

# Depot charging management strategies

## Master's Thesis

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## Introduction and Problem Description

A common problem in modern delivery logistics is delivery vehicle charging. Typically electric delivery trucks are parked in depots while not in use, and need to be charged either overnight or during downtime. However a depot is often limited by the grid power available, and smart management strategies must be designed in order to efficiently manage power distribution at a depot.

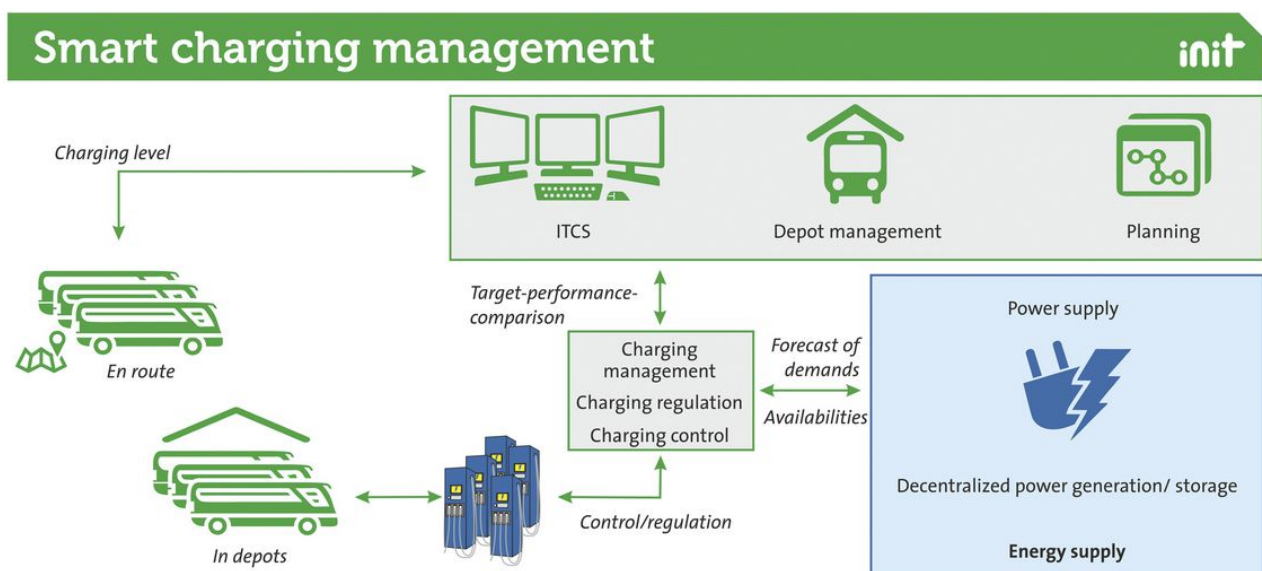


Figure 1: A diagram representing the logic of a charging management strategy.

## Task Description

The task is to design, implement and test dynamic real-time strategies to efficiently manage power distribution to electric vehicles at a delivery depot. The variables that these strategies need to take into account include:

- Global depot state
  - Total available grid power
  - Number of vehicles that need to be charged
  - Number of charging slots and their charging capacity
  - Power consumption of other processes at the depot (forklifts, building power, employee vehicle charging)
  - Price of power and available budget
- Local vehicle states

- Battery capacity of each vehicle
- Current state of charge (SoC) of each vehicle
- How long each charging vehicle has been charging
- How long each waiting vehicle has been queueing
- Upcoming delivery schedule, i.e. how soon each vehicle needs to leave the depot

Evaluation of the strategies will use [CityMoS](#), a high-performance microscopic mobility simulator developed by TUMCREATE in Singapore, using real-world delivery and traffic data and a "digital twin" of a real city.

## Requirements

- English speaker
- Familiarity with C++ and/or Python
- Knowledge of algorithm design, optimisation methods, and/or machine learning

## Recommended Literature

[Wang2020] Management strategy of an electric vehicle charging station under power limitation