# Stakeholder Motivation Analysis for Smart and Green Charging for Electric Mobility

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**Abstract.** An innovative smart charging infrastructure is a prerequisite for the wide scale adoption of electric mobility (eMobility) to avoid intolerable demand peaks in the electricity grid, and to ensure predictable availability of charging facilities and green energy supply. Realising such a system is a cross-sectorial undertaking and concerns of a wide range of involved stakeholders must be addressed. This paper presents a stakeholder motivation analysis for smart and green charging for eMobility. The drivers, barriers, goals and requirements have been modelled using ArchiMate motivation models with input and feedback from representatives of the stakeholder groups. The work contributes with insight on how to achieve the required changes towards eMobility for core stakeholder groups, more specifically the associated drivers, barriers, goals and overall requirements. The motivation models have been the basis for the design of solutions for smart and green charging.

## 1 Introduction

The transport sector is one of the main contributors to the emission of greenhouse gasses, and a transition to electric Mobility (eMobility) is considered as a necessity for the fulfilment of European sustainability goals [1]. However, the required reduction of greenhouse gas emissions can only be achieved if the electric vehicles (EVs) are charged with green electric energy. There are however many barriers to overcome. Potential EV owners worry about where they can charge their vehicle, potential charging service providers hesitate to invest in the charging infrastructure, and property owners and the public grid may struggle to meet energy requirements when many electric vehicles are plugged in to charge at more or less the same time. In addition, the current electric energy production system is to a large extent based on non-renewable energy sources in most countries. These barriers might delay the electrification of the transport sector and may in some cases even be show-stoppers.

To cope with these challenges, the EU funded project GreenCharge (https://www.greencharge2020.eu/) aims to enable the emergence of charging infrastructures that are more available, efficient and user-friendly, facilitating more sustainable electric energy supply for the charging, and reducing the need for costly extensions to the electric grid to supply the necessary additional electric energy. In the GreenCharge proposition, digitally assisted charge planning, smart charge management, local renewable energy production, smart energy management and demand response signals from the public grid work together to facilitate a transport

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system running on green energy with acceptable investments in the electric grid. This requires cross sectorial collaboration involving business actors and supporting technical systems of the electricity supply, transport and building sectors.

The transition to eMobility and the adoption of smart and green charging will require new solutions as well as societal changes and changes affecting the roles, responsibilities and behaviour of the stakeholders involved. Thus, the work on smart and green charging must consider how to motivate different stakeholder types for the required changes. Current work for EV charging has identified stakeholders involved, but not investigated their motivations for the changes needed for the transition to eMobility. This paper takes a holistic perspective on eMobility and analyses how the affected stakeholders can be motivated for the transition. More specifically the contributions of the paper are:

- Identified drivers, barriers and goals for changes towards smart and green charging for each stakeholder type.
- High level requirements for the realisation of the necessary underpinning business models and technical systems.
- Experience with analysing, documenting and communicating the stakeholder motivations in ArchiMate motivation models [2] and the experience from an example of using motivation models as a method to capture stakeholder concerns.

The rest of the paper is structured as follows: Section 2 presents the related work. Section 3 describes the modelling approach and the process. Section 4 presents the results from the analysis, while Section 5 provides evaluation and discussion. Finally, Section 6 concludes and indicates future work.

## 2 Related Work

Standards, e.g. the pre-release of IEC 63119-1 [3], have identified stakeholders related to eMobility, and such stakeholders have also been addressed by the eMI$^3$ group[1] [4] and by work on eMobility in other initiatives, e.g. the electric vehicle charging definitions and explanations provided by the Netherlands Enterprise Agency [5]. In all these works, the charging of electric vehicles is addressed. Some links to the electricity sector are also identified.

The links between eMobility and the electricity sector, and the integration of renewable energy resources (RES), are to some extent addressed by the CIRED report on smart grids [6]. Stakeholders of relevance to energy smart neighbourhoods are addressed in the European project CoSSMic [7]. Common to all the initiatives addressed above is that drivers for changes towards smart and green charging and the specification of related requirements to systems and solutions have not been addressed in a formalised way.

Stakeholder analysis is used in many contexts, e.g. in work on business models [8] and in software engineering [9]. The latter is also of relevance to the work addressed in this paper, but in addition to the traditional identification of relevant stakeholders

[1] eMobility ICT Interoperability Innovation Group. See https://emi3group.com/

and description of their role in the system of interest typical of the work mentioned above, we have analysed drivers and barriers for the required changes for the stakeholder types in the eMobility ecosystem. Many different aspects influence decisions and willingness to change. A better insight into these aspects can be used to guide and encourage the implementation of solutions facilitating smart and green charging.

# 3 Analysis Method

The stakeholder motivation analysis is a part of the work on a reference architecture for smart and green charging [10]. The main purpose of the reference architecture is to specify the participation of relevant existing sectorial systems in the realization of the smart and green charging infrastructure in terms of modified and/or added responsibilities and collaboration patterns. The ARCADE architecture description framework [11] and ISO/IEC/IEEE 42010 Systems and software engineering — Architecture description [12] guided the work.

ArchiMate motivation model elements [2] were used to analyse and document the concerns of the stakeholders. The models show drivers, barriers to overcome, goals to be met to overcome barriers, and overall requirements to the system, and provide an understanding of stakeholder motivations and needs. The result constitutes the specification of concerns requested by ISO/IEC/IEEE 42010 as well as overall requirements.

## 3.1 Motivation Modelling

Our work identifies and analyses the need for societal changes as well as changes required by the stakeholders involved in the smart and green charging ecosystem. The ArchiMate model elements notation is used as described in Fig. 1 .

| | |
|---|---|
| Stakeholder | Relevant stakeholder types were identified. These are stakeholders playing a role in the eMobility and energy domains, as well as regulators/authorities role addressing societal aspects. |
| Driver | Drivers that motivate a Stakeholder to change in a way that facilitates a transition towards sustainable eMobility were identified. The Drivers reflect the different roles and the responsibilities of the Stakeholders. |
| Assessment | Assessments of the current situation with respect to a Driver were done with focus on the Barrier to overcome. The barriers identify possible showstoppers and factors that may delay the transition to eMobility. |
| Goal | Goals that must be met to overcome a Barrier and to meet Drivers were identified. |
| Requirement | High level requirement to solutions for smart and green charging fulfilling stakeholder goals. |

**Fig. 1** Motivation model elements – notation used

### 3.2 Approach for Initial Elaboration of Motivation Models

Relevant stakeholder types and their input on their concerns were identified through the related work on stakeholders as presented in Section 2.

An initial version of motivation models for relevant stakeholder types were established by the researchers (the authors). We did not find any literature on the stakeholder's motivations and the required changes for a transition towards smart and green charging. Thus, the researchers had to derive such information from networks and related seminars (e.g. eMobility associations) and stakeholder involvement at workshops. In addition, the GreenCharge proposition was analysed by means of scenarios describing the realization of the proposition through digital systems interacting to support different stakeholder types. The scenarios envisioned an ecosystem and clarified the needs, roles and responsibilities of the different stakeholder types. Based on these, the way the stakeholders must operates were analysed, and drivers for such behaviour were identified.

The next steps were to assess the current situation and to identify possible barriers towards achieving the drivers, and to identify the goals to be met to overcome these barriers. Starting with the goals, overall requirements to the solution for smart and green charging were also identified.

### 3.3 Workshop for Refinement of Motivation Models

Being EV owners or planning to buy an EV, the researchers making the initial motivation models knew the concerns of the EV User stakeholder type quite well. The same was the case with the Energy consumer/procumer stakeholder type since all citizens and building/apartment owners receive energy bills, and they can potentially also produce energy by installing for example solar panels. However, the initial motivation models for other stakeholder types had to be verified and refined in collaboration with representatives of the stakeholder types. All these stakeholder types are represented by the project partners.

In a workshop, the project partners were divided into groups representing different stakeholder types. After a short introduction on the notation used, the stakeholder groups were asked to discuss and suggest refinements to the model for the perspective of the respective stakeholder types. We failed to have a group representing Electric Mobility Provider (EMP) stakeholder type since the EMPs in the project group also have other roles, and they mainly joined the Charge Point Operators (CPO) group. The EMP's point of view does however to a large extent covered by the CPO and the EV User. The participants quite easily understood the models, and most participants contributed actively, and they were eager and engaged. In most cases the groups agreed on many of the statements in the initial models, but for one or more of the model elements, improvements were suggested. The public authority model was however completely remade to include perspectives not identified by the researchers. The stakeholder types represented were: Charge Point Operators (CPOs) (4 participants), Local Energy Managers (LEMs) (7 participants), Public Authorities (8 participants) and Roaming Operator (1 participant).

## 4 Results from the Analysis

GreenCharge has proposed a concept where users of electric vehicles get planning and charging support. Peaks in the power grid and huge grid investments are avoided through a balance of power. When many vehicles are plugged into the grid around the same time (e.g. on returning home from work), the local energy management balances demand with available supplies. Supplies from local renewable energy sources and the batteries of connected vehicles not in use may also be included. Roaming services are provided for seamless access to the above across different charge point operators. The GreenCharge concept also includes viable business and price models rewarding charging behaviour contributing to peak reductions.

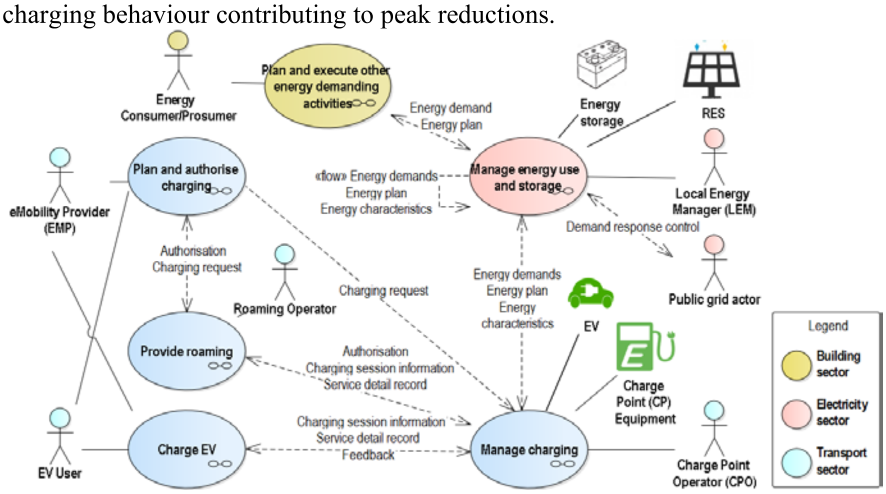


**Fig. 2** Overall use cases and stakeholders [10]

The overall functionality and stakeholder types in smart and green charging are illustrated by the use cases (ovals) and related actors (stickmen) in Fig. 2.

### 4.1 Stakeholder Types

Fig. 2 shows the main stakeholder types: EV User is driving an electric vehicle (EV) and needs charging; Energy Consumer/Prosumer is using and in some cases also producing energy; eMobility Provider (EMP) is providing EV charge services to EV Users; Charge Point Operator (CPO) is responsible for the provisioning and operation of the charge infrastructure; Roaming Operator is facilitating authorisation, billing and settling procedure for electric vehicle charge service roaming with single access and contract; Local Energy Manager (LEM) is managing optimal use of locally produced green energy and managing the use and storage of energy in a local energy community; and the Public Grid actor is managing the public grid but is not further addressed in this paper. In addition to the stakeholders in the figure, the Public Authority is making policies for the transition towards eMobility and is also addressing how the transition is to be accomplished in a Sustainable Urban Mobility Plan (SUMP). More details can be found in [10].

## 4.2 Motivation Models

The overall concerns of the different stakeholder types have been analysed through a structured approach guided by ArchiMate motivation models. For each stakeholder type, the motivations for the required changes are identified and analysed. Fig. 3 shows the motivation model for the EV User stakeholder type.

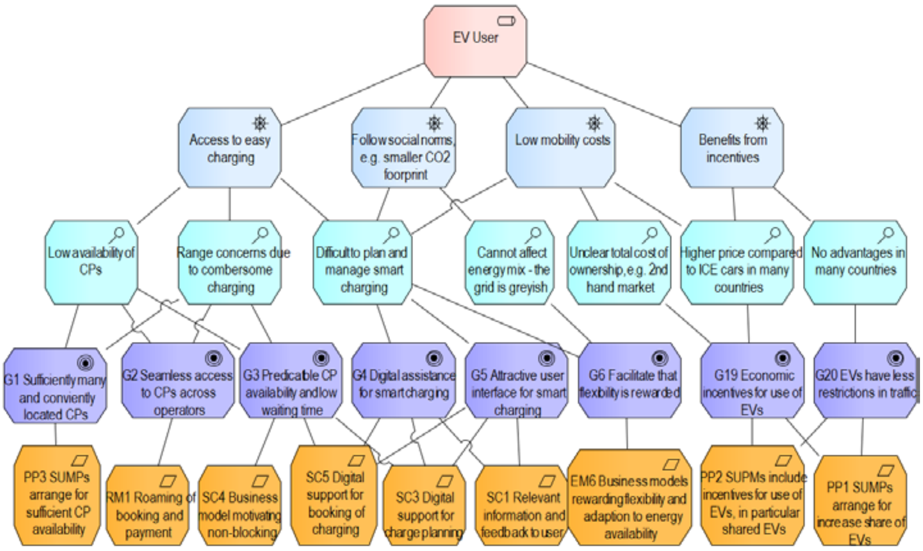


**Fig. 3** EV User motivation model [10]

The drivers, assessments and goals of the other main stakeholder types are described in Table 1, Table 2, Table 3, Table 4, Table 5 and Table 6. As illustrated by Fig. 3, several drivers may link to the same assessments. Due to this, and to avoid some of the repetitions in the tables, some assessment cells are shared between several drivers. To meet the goals, overall requirements to solutions that will resolve the concerns and thus in turn motivate the transition are defined. These requirements are summarised in Table 7, and more details can found in [10].

By establishing the link between stakeholder concerns and the requirements to the solution for smart and green charging as foreseen by the GreenCharge project, these models are meant as an aid to convince the stakeholders to engage in the necessary changes to behaviour, business models and underpinning technical systems and thus propel the transition.

**Table 1** Drivers, assessments and goals for Roaming Operator

| Driver | Assessment | Goal |
|---|---|---|
| Higher market share within roaming | Lack of new business opportunities | G16 Roaming for new EMP types (e.g. providers of charging services for electric bikes) |
| | Roaming services not adapted to new needs | G2 Seamless access to CPs across operators<br>G17 Roaming solutions for booking of CP |
| Competitive roaming service | | |

**Table 2** Drivers, assessments and goals for Public Authority

| Driver | Assessment | Goal |
|---|---|---|
| Transition towards eMobility | Not sufficient grid capacity | G10 Flexible charging adapted to energy availability |
| | Large user groups cannot use EVs | G1 Sufficiently many and conveniently located CPs<br>G21 Increased share of EVs |
| | Lack of charging points | G1 Sufficiently many and conveniently located CPs |
| Reduce land use for transport<br>Reduce local pollution<br>Reduce greenhouse gas emissions | Lack of experience and knowledge about eMobility | G23 Run living lab trials<br>G24 Simulate scenarios that cannot be tested |
| | Too many fossil cars and parking spaces | G19 Economic incentives for use of EVs<br>G20 EVs have less restrictions in traffic<br>G21 Increased share of EVs<br>G22 Increased use of shared EVs |

**Table 3** Drivers, assessments and goals for eMobility Provider (EMP)

| Driver | Assessment | Goal |
|---|---|---|
| Competitive charge service | Charging is not easy and predictable | G2 Seamless access to CPs across operators<br>G3 Predictable CP availability and low waiting time<br>G5 Attractive user interface for smart charging |
| Reduction of charging energy cost | Difficult to plan and manage smart charging | G4 Digital assistance for smart charging<br>G5 Attractive user interface for smart charging<br>G6 Facilitate that flexibility is rewarded<br>G7 Smart energy management |
| Reduce the need for costly grid extensions | Charging is not coordinated with other energy demand | G6 Facilitate that flexibility is rewarded<br>G7 Smart energy management<br>G10 Flexible charging adapted to energy availability |
| | Grid upgrade needed to accommodate peak loads | G7 Smart energy management<br>G10 Flexible charging adapted to energy availability |
| More optimal utilisation of CPs | CP capacity is not optimal or not used in an optimal way | G8 CP used according to plan and not blocked<br>G9 Digital assistance for identification of available CPs and timeslots |

**Table 4** Drivers, assessments and goals for Energy Consumer/Prosumer

| Driver | Assessment | Goal |
|---|---|---|
| Reduction of electric energy costs and CO2 | No information on possible measures and effects | G12 Increase awareness of members of energy smart neighbourhoods |
| | No incentives for adaption to energy availability | G6 Facilitate that flexibility is rewarded<br>G7 Smart energy management |
| Consume greener energy mix | Cannot affect grid mix – Energy mix is greyish | G6 Facilitate that flexibility is rewarded<br>G7 Smart energy management |
| | No energy storage | G7 Smart energy management |
| Maintenance of comfort of living | Reduces energy availability when energy is used to charge EVs | G7 Smart energy management |
| Return of investments in RES and storage | Energy from local RES and storage is not used to reduce peaks | G7 Smart energy management |
| | Investments in RES and Storage do not pay of | G29 Facilitate that investments in RES and storage are rewarded |
| Return of investment in CP | Low utilisation of CP | G30 Other EV Users pay for use of available CP capacity |

**Table 5** Drivers, assessments and goals for Local Energy Manager (LEM)

| Driver | Assessment | Goal |
|---|---|---|
| Follow social norms, e.g. smaller CO2 footprint | No incentive for local RES | G6 Facilitate that flexibility is rewarded<br>G7 Smart energy management<br>G11 Production of green energy is encouraged |
| | Cannot affect grid mix – Energy mix is greyish | |
| | Difficult and time consuming to do smart energy management | G7 Smart energy management<br>G13 Attractive user interface for energy management |
| Follow social norms, e.g. smaller CO2 footprint / Reduced energy operation costs and reduced peak demand | Energy use not adapted to energy availability | G6 Facilitate that flexibility is rewarded<br>G7 Smart energy management<br>G12 Increase awareness of members of energy smart neighbourhoods |
| Reduced energy operation costs and reduced peak demand | Grid upgrade needed to accommodate peak loads | G7 Smart energy management |

**Table 6** Drivers, assessments and goals for Charge Point Operator (CPO)

| Driver | Assessment | Goal |
|---|---|---|
| Offer effective and attractive charge management | Grid upgrade needed to accommodate peak loads | G7 Smart energy management<br>G10 Flexible charging adapted to energy availability |
| | Charging is not integrated in smart energy management | G6 Facilitate that flexibility is rewarded<br>G7 Smart energy management<br>G10 Flexible charging adapted to energy availability |
| | Charging is not easy and predictable | G2 Seamless access to CPs across operators<br>G3 Predictable CP availability and low waiting time |
| | Cannot affect EV User behaviour | G3 Predictable CP availability and low waiting time<br>G8 CP used according to plan and not blocked<br>G9 Digital assistance for identification of available CPs and timeslots |

The Goals in the motivation model are the starting point for overall requirements regarding smart and green charging, as presented in Table 7.

The overall requirements were used in the further work on the reference architecture for smart and green charging - to find and structure detailed requirements. Detailed use cases were elaborated for the overall use cases in Fig. 2, and these use cases were analysed in the contexts defined by the overall requirements to find more detailed requirements. The reference architecture [10] specifies the decomposition of the overall requirements into detailed requirements.

# 5 Evaluation and Discussion

## 5.1 Discussion of Motivation Model Content

The motivation models visualize the relations and dependencies between the above elements, and they also illustrate that drivers might be mutually dependent on each other since they are linked to the same barriers and goals.

From the motivation models in Fig. 3 and the tables in section 4.2, we see that the topics addressed by Drivers for the different stakeholder types are partly overlapping.

For citizens, represented by the EV Users and Energy Consumers/Procumers stakeholder types, the Drivers are social norms like environmental sustainability, costs and attractive incentives as well as comfort of living and easy charging. Commercial stakeholders (CPO, EMP and Roaming operator) emphasize market shares, service efficiency and service attractiveness, either through the content of the service or through the support to the fulfilment of social norms. Service providers providing solutions for smart energy management, i.e. the LEM stakeholder type, aim to fulfil social norms regarding use of green energy and to facilitate cost reductions. The Public Authorities aim for better use of space, reduction of pollution and development of policies enabling that.

The Assessments are linked to the Drivers, and different Drivers may have overlapping Assessments. The same is the case for the Goals. Many of the same Goals as well as the overall Requirements derived from the Goals are applicable across several stakeholder types, as illustrated in Table 7. For example, the overall Requirements for Smart Charging originates from the EV User, EMP, CPO, Roaming Operator and Energy Consumer/Procumer stakeholder types.

**Table 7** Overall requirements on smart and green charging

| Overall requirements | From Goals | From stakeholder |
|---|---|---|
| **Smart Charging (SC)** | | |
| Relevant information and feedback to user | G4/G5/G6 | EV User, Electric Mobility Provider (EMP) |
| Standardised terminology and content in user interfaces | G5 | |
| Digital support for charge planning | G3/G4/G5 | EV User, EMP, Charge Point Operator (CPO) |
| Business model motivating non-blocking | G3/G8/G9 | |
| Digital support for booking of charging | G3/G4/G5/G9 | |
| Sharing of private charging points | G30/G16 | Roaming operator, Energy Consumer/Procumer |
| **Local Energy Management (EM)** | | |
| Increased self-consumption from RES | G6/G7/G11 | EV User, EMP, CPO, Local Energy Manager (LEM), Energy Consumer/Procumer |
| Business models rewarding flexibility and adaption to energy availability | G6/G7/G10/ G12/G13 | |
| Energy management according to grid tariffs, local constraints and preferences | G7 | EMP, CPO, LEM, Energy Consumer/Procumer |
| Reduce peak loads | G7 | |
| Charging integrated in energy smart neighbourhood | G7 | |
| Motivating feedback on cost and emission reduction | G12/G13/G29 | LEM, Energy Consumer/Procumer |
| Easy to be rewarded | G12 | |
| Business models rewarding prosumers | G29 | Energy Consumer/Procumer |
| **Roaming (RO)** | | |
| Roaming of booking and payment | G2/G17 | EV User, EMP, CPO, Roaming Operator |
| Standardised interfaces for roaming | G2/G17 | |
| Roaming for light EV (LEV) charging | G16 | Roaming Operator |
| **Public Policy (PP)** | | |
| SUMPs arrange for increased share of EVs | G19/G20/G21/G25/G26/G27/G28 | Public Authority |
| SUMPs include incentives for use of EVs, in particular shared EVs | G19/G20/G21/ G25/G27/G28 | |
| SUMPs arrange for new eMobility services | G22/G27 | |
| Integration of eMobility into MaaS | G22/G27/G28 | |
| SUMPs arrange for sufficient CP availability | G1/ G27/G28 | Public Authority, EV User |

The input received from the real stakeholders at the workshop (cf. Section 3.3) was useful and improved the quality of the models. Table 8 shows some examples from the Local Energy Manager model. The driver statement "smaller CO2 footprint" is changed to the more generic "follow social norms", indicating that the energy management must be adaptive or configurable. The "energy mix is greyish" assessment is changed to "cannot affect grid mix", which indicates that the current grid mix may not be the problem if it can be improved. The initial goal "tariffs reward adaption to energy availability" is changed to "facilitate that flexibility is rewarded". The latter is better since the local energy management cannot affect the tariffs, but the local energy management can adapt to the tariffs if the energy user shows flexibility.

**Table 8** Example of refinements done based on input from workshop

<table>
<tr><th colspan="4">Stakeholder: Local Energy Manager (LEM)</th></tr>
<tr><td rowspan="2">Driver change:<br>Smaller CO2 footprint<br>→ Follow social norms, e.g. smaller CO2 footprint</td><td rowspan="2">Assessment change:<br>Energy mix is greyish<br>→ Cannot affect grid mix – Energy mix is greyish</td><td>Goal change:<br>Tariffs reward adaption to energy availability<br>→G6 Facilitate that flexibility is rewarded</td><td>Requirement change:<br>Easy payment<br>→Easy to be rewarded</td></tr>
<tr><td>No change:<br>G7 Smart energy management</td><td>Requirement change:<br>Optimal use of local RES and energy storage<br>→Increased self-consumption from RES<br>Avoidance of peak loads<br>→Reduced peak loads</td></tr>
</table>

The requirements were also improved. "Easy payment" was changed to "easy to be rewarded", opening for different reward mechanisms. "Optimal use of local RES and energy storage" was replaced with "increased self-consumption from RES" which is a more specific requirement. "Avoidance of peak loads" was replaced by "reduce peak loads" which is more realistic, since the peaks cannot be completely avoided.

### 5.2 Evaluation of the Usability of the Method

We used input from the workshop participants (cf. Section 3.3) to evaluate the content in the motivation models and the use of the method. At the end of the workshop, we asked all participants to fill in a questionnaire. They expressed the stakeholder type they represented, and by means of a Likert scale (with 1 for strongly disagree and 5 for strongly agree) indicated how much they agreed with the statements regarding the content of the motivation model and the usability of the motivation models.

The questions and the distribution of the answers from the questionnaire for each question is shown in Table 9. We can see that over 58% of the participants gave higher score (4-agree or 5-strongly agree – last line in table) for all the questions, even 84% for the question regarding the assessments identified. This indicates that most of them agreed that the content of the models (drivers, assessments, goals and requirements) were relevant and the use of the motivation models was a good method for analysis and description of stakeholder concerns and requirements.

In addition, one comment from the participants was that the discussion in the workshop was relevant. Due to time constraints, the workshop lasted only 2 hours. One participant commented that it "would have had more benefit from these models if we had more time to fill out the boxes ourselves (e.g. a whole day)".

**Table 9** The results of the questionnaire on the experience with the motivation models

| 1 is strongly disagree. 5 = strongly agree | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | On the content of the diagrams | | | | On the use of such diagrams | | | |
| Likert scale | The drivers identified are relevant | The assessments identified are relevant | The goals identified are relevant | The overall req. Identified are relevant | The diagram is easy to understand | The diagram is a good approach for description of stakeholder concerns | The diagram supports the identification of goals | The goals support the identification of overall requirements |
| 1 | 4 % | 0 % | 0 % | 0 % | 8 % | 12 % | 4 % | 4 % |
| 2 | 16 % | 12 % | 12 % | 8 % | 8 % | 8 % | 4 % | 0 % |
| 3 | 4 % | 4 % | 20 % | 16 % | 27 % | 16 % | 15 % | 27 % |
| 4 | 36 % | 64 % | 44 % | 68 % | 42 % | 36 % | 46 % | 54 % |
| 5 | 40 % | 20 % | 24 % | 8 % | 15 % | 28 % | 31 % | 15 % |
| **4+5** | **76 %** | **84 %** | **68 %** | **76 %** | **58 %** | **64 %** | **77 %** | **69 %** |

All workshop participants participated in the project, and we did not arrange workshops with external stakeholders. This might have influenced the scores.

The results and the usability of the motivation models are also evaluated through a validation of the overall requirements – i.e. how well they reflect what is needed and how well they support the identification of detailed requirements. The work on the reference architecture for smart and green charging supported the validation. We experienced that the overall requirements supported the definition of the detailed requirements. As far as we can judge, the resulting detailed requirements address a more holistic view upon smart and green charging than an alternative approach where requirements are derived from just the use cases.

In addition to detailed requirements linked to the overall requirements, we saw the need for additional requirements to the software solutions, such as requirements regarding availability, openness, security and privacy. We also defined requirements addressing the interfaces between the logical system components. The motivation models did not support these aspects. Thus, a separate motivation model addressing the software developer's/provider's point of view would have been needed.

## 6 Conclusions and Future Work

This paper presents the analysis of a solution for smart and green charging of EVs proposed by the GreenCharge project. The analysis focuses on the motivation of the affected stakeholders to make the changes necessary to realise and deploy it.

Furthermore, we have reported our experience with using ArchiMate motivation models as input to architecture design in the GreenCharge project. In conclusion we consider that the motivation model is a good tool to capture and communicate goals, and their relationship with high-level requirements from the stakeholders' perspective.

In a project like GreenCharge, where the adoption of the proposed solution requires cross sectorial collaboration between several stakeholder groups and coordinated changes to stakeholder behaviour, business models and underpinning technical systems, such motivation models are particularly useful to promote and coordinate the necessary changes across sectors.

The motivation models will be further improved and verified through experiments using pilot implementations and simulations. In particular, the pilots and simulations are meant to demonstrate that the derived requirements will fulfil stakeholder goals and thus convince stakeholders to contribute to the desired transition towards eMobility. Work is in progress for implementing demonstrators with various use cases in three pilots in Barcelona, Bremen and Oslo. Evaluations will be done based on data collected by the pilots and supplemented with simulations of extended scenarios using real data collected from the pilots.

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