will be tested on real-world instances provided by EdF. More technical details about the project can be found at [3].



References:
[1] An Overview on Mathematical Programming Approaches for the Deterministic Unit Commitment Problem in Hydro Valleys ; R. Taktak and C. D'Ambrosio ; Technical Report, submitted
[2] Local branching ; M. Fischetti and A. Lodi ; Mathematical Programming, 98: pp. 23-47, 2003.
[3] http://www.lix.polytechnique.fr/~dambrosio/poster_PGMO_LIX_EDF_2015.pdf

Required background:
mathematical programming, algorithms, coding

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