EAEB PROJECT

Role playing Workshop - Report

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Background

The introduction of electric buses in the public transport system, generates new demands and requirements on the procurement process – i.e. managing building permits, electricity connection, coordinating chargers use and ensuring long-term cost-effectiveness among others.
The technology has started to mature, but the planning and procurement phase can slow down the advent of electric buses significantly. The complexity is also high since many actors are called to collaborate in ways which the present procurement models and business models does not necessarily support. Developing the competencies and procurement process for this transition to succeed is difficult, since no one player can decide on their own how to modify the procurement process and business models to fit electric buses.

This report is a documentation of work and research done in the field of the electrification of bus systems. The case study for this has been the local public transportation system in Gothenburg. As part of the project "Energiförsörjningsalternativ för elektrifierad bussytem" (EAEB) we had grasped how to measure he electric buses technically and how the bus operation is affected with electrification. However, that led us to realise that the main hinder for the inclusion of electric buses in the next procurement is that it is not yet known how the actors should work together to build and operate the system and most of them do not know it themselves either. Therefore, here we intend to:

1. Map the relevant actors.
2. List the barriers and research why procurement and collaboration models differ from an ordinary process.
3. Get an insight on actors' intentions and understanding of the system.
4. List the necessary contracts that need to happen among the actors.
5. Develop and co-create criteria for a successful and desirable procurement.
6. Develop three potential scenarios and evaluate them in relation to the criteria.
7. Organise and conduct a workshop where the scenarios and criteria are tested.

The EAEB project therefore wants to support a dialogue on how procurement can be run - to get a better understanding of alternative solutions - without making decisions on the issue. For that a workshop was organised and carried out with a view to organising a larger one with the participation of more actors.

Actors analysis

The actors identified playing a role in it are (per sector):

1. The Public Transport Administrator (PTA),
2. The Public Transport Operators (PTO)
3. Charging Infrastructure Operators
4. Charging Infrastructure Manufacturers
5. The Region
6. The City
7. Electricity distribution actors
8. Depots Owners
9. Electricity brokers

10. Bus Manufacturers

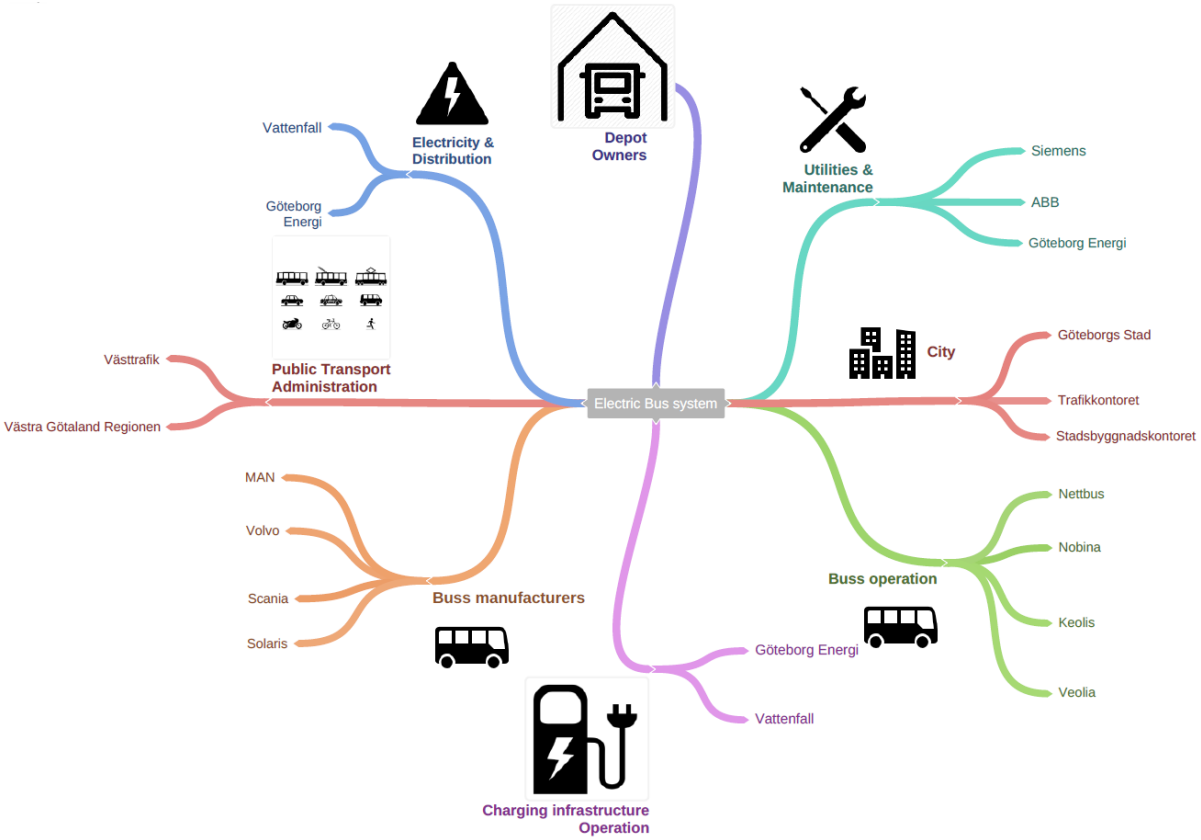

Figure 1: A stakeholder map for the electrification of the current bus system.

The work started in a largely inclusive workshop under the project “Energiförsörjningsalternativ för elektrifierad bussytem” (EAEB) where participants from most of the above-mentioned areas joined. There, among presentations and discussions about the technical hinders and issues encountered in the process of electrification of the bus system questions on collaboration, ownership and implementation of technology were also discussed through creative dialog techniques such as “World Café”. The World Café method provides an effective and flexible format for hosting large group dialogues and to ensure co-creation, where the participants can contribute to all topics of the workshop as much as possible.

The questions that encouraged dialogues among the participants were:

1. Questions:
    a. Who owns and who accounts for a 24/7 operation of a depot charger. How would this function in practice for the bus when problems arise? Is there an actor whom we miss?
    b. Who owns and who account for a 24/7 operation of a destination charger. How would this function in practice for the bus when problems arise? Is there an actor whom we miss?
    c. Depending on the answer in question no1. a. and 1. b. in which situations or combinations could we allow different bus Operators to use the chargers that belong to other Operators?
    d. How can business models look like for the bus chargers?
2. Ownership of electric buses:
    a. Should the PTA, the PTO or another actor own the buses?
    b. How can business models look like for an owner of electric buses in the public transport?

3. How would the procurement with electric buses look like with a view to reaching the national environmental goals regarding the independence from fossil fuels in the transport field in 2030?
    a. What is optimal?
        i. Procurement of individual lines? In what way?
        ii. Procurement of area? In what way?
        iii. Procurement of area? In what way?
        iv. Procurement in another way? How?
4. How do we get the electric buses on the streets as soon as possible?
    a. How is the dream scenario looking for you?
    b. How is the main hinder for realising that?
        i. Within your organisation?
        ii. From the surroundings of the system?

After the workshop and through a follow-up survey, we booked interviews with actors that wanted to collaborate in our attempt to elaborate deeper in the system.

Results from stakeholder interaction

Through the interviews, relevant literature and research a list of potential critical uncertainties was documented.

The critical uncertainties below can also be interpreted as potential barriers for the electrification of the bus system:

1. Regarding the procurement:
    - How high is the intervention by the PTA and how much flexibility is left to the rest of actors?
    - Does the PTA procure a desired technology like electric buses or do they only set the criteria of zero-emissions for example?
    - Uncertainty on how the PTA considers the eventual limitations (e.g. environmental, noise etc.)
    - Who designs the bus lines? Are they pre-decided by the PTA?
    - Preconditions before the procurement:
        - Thorough cost analysis by the PTA
        - Alignment of goals and requirements among the PTA, the City and the Region
        - Need for holistic planning for traffic management
    - Is there a need for preliminary agreements for:
        - Fair fixed pricing for charging?
        - Responsibility for operation and delays?
        - Pre-approval of building permits?
    - The `Etableringstid' duration between the end decision and the delivery of traffic depends on how much is agreed in advance.
2. Regarding the charging infrastructure:
    - Uncertainty on the ownership of charging infrastructure after the procurement
    - Uncertainty on what type of chargers are more preferable than others (e.g. destination or depot chargers)
    - Who takes the final risk of investment?
    - Should other bus operators or other actors have access to the chargers?
    - How easy is it to completely move chargers in case the traffic contract ends?
    - Who is responsible for what regarding charger breakdown or delays?

- Shared use of chargers
    - Who has the priority? Is there a need to synchronize timetables?
- Facilitation of building permits for chargers. Current lack of standardization and simplification.
- Uncertainty about the use of chargers after the traffic contract ends.

3. Regarding Buses:

- Uncertainty on the size of batteries
- Uncertainty on the second-hand value of batteries and buses
- Who owns the battery?
- There are differences in time between the date of the purchase, order and delivery for buses and chargers.

Scenarios

After listing these uncertainties that clearly influence the electrification of the bus system, the uncertainty of how high intervention the PTA applies was chosen to be analysed on a continuum (see figure 2) between the extremes of high intervention and laissez-faire with modesty being right in the middle of these two.

Figure 2: The horizontal axis expresses the continuum of public intervention before, during and after the procurement.

From these three "values" on the continuum, three possible scenarios with certain distinctive characteristics emerged (see also figure 3):

- Scenario A: `The institutional mandate'
- Scenario B: `We will green it ourselves'
- Scenario C: `Green modesty'

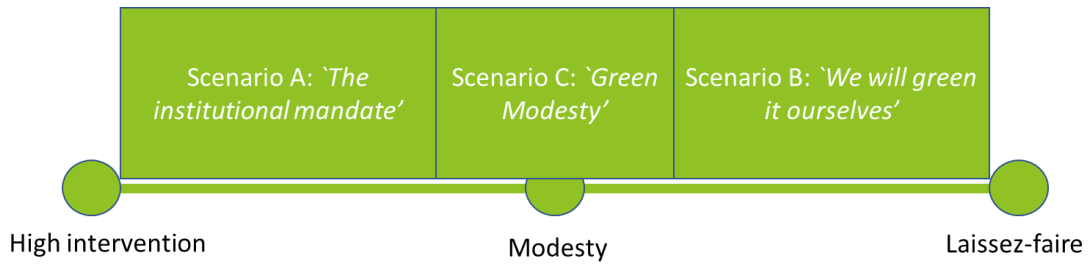

Figure 3: The three scenarios that were generated about the future of the electrification of the bus system.

Scenario A: `The institutional mandate'

On this scenario:

- The PTA pre-determines:
    - The charging points
    - The bus lines
- The PTA pre-acquires building permits
- The PTA facilitates predefined deals between the Charging Operators and Bus Operators

- Accountability for breakdowns, fixed pricing etc.
- The City/ PTA procures chargers or both chargers and operation.
  - The city/ PTA takes the risk of investment and ownership.
- The City/PTA gives out very thorough guidelines and limitations in the procurement conditions.

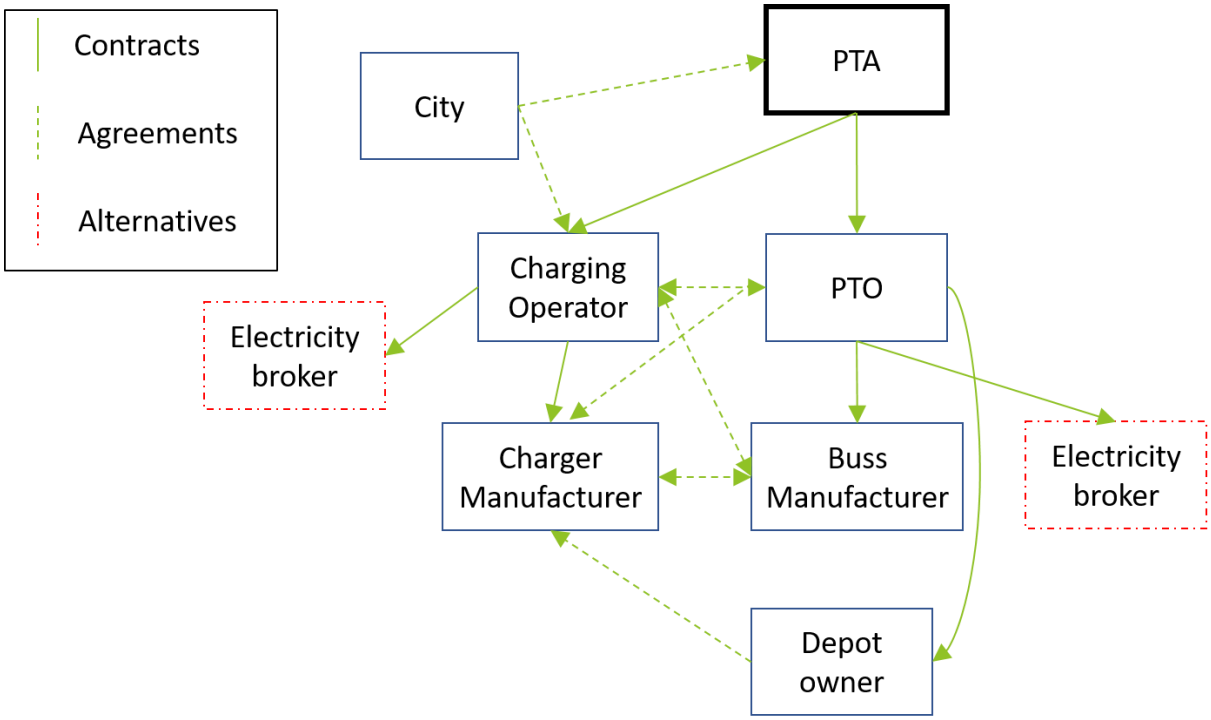

Figure 4: A simple depiction of an eventual contract flowchart in scenario A. The direction of the continuous arrows symbolizes the `purchase' by the buyer of a service/product from the supplier. The red dashed line and arrows are alternatives that may exist in the system.

Scenario B: `We will green it ourselves'

On his scenario:

- The PTA gives traffic contract as business as usual.
- Very general guidelines on environmental, technological, fuel or noise limitations.
- No building permits obtained before procurement.
- No control over the charging infrastructure from the PTA as long as the conditions are met.
- Bus operators determine and arrange the building of the charging infrastructure according to their needs.

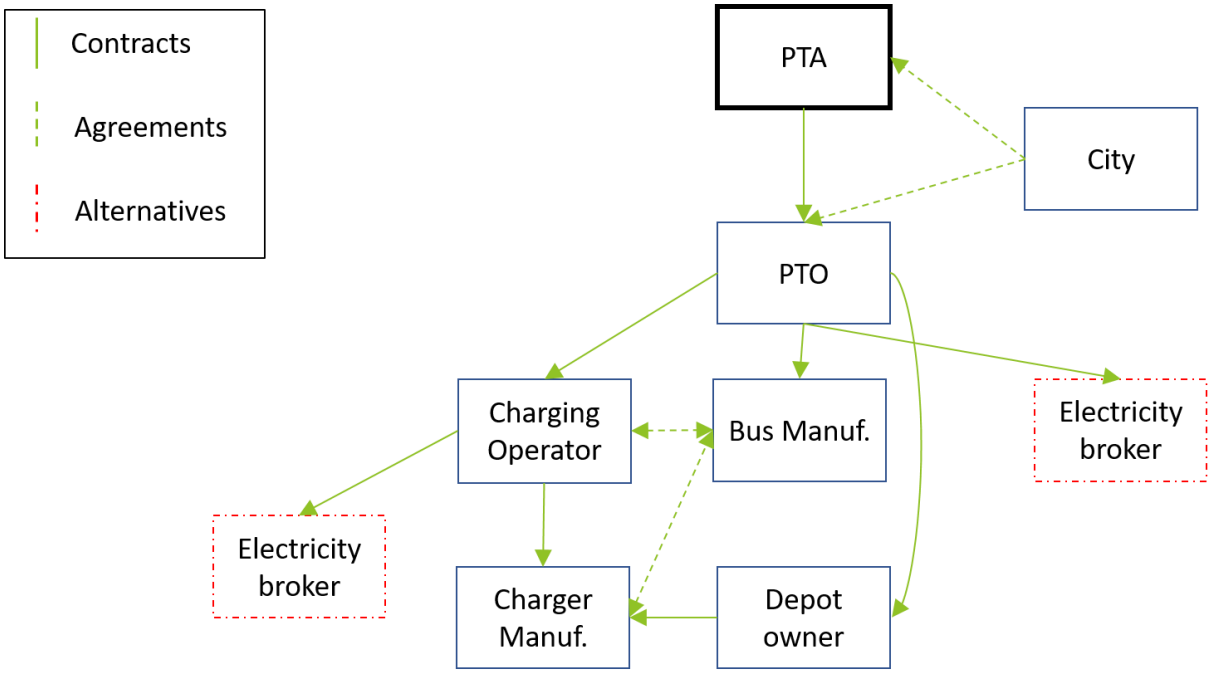

Figure 5: A simple depiction of an eventual contract flowchart in scenario B.

Scenario C: `Green modesty'

On this scenario:

- Pre-negotiated contracts for chargers are made available for PTO before tender.
- Pre-acquired limited building permits that are optionally activated from Bus operators.
- Minimum conditions for delivering electric traffic.

Role playing Workshop

In the role-playing workshop 8 participants joined representing the public transport administrator (PTA), the traffic operators (PTO), the charging operators as well as mobility research institutes.

During the workshop, the three future scenarios (described above) were presented and discussed with the representatives. During that phase of the workshop, they were called to discuss the following topics:

- What are the pros and cons for the future traffic system for each scenario?
- Discuss comments on the contract flowchart.
- Can each scenario handle both opportunity and depot charging?
- How possible is each scenario?
- How desirable is each scenario for your organization?

For the last two questions the participants were given voting cards to vote about the probability and desirability of each scenario. For that two rounds of voting took place. First, they were called to cast their vote once the question would appear to them. Then discussion and motivation around the first voting round would take place before a second final voting round would happen. This way of working was chosen by the facilitators in order to study the discrepancy on the voting results before and after the dialogue.

Subsequently criteria for a procurement process were discussed building up on an already formulated basis given by the facilitators. A dialogue followed where the facilitators and the participants co-created six main criteria. Based on these criteria eventually the scenarios were evaluated with a simple score-based system similar to the voting sessions.

The final co-created criteria for a procurement were the following:

- **Availability of tenderers:** There are enough actors who want / can bid on the contract.
- **Opportunities for optimization:** Enough opportunities for tenderers to optimize their tenders
- **Opportunities** to reuse public chargers during ongoing and earlier contracts
- **Flexibility for changes during contracts:** Flexibility for expansion and change during ongoing contracts
    - Longer use of vehicles than the tender period.
    - The process should not make it impossible for a charging solution that is cost effective
- **Clear accountability of tasks:** Clear comprehensible conditions for responsibility to know who will solve which problems.
- **Time-efficient process** in terms of duration.

Evaluation of scenarios for probability and desirability

As one can see on the charts below, scenario C was voted both the most probable and desirable scenario out of the three proposed ones. This is partly because Scenario C: `*Green Modesty'*, being the most modest of all, is also the one that gives some freedom to the actors to be flexible and design a large part of the delivery of the service of the electric buses as they want it. At the same time in Scenario C, the PTA makes sure that the minimum conditions for getting electric buses on the road are met while giving room for `self-organization' from the operators.

It is important here to note that this scenario was seen by some of the actors as a well-suited scenario for the transition phase between the conventional and electric buses. In addition, the facilitators observed no discrepancy in the results between the two voting sessions.

The results from the **second** voting are presented in the following charts.

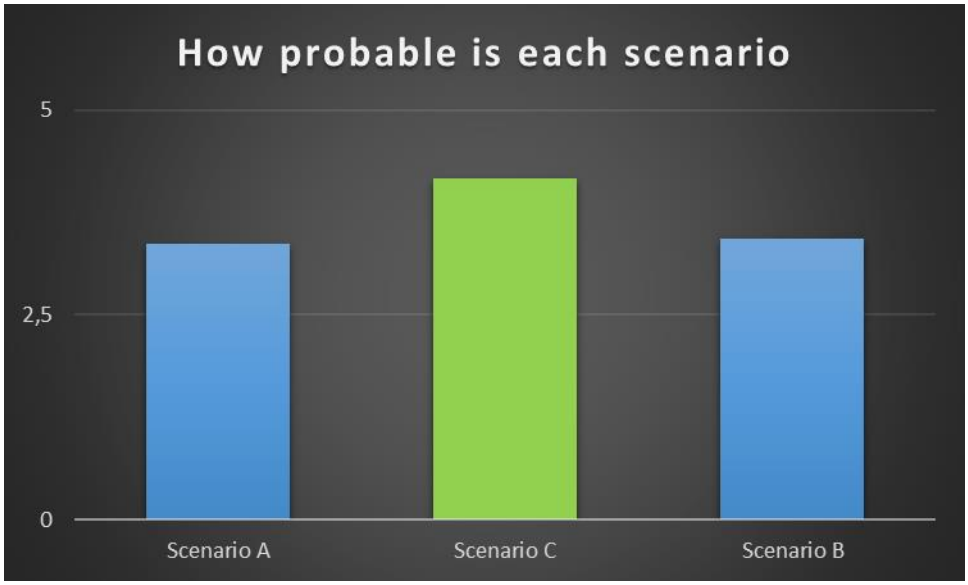

Table 1: Here it is presented how the participants voted for the probability of the scenarios. Scenario C `Green Modesty' is perceived as most probable to happen.

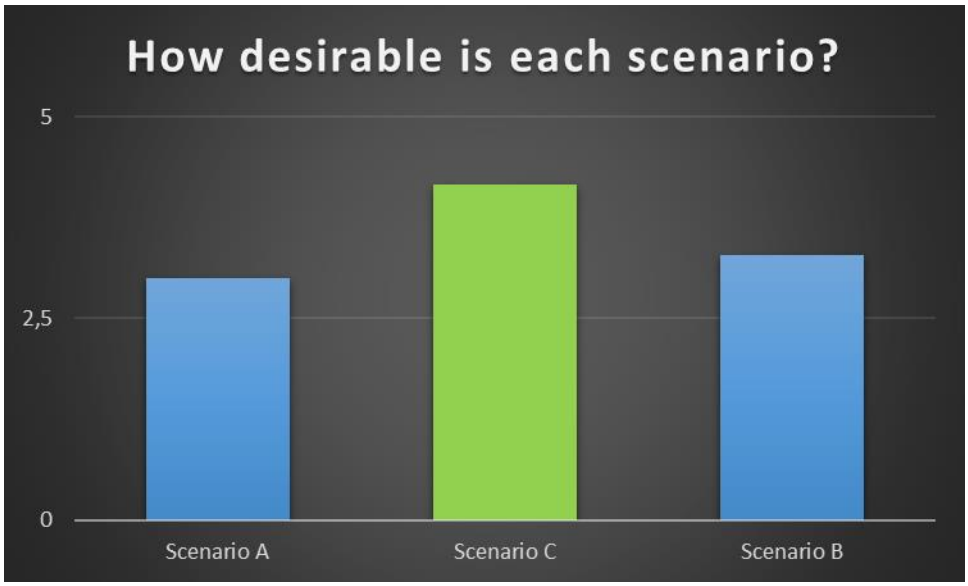

Table 2: Here the participants voted on how desirable they find each scenario. Scenario C: `Green Modesty' is the most desirable.

Evaluation of scenarios with criteria

The last part of the workshop was dedicated to the evaluation of the three scenarios based on the co-created criteria with the actors. Originally the voting session that took place was to give a clear indication of which scenario performs better or worse than the others. However, all three of them scored roughly equally on the voting process hence there was not much interest in presenting that here. Thus, it was considered more fruitful to demonstrate the criteria `range' on the scoring for each scenario as well as to highlight the criterion that performs best with the respective scenario as it is seen on the following charts.

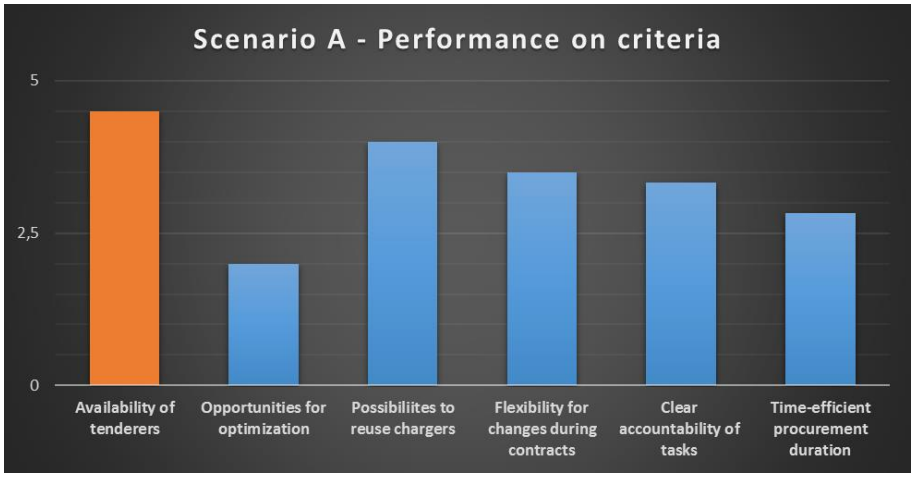

Table 3: Evaluation of Scenario A: `The institutional mandate' based on co-created criteria with participants.

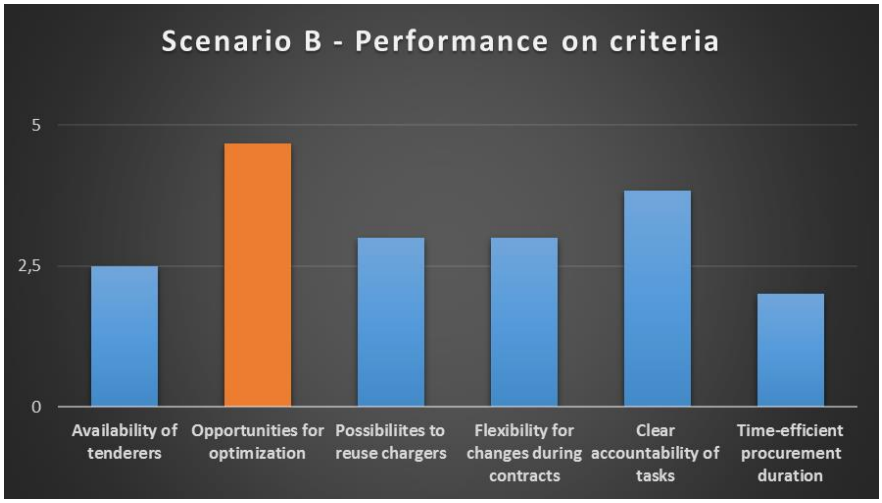

Table 4: Evaluation of Scenario B: `We will green it ourselves' based on co-created criteria with participants.

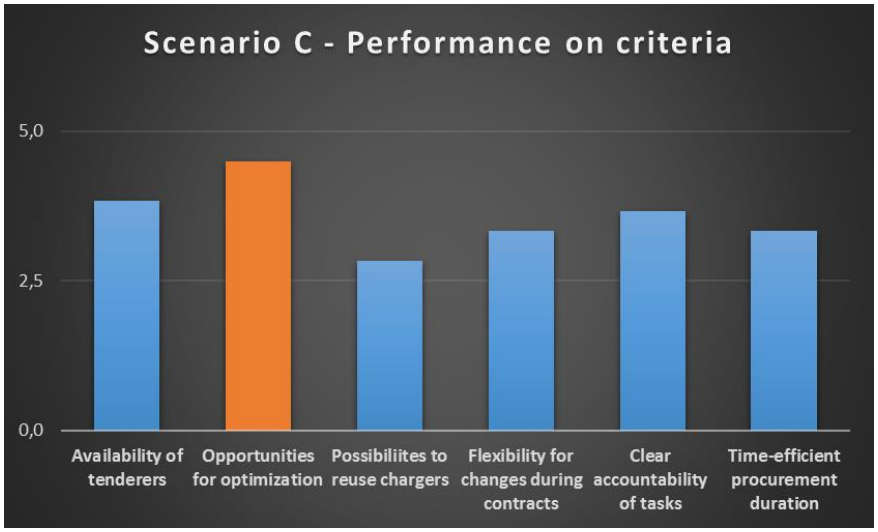

Table 5: Evaluation of Scenario C: `Green Modesty' based on co-created criteria with participants.

Conclusions and recommendations

Scenario Conclusions

- Scenario A: `The institutional mandate': is more inclusive since many actors can participate but more rigid than the other scenarios. The rigidity has limited possibilities of optimization which can be very crucial for the PTOs.
- Scenario B: `We will green it ourselves' excludes smaller PTOs or actors that are not so advanced with the strategy or planning for electromobility. Therefore, it also scores low on the availability criterion. On the other hand, since there is a lot of flexibility and room for self-organization from the actors, the opportunities for optimization in ongoing contracts are high. Hence they can take accountability for their tasks since they have designed themselves `rather than been assigned with the mandate'. In this scenario, the time is an important issue as it seems on the chart (table 4) because there is high uncertainty with how fast the building permits can be issued.
- Scenario C: `Green Modesty' gives significant possibilities for optimization from the actors but limited capabilities for reuse of chargers mainly because there are limited building permits pre-acquired early in advance. At the same time the minimum conditions for delivering electric traffic are ensured which makes the scenario accessible to smaller actors or actors who have not perfectionated a plan for electromobility. This scenario seems useful during a transition phase towards more electrified public transport system with buses.

General Conclusions

- The electrification of the bus system through procurement process is not a technological issue anymore. It is rather an issue of successful, long-term flexible planning with clear tasks in the procurement phase.
- It is evident that the actors want flexibility with **limited but not zero intervention** by the PTA in the bus system. Through the research and the workshops, it was also observed that the more rigid and predefined the procurement gets, the slower the progress may become.
- One of the most important conclusions is that one can see that even though Scenario C: `Green Modesty' was voted as the most desirable scenario by the participants, there was no such conclusion when the criteria method was applied. That shows the discrepancy between the desirability and the objectivity of the criteria. By engaging all the participants in the constructing of the criteria they were bound to co-create an objective formula that can evaluate without letting subjectivity influence the process. Hence, we are perhaps running the risk of favouring a desirable scenario but not a sustainable one. Perhaps this is because this specific scenario brings together all the different perspectives and avoids conflict as it is a modest `hybrid' version of the two other scenarios.

Next steps – Recommendations

There is still a lot of room for continuation of the research in the field, especially because of the high complexity in the system and the lack of communication among the actors involved. Here are some recommendations of further work and research:

- Detailed `road-maps' for each one of the actors (or perhaps the `core' ones: PTA, PTO, Charging Operators/Manufacturers) with actions that will be taken towards the electrification of buses, placed on a timeline. The timeline has already been defined in

this project as the whole duration from the very beginning of the procurement for busses till until after the end of the traffic contract. This continuation could also include more elaborate contract flow charts between the involved parts. For that, the initiation has been done and the case study could as well be the next procurement for busses in the city of Gothenburg.

- A larger workshop based on the energy that the research team has created with the one documented in this report. A larger variety and representation of actors especially from the Charging Operators/Manufacturers sector is recommended. A simulation of setting in sequence the necessary steps to be taken on a potential collective `road-map' (potentially similar to the one described above) during the workshop with the actors is also recommended. This way the actors realise hidden complexities but also practical issues such as synchronisation of tasks and deliveries and timing of agreements. They may also see the interdependency of their actions and analyse other actors' perspectives and needs.