

## User interface for Smart Charging project

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### Introduction

This document describes a project that investigates how users respond to insight about decision-making and prioritization in the smart charging process

The project serves the interests of multiple actors and is related to various projects: the Transparent Charging Station, Flexpower, the AMS Urban data and intelligence program and the Smart Mobility Action program of the city of Amsterdam.

### *Transparent charging station prototype*

The idea for a smart charging interface for the public came from the transparent charge point project. Alliander, ElaadNL and The Incredible Machine developed the world's first prototype of a 'Transparent Charging Station'. The prototype has been presented in Paris, Helsinki, Stuttgart, Eindhoven and Amsterdam and won the 2018 Dutch Design Award.

The transformation of cities into smart cities means that objects in public space become programmable and more dynamic. As more and more actors will contribute input to the algorithms, conflicts of interests will arise, and will be resolved within algorithms. For instance, an energy supplier might want to charge a vehicle at a certain time because the electricity price is low, but the grid operator might be opposed to charging because the grid at that time is overburdened. The resolution of this conflict will be programmed into algorithms. Also, situations of scarcity will arise, in which there is not enough electricity / grid capacity to charge all cars at the same time. These will be resolved by prioritization rules, which will be programmed into the algorithms that control the smart charging process.

However, algorithms that currently control smart city objects are 'black boxes': the public is affected by their decisions, but does not know what factors are taken into consideration and how they are weighed against each other to reach a decision. Goal of developing the prototype for the transparent charging station was 1) to start a discussion about the necessity of algorithmic transparency for a public debate about the rules of the game and 2) to explore what a meaningful human readable interface should look like.

### *Flexpower*

In phase 1 of the Flexpower project, Amsterdam, Elaad, Liander and Nuon developed a smart charging pilot. The pilot consists of 4 charging stations (8 charging points) and is located at the Raamplein in Amsterdam. During the pilot, the charging speed of participating cars was adapted to the availability of

the electricity grid. Only during peak hours (between 16.30 and 19.30), when other devices (such as devices in households) demand a lot of power, cars were charged slower and with less power. Currently Amsterdam, Elaad, Nuon and Liander working on a second phase of this project. In project Flexpower 2, the new type of grid connection is piloted on a large number of charging stations. The number of charge points will be increased and the algorithm that expresses grid congestion will be improved, and become more complex. Also, the City of Amsterdam intends to experiment with giving priority to shared vehicle charging demands. Visibility on the automatic decision making in the smart charging process can help the adoption of this new technology.

### *Smart Mobility Action Program*

With the Smart Mobility action program the city of Amsterdam wants to prepare for the digital mobility transition. The role of the government in communicating about smart solutions for mobility is one of the topics in this program. The smart charging interface for the public is a good example to make this question 'tangible'.

### *AMS Urban data & Intelligence Program*

In this program, AMS Institute researches, develops and advanced and novel ICT and data science technologies to quality of life in the city and work on solving urban challenges.

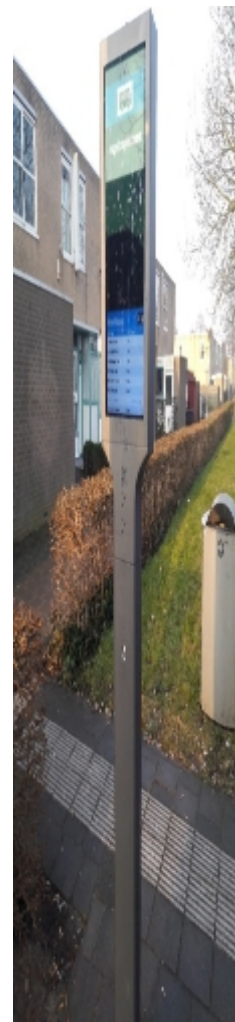
These questions are tackled while also addressing the values-for society and citizens on topics arising from these new tools technologies, such as autonomy, privacy, transparency, empowerment. The smart charging interface for the public is a the programme.

### **Goals**

- Learn how users respond to insight about decision- and prioritization in the smart charging process
- Give visibility to the Flexpower project by offering a interface of the algorithm

### **Results**

- A public monitor at the Raamplein which offers insight algorithmic decision making that controls the charging four charging stations / 8 sockets at Raamplein.
- A user-tested interface that gives meaningful insight



integrates  
improve the

related questions  
and  
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user

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sessions at the

on grid /

Figure 1 on a public monitor we will communicate about prioritization and availability in the process

connection availability, availability of local solar energy production and shared-vehicle prioritization.

- A back-office that feeds the public monitor, integrates smart charging session information from Charge point Operator and Grid operator and Municipal data sources.
- A back-office that can deliver input on shared vehicle prioritization.
- a 'sketch' of an add-on to the existing charging IT architecture in which municipality can express charging priorities for shared vehicles (and others)
  - Who manages the registry?
  - What should be registered?
- A report on the generic lessons of this project for other smart city domains (i.e. smart traffic lights, smart advertisements, etc.)
- A public monitor that shows logos of all involved parties in the project both of the Flexpower project and the user interface involved parties

### **Location**

During phase 1 of the Flexpower project, 4 smart charging stations (8 sockets) were deployed at Raamplein in Amsterdam. This location is well suited to test a User Interface for Smart charging for various reasons. Located in the city centre, there is a fair amount of public. The chargers are well-used. Also, the usage of the low voltage cables feeding this part of the city is approximating its maximum capacity.

### **Duration**

Nine months, with an intention to continue the project after evaluation with the consortium at the end of the year 2019.

### **Not in scope**

- Standardizing and communication electric vehicle charging pricing schemes
- Developing charging station hardware

### **Work packages**

#### *1 Interface research and design*

- Establish the exact algorithm that Flexpower 2 will use for smart charging
- Conduct expert-interviews / organize workshops which will inform interface design

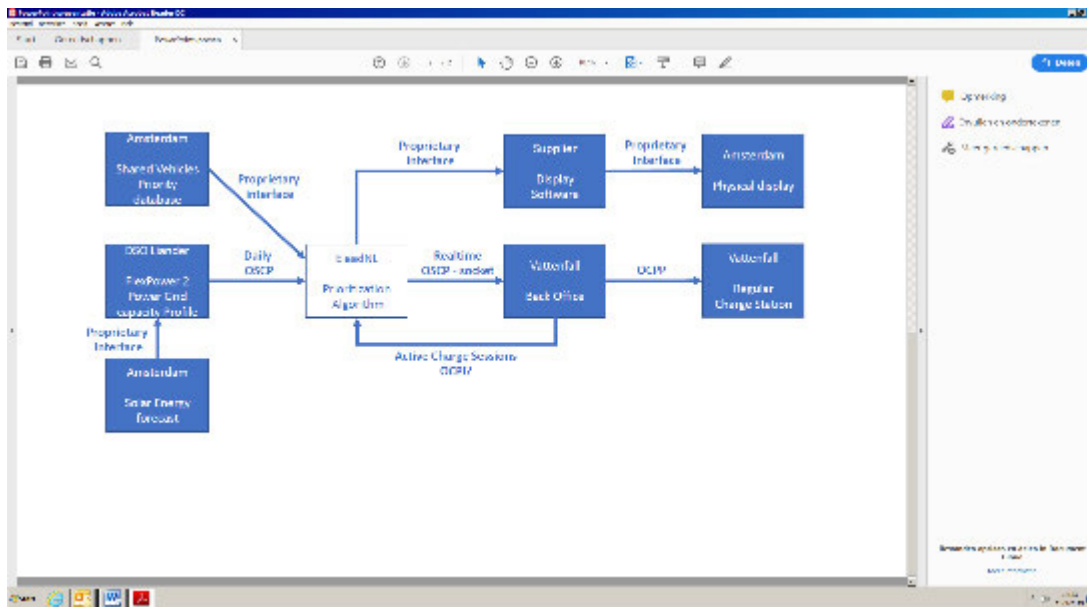
- Develop three 'rough' design sketches (non-functional graphics or MVPs): test with friendly users / steering committee
- Develop one functional interface that will be deployed in field test
- Carry out minor revisions to interface based on field test experiences during pilot.

[interface design is dependent on possibilities with available monitors, work stream 3]

## 2 Software and back office development

- Develop backoffice that integrates Charging Profile, Current Grid availability and Future Grid availability and shared vehicle priority and sends this to public monitor
- Develop back-office that manages car priorities (shared vehicle / non shared vehicle) for cars participating in pilot and sends this to CPO to incorporate in OCCP signal.
- Maintain and host server for duration of pilot (1 year)

### • Illustration 1 A sketch of the IT architecture



## 3 Hardware acquisition and deployment

- Market scan for possible monitors
- Acquisition a monitor suitable for Raamplein – conditions.
- Acquire permits and install monitor in location

- Link monitor to back-office.
- Manage monitor and hardware maintenance

#### *4 Monitoring & research*

- User-interviews at location
- Survey amongst pilot – participants

#### *5 Generic lessons*

- Establish what lessons can be learned to apply should be applied city-wide
- Organize round-tables sessions / expert interviews desk research

The city of Amsterdam is working on a strategy for its role on the smart mobility playing field. Smart charging is a use case to establish what lessons should be applied city-wide.

We organize round table sessions to gather insight on:

##### 1. Dilemmas in programming Smart Mobility applications

When a city service is scarce, prioritization is required. By using smart applications, cities need to make the prioritization beforehand and program it explicitly. It's possible to prioritize on:

- Target groups, like citizens, disabled, professionals, etc.
- Shared vehicles
- Price
- Time slots

We will discuss in a round table what the prioritization in smart charging needs to be following the coalition agreement and if the same prioritization applies for different smart applications like traffic control.

##### 3. Showcase for public dialogue on smart mobility applications

One of the leading principles in governing smart applications is transparency. Smart charging is a use case to test what that leading principle will practically imply. With citizens we will elaborate what the principle of transparency means for all smart applications and what it will require for the local government.

- [REDACTED]

#### *6 Communication*

- Press releases
- Video / animation
- Etc..

We plan to use existing communication means available with the various organizations.

## 7 Project management

- Plans project meetings
- Point of contact
- Chairs project meeting

	<b>Amsterdam R&amp;D</b>	<b>Amsterdam CTO</b>	<b>Elaad</b>	<b>AMS</b>	<b>TU Delft</b>
1 Interface research and design		<b>WP leader</b>		<b>WP leader</b>	<b>x</b>
2 Software and back office development			<b>WP leader</b>		
3 Hardware acquisition and deployment	<b>WP leader</b>				
4 Monitoring & research	<b>x</b>			<b>x</b>	<b>WP leader</b>
5 Generic lessons		<b>WP leader</b>		<b>x</b>	
6 Communication	<b>x</b>		<b>x</b>	<b>x</b>	
7 Project management	<b>x</b>	<b>WP leader</b>	<b>x</b>	<b>x</b>	

BUDGET	Amsterdam CTO		Amsterdam R&D		TU Delft		AMS
	euro	hours (in kind)	euro	hours (in kind)	euro	hours (in kind)	euro
1 Interface research and design							
2 Software and back office development							
3 Hardware acquisition and deployment							
4 Monitoring & research							
5 Generic lessons							
6 Communication							
7 Project coordination							
Subtotal							
							TOTAL