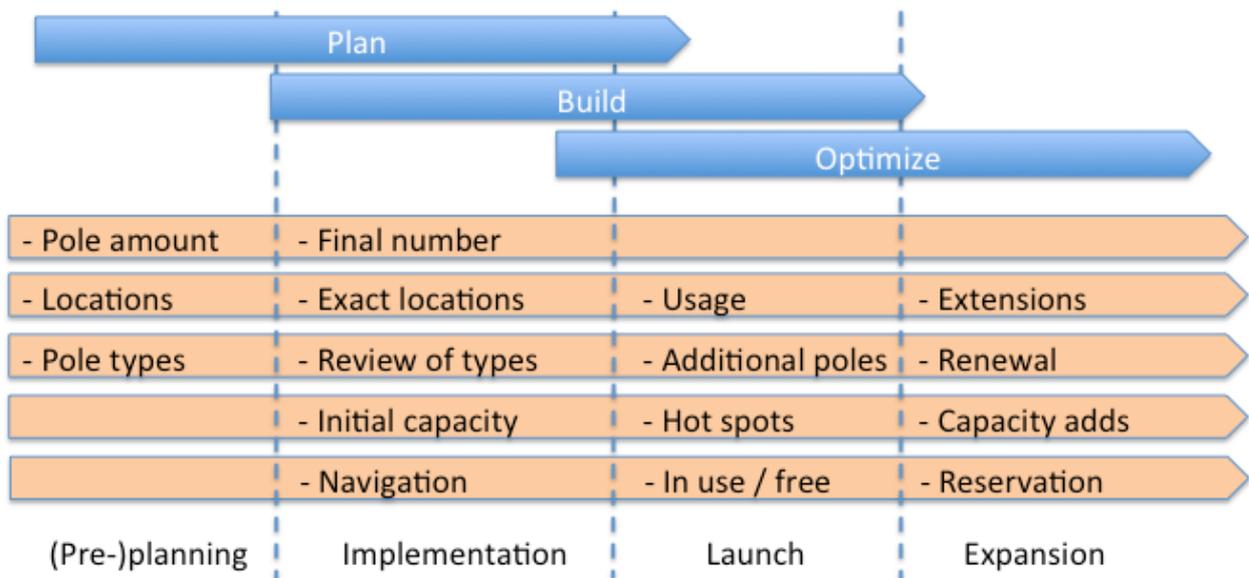


EVPlanner Product Description

Software for Intelligent EV Infrastructure Planning

Introduction

This document has been written to present the EVPlanner software developed by AC2SG Software Oy for the purposes of managing the entire process of planning and implementing an electric vehicle (EV) charging pole network. This process starts from the pre-planning work done to estimate the size of the investment and stretches to the optimization of the network. The process and the key factors in it can be illustrated with the following picture:



Charging infrastructure planning for electric vehicles is typically an iterative process that involves many different parties and points of view (pole owners, service providers/retailers, city councils, building and zoning regulators etc). The plan is never quite finished or finalized, the planning starts ahead of the investment decision or implementation. The plan becomes more concrete and accurate as the implementation starts, as new poles and pole types become available and the construction of the sites commences. Therefore the planning should be seen as a process where a lot of work is required early on and which continues for at least a year or two.

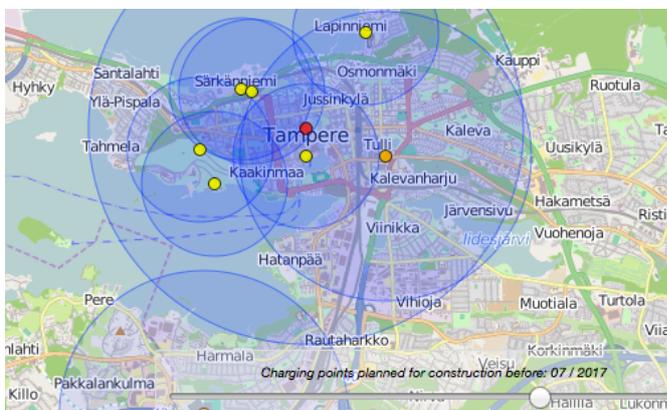
The infrastructure should be planned as a whole, rather than as a set of individual poles. This is important for ensuring that the required quality of service level is met. The key issues to address for service level planning are the geographical coverage and seamless availability of the service as well as the adequate capacity of the charging infrastructure. Taking these planning parameters into account requires insight of the geographical area in question, but that insight and knowledge can, and in most cases should, be complemented by external expert views and best practices.

High quality planning requires constant and effective communication within the planning team. While it is necessary to share the plan within the team, it is just as important to share the information with external constituents early on. Examples of these are potential customers, automobile retailers and tourists looking for charging services and poles.

EVPlanner Product Overview

The EVPlanner software has been designed to help with the challenges on infrastructure planning for Electric Vehicles (EVs). The software allows the user to place the poles on a geographical map and the key data for each pole is stored. These data are then utilized for defining the optimal configuration for the network, go through what-if scenarios and plan the timeline of the network implementation. The software allows the work to be performed by a team rather than a single individual.

The key functions of the software are: the ease of sharing the plans, centralized storage of the data, the ability to review various options for building the network as well as removing the



need for storing the information in a paper format. These contribute significantly to the quality, speed and cost of the planning. These advantages are especially important in a case where the plan is the result of work by multiple organizations and individuals.

In the first phase of the planning process (referred to above as the “Plan” phase) the key is to design the network to

conform to the needs of the users. The product has not been designed to maximize or minimize the required investment, but to produce a plan that allows a successful launch of the service by looking at the geographical coverage of the network.

In the second phase (the “Build” part of the process) the construction of the network commences and the tool assists in minimizing the construction costs for each pole by allowing more detailed planning of the pole type, model, exact location and feeder length.

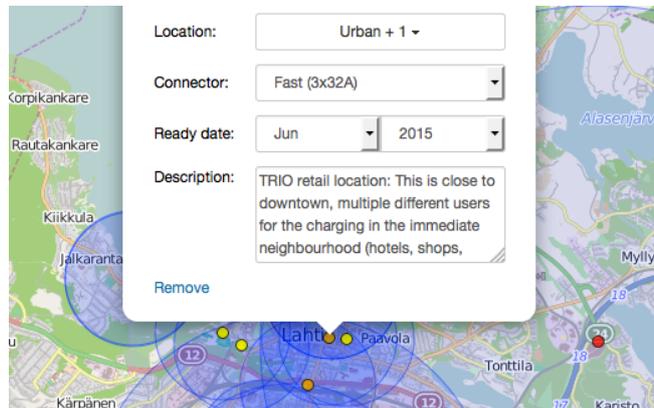
In the third phase (the “Optimize” part of the process) the focus moves to optimizing the capacity at the existing locations and extending the coverage of the service based on the measured usage of the network. In each phase of the process the software is based on supplier-independence and provides functions and features that allow the planning to start prior to the selection of the pole vendor and to optimize the investment.

Main modules of the EVPlanner software

The key functionality in the current version of the software has been presented below. The main target in the software design has been the ease-of-use and the improvement of the plan quality by allowing the data to be presented in ways that are intuitive and provide a lot of visual summary information to the user.

Basic Pole Data Storage

The basic data for each pole location includes the following information: radius of the “dominance area”, number of poles at the location, owner, location type (urban, highway etc.), pole type (DC, AC 3-phase etc), planned date for construction and a free format description of the location. The software will add the GPS coordinates of the pole location to the other data based on the placement of the symbol on the map. These data are usually modified during the subsequent phases of the planning work. Different versions of a plan can be saved to allow the comparison of alternative plans.



Pole Grouping and Viewing

Based on the data entered into the system the plan can be displayed in different ways on the map with the range indication visible or turned off to reduce the amount of data on the screen. Selected poles can be filtered out of the view to look at particular subsets of the plan and thus optimize the planning and coverage for these poles or subsets. Filtering can be done based on the pole owner, pole type and location type or any combination of these. The other main data

display feature is the construction timeline for the whole or a partial plan. This is a highly intuitive way of assessing the viability of the plan and the sufficiency of the pole capacity at various points in time during the construction.

Data Storage and Sharing

All data are stored in the tool and is saved into a plan or a series of plans with different version numbers and/or names. The most effective way of using the software is to assign a single individual or a small number of individuals to manage the updating of the plan and the sharing of the most recent data based on discussions with various constituencies involved in the process. By default the plans are shared in a read-only mode to ensure that unauthorized changes to the plan can not be made.

Data Import

The tool allows the importing of data from other tools to 1) display the existing locations in the tool 2) display competitor locations in the tool or 3) import potential charging station locations into the tool to assist in identifying suitable locations more easily and cost-effectively. Typical data for importing are gas station, restaurant or cafeteria locations. Alternatively public so called "open data" can be utilized, e.g. parking or rest area locations along highways.

Data Export

In a lot of cases the data entered into the planning tool is also needed in other IT systems, either as input for further work or simply allowing the planning data (or selected parts of it) to be used for informative purposes. The tool allows the data to be exported in .CSV file format. The export can be a complete export of all data or user-selected set.

In typical cases the data might also be further analyzed in Excel or other financial planning systems.

Key EVPlanner Advantages

The use of a software tool as a part of the overall planning process creates significant advantages and cost savings, among these are:

- Planning can be done flexibly in a team that contains different types of competences required for the planning (network planning, zoning, charging service planning, investment planning etc)
- Both internal and external resources can be used effectively and easily within the planning process
- Overall costs of the planning are reduced (less re-work) and the process is faster due to the centralized storage of information and constant updating of the data
- Sharing of the data to all different constituencies is easy, up-to-date and cost-effective

- The quality of the plan is much improved and therefore provides a better basis for the investment and strategy planning
- The tool improves the transparency of the planning process and makes discussions with external partners easier

The data are stored and structured in such a way that it can be moved easily to other IT systems. For example, all constructed sites can easily be filtered and that data moved to city council's GIS systems or sites planned for construction within the next 6 months can be moved to the construction planning system.

Typical Use Cases and Planning Needs

Preliminary Planning for Investment Decisions

This type of a plan is typically required for preliminary investment decisions or budgeting and can be done by internal or external resources. Whilst a plan can quickly be put together by a single individual, the plan needs to be reviewed by a larger team of people prior to its use as a basis for the investment decisions. By using the EVPlanner tool already at this stage of the process the data and the plan can be easily presented and modified for final decision making.

Further Planning of a Base Plan

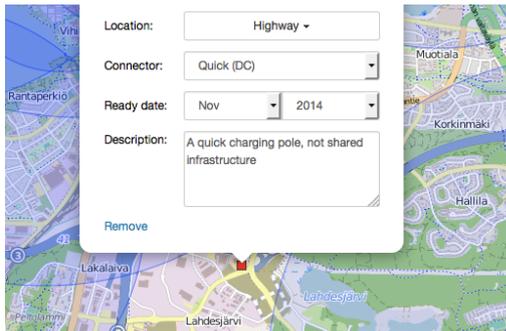
Once the preliminary plan has been accepted, this is then typically further developed and modified by a larger team. At this stage it is typical that external partners are also approached (retail chains, service stations, business parks etc). This round of discussions provides additional information on pole ownership, construction plans and overall interest in co-operation. The software is a useful tool in these discussions for presenting current plans and for modifying the plan based on the feedback.

Detailed Planning for Poles and Sites

A significant proportion of the overall cost of a site is due to the decisions made during the planning phase. Key questions to be addressed are, for example, exact location of the pole (traffic planning, grid connection etc), current network capacity and plan for the expansion of the site at a later time. These have a significant impact on the cost of the construction either now or sometime in the future. Typically the exact location of a pole is a compromise between points of view representing marketing, capacity planning, zoning regulations and costs.

Reacting to Competition and Expansions

It is likely, that EV charging poles will be constructed by multiple parties for multiple types of use cases. For example, retail chains and service stations may install poles to lure in and retain



customers. If these plans are not coordinated in any way, the service quality and level from the point of view of the end users may suffer.

Therefore one of the key principles in the planning of the pole network should be the ease-of-use for the customers and the service continuity for the end users. If the service allows the infrastructure to be shared easily, then investments can be lower. On the other hand, if the shared use requires complicated

service agreements, invoicing arrangements or multiple subscriptions it is unlikely that the other parties' poles would be used for charging.

Technical Requirements

The EVPlanner software has been designed to work with any browser and operating system (Firefox, Chrome, Internet Explorer etc). The software runs in a cloud environment and is therefore accessible from any geographical location without requiring additional software to be installed by the users.

The data is stored centrally and access to the data is managed via a password and a user ID.

Consulting Services

AC2SG Software Oy can also offer consulting services related to the infrastructure planning. The services can be tailored to fit the needs of the clients and can be flexibly delivered either locally or remotely. In addition to assisting the clients with the planning itself, services can be offered to host the software and maintain the access rights to the software.