

Location of Electric Replenishment Stations for Electric Vehicles

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Electric vehicles have a very limited range. In order to be able to drive longer distances the vehicles need replenishment stations. The question is where to locate the replenishment stations. The problem can be formulated as follows. A number of daily tours for a large group of owners of electric cars are given. Each tour is represented by a set of consecutive line segments. Determine the location of a given number of electric replenishment stations such that the maximum range of an electric car is respected and such that the total deviation from the original tours given is minimized or such that the total number of electric cars served is maximized.

Two mathematical models are presented. A set covering model considering the total flow and a maximal flow capture model.

A real case from Denmark is used as test instance. The underlying graph will in this case be of size 105,000 vertices and 2200 paths. In order to solve this case an aggregation is formed. The aggregated problems are solved by CPLEX and a detailed evaluation of the actual vehicle routes is performed by a posteriori simulation.