USER-CHI
CHARGING YOUR E-MOBILITY FUTURE

USAGE SCENARIOS

D1.2: Usage Scenarios for validating low-medium and high range charging system

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Authors: **J. Giménez - A. López – C. Soriano**

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Author(s)	Organisation
Juan F. Giménez	IBV
Amparo López	IBV
Carol Soriano	IBV

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Abstract

USER-CHI project includes the demonstration of its products in different European cities. Although most of these products are in its early development phase, the definition of *Usage Scenarios* is a powerful tool to support this development, as allow the project team to envisage real situations and scenarios where products will be employed. On the other hand, cities where products will be demonstrated, active members of the project consortium, must reveal their interests and expectations related to these demonstrations, in order to have win - win scenarios between the hosts (cities) and the companies that are on charge of product developments (product leaders), which have requirements to demonstrate their products' innovative features. The tasks performed by the project team to define the *Usage Scenarios*, that must be the initial sketches of the demonstration tests that will be deployed in the cities during the following months, are reported in this deliverable.

Keywords

Usage Scenario, end user, intermediate user, demonstration site, city, INSOC, CLICK, INDUCAR, SMAC, INCAR, USER-CHI product, pilot test, product card, product leader, bilateral meeting, workshop.

Copyright statement

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1. Introduction

Usage Scenarios are feasible situations that can be created in the USER-CHI demonstration sites, with the aim of proving project products' innovative features. These scenarios must accomplish cities interests and product leaders' requirements to demonstrate USER-CHI products.

The use of USER-CHI products must be demonstrated under real conditions, in a controlled environment. To accomplish these demonstration requirements, we need to generate scenarios that facilitate the test of the products by certain user's profiles, in facilities located in the project demonstration sites. These scenarios, that we refer to as *Usage Scenarios*, are consequently characterised by three main attributes: a USER-CHI product, one or several user profiles and a physical location or facility.

Regarding locations and facilities, *Usage Scenarios* must be deployed in the demo sites of the USER-CHI project, which are five cities: Barcelona (AMB), Berlin (BER), Budapest (BUD), Rome (RSM), and Turku (TUR). Therefore, the cities must be involved in the definition of *Usage Scenarios*, as these scenarios have to be achievable for them, and meet their interests and expectations in terms of electromobility promotion and implementation within their area of influence.

On the other hand, USER-CHI products are being defined and developed by some companies (project partners), which are the *product leaders*. These companies require that certain user's profiles test their products in a way that their main innovative features can be demonstrated. In this sense, the *Usage Scenarios* must be *realistic scenarios to be deployed in a city, where products can be properly demonstrated.*

For these reasons the *Usage Scenarios* must describe situations which include the use of a USER-CHI product by a user profile in a physical location, that permits the demonstration of the main innovations related to the product, and are achievable and interesting for the cities which will host the project's tests.

In this document the procedure followed to define USER-CHI's *Usage Scenarios* is reported. As a starting up task VMZ, the demonstration leader of USER-CHI project, organised bilateral meetings between cities and product leaders, in order to expose and compare the cities interests and the products requirements for the demonstration phase.

The results achieved in these five bilateral meeting (one per city demo site), combined with the information included in the DOA document of USER-CHI project and the *product cards*[1], was the starting point for IBV to generate a draft version of the *Usage Scenarios*. On the basis of this working versions, five dedicated workshops between cities and product leaders were performed with the aim of discussing and determining the main aspects of the *Usage Scenarios*. As a result of these workshops, *Proposed Usage Scenarios* were generated for each city, that were internally reviewed by each demonstration site's working group. The updated version of the *Usage Scenarios* presented in *Results* section is the outcome of the last loop of review we performed, mainly addressed by the last updates coming from USER-CHI products definition.

Finally, the *Usage Scenarios* presented in the following sections are not locked scenarios, and they will most likely evolve at the same time that USER-CHI products are more and more defined. But we consider that its generation has been a very profitable exercise for cities, to think about not only in their expectations and interest during the demonstration phase of the project but also in all the required effort to execute the tests in their facilities. In addition, during this task product leaders envisaged real validation scenarios, that helped them to better Identify their products' key features, and to find a way to demonstrate its main innovations in the complex electromobility ecosystem.

[1] A template where the main USER-CHI product features were described by the product leaders. These documents are properly introduced at the beginning of *Section 2*.

2. The bilateral meetings

Between the 2nd of November 2020 and the 9th of November 2020 VMZ, as demonstration leader, organised bilateral coordination meetings between the demonstration cities (AMB, BER, BUD, RSM and TUR), and the USER-CHI product leaders. The main aim of these meetings was to take the first steps in the definition of the pilot tests, by generating scenarios where products could be tested. To achieve this aim, we performed bilateral meetings in which product leaders exposed their needs in terms of product demonstration, and cities presented their interests and possibilities to supply an adequate testing environment.

The products and the companies (product leaders) involved in the USER-CHI demonstration tests are (*Figure 1*):

- CLICK (Charging Location and hollstiC planning Kit), developed by VMZ.
- INCAR (INteroperability, Charging and paRking platform), developed by ETRA.
- SMAC (SMArt Charging tool), developed by ETRA.
- INSOC (INtegrated SOlar dc-Charging for levs), developed by ENELX.
- INDUCAR (INDUctive Charging for e-cARs), developed by IPT.

Figure 1: Products to demonstrate in USER-CHI demo sites

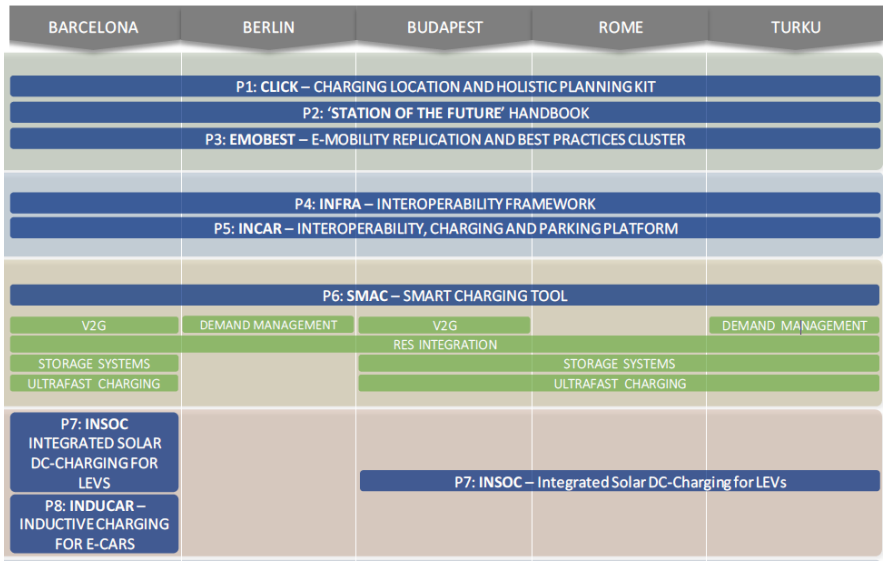
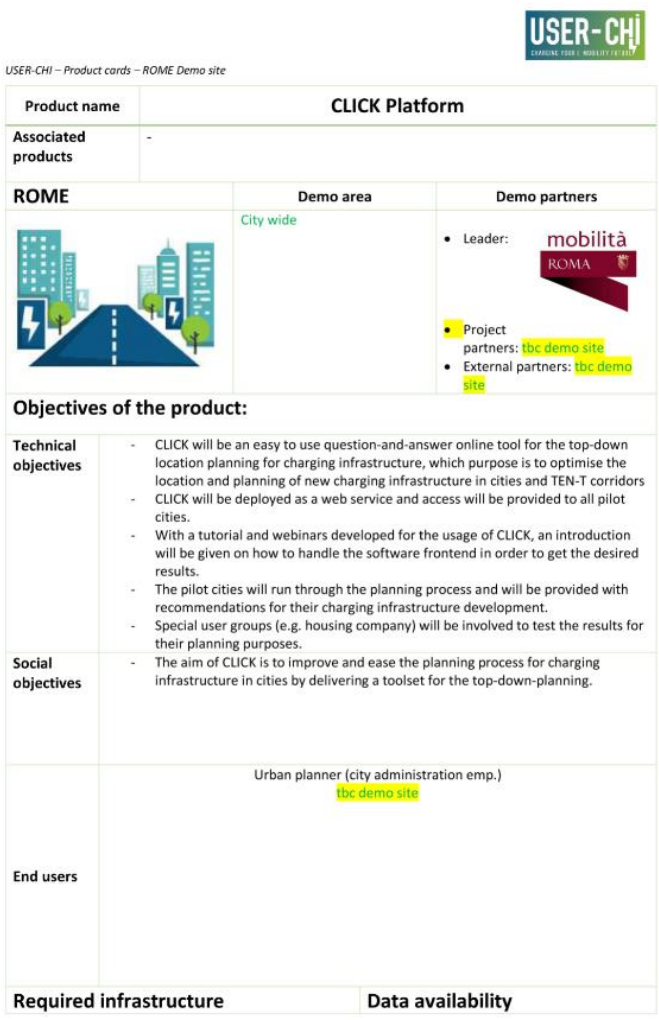


Figure 1 presents the demonstration cities where USER-CHI products will be tested, according to the DoA document. These products are still in their development process, what involves that they were not completely defined at the moment we performed the bilateral meetings. With the aim of facilitating the level of common understanding of product features by cities' personnel, product leaders were asked to fulfil a template, where the main product features where presented. These templates (named as *product cards*), generated for each product in each demo

site, included the main technical objectives of the product leaders. They were sent to cities before the meeting, in order they could present their vision regarding the demonstration requirements within their facilities.

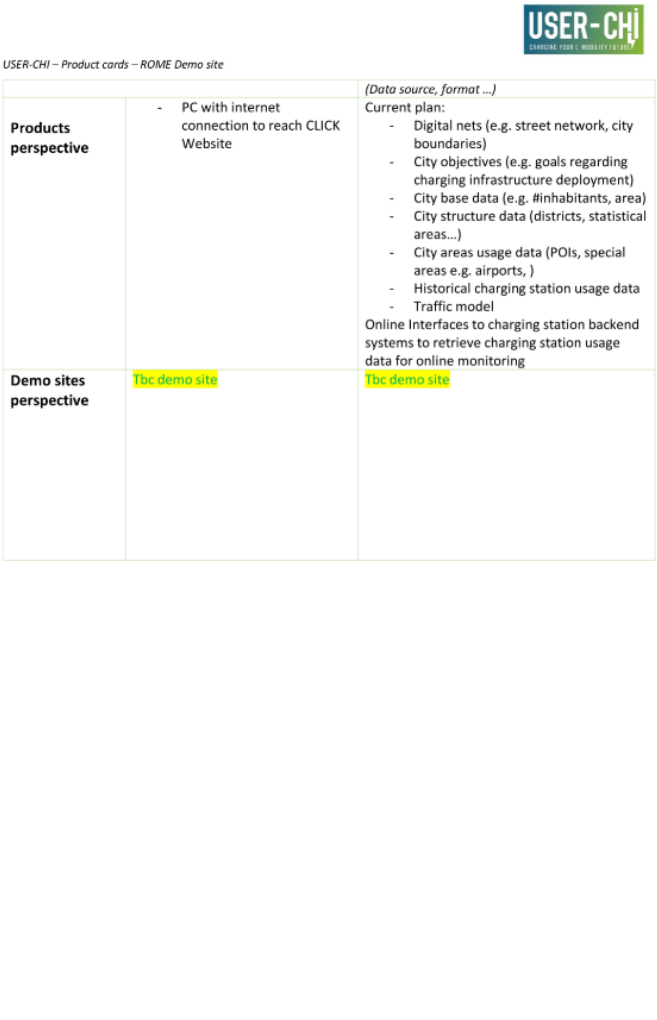
Figure 2: CLICK product card for RSM



USER-CHI – Product cards – ROME Demo site

Product name	CLICK Platform	
Associated products	-	
ROME	Demo area	Demo partners
	City wide	• Leader: mobilità ROMA • Project partners: tbc demo site • External partners: tbc demo site
Objectives of the product:		
Technical objectives	- CLICK will be an easy to use question-and-answer online tool for the top-down location planning for charging infrastructure, which purpose is to optimise the location and planning of new charging infrastructure in cities and TEN-T corridors - CLICK will be deployed as a web service and access will be provided to all pilot cities. - With a tutorial and webinars developed for the usage of CLICK, an introduction will be given on how to handle the software frontend in order to get the desired results. - The pilot cities will run through the planning process and will be provided with recommendations for their charging infrastructure development. - Special user groups (e.g. housing company) will be involved to test the results for their planning purposes.	
Social objectives	- The aim of CLICK is to improve and ease the planning process for charging infrastructure in cities by delivering a toolset for the top-down-planning.	
End users	Urban planner (city administration emp.) tbc demo site	
Required infrastructure	**Data availability**	

1 / 2



USER-CHI – Product cards – ROME Demo site

		(Data source, format ...)
Products perspective	- PC with internet connection to reach CLICK Website	Current plan: - Digital nets (e.g. street network, city boundaries) - City objectives (e.g. goals regarding charging infrastructure deployment) - City base data (e.g. #inhabitants, area) - City structure data (districts, statistical areas...) - City areas usage data (POIs, special areas e.g. airports,) - Historical charging station usage data - Traffic model Online Interfaces to charging station backend systems to retrieve charging station usage data for online monitoring
Demo sites perspective	Tbc demo site	Tbc demo site

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2.1 Product leader's requirements

At this stage of the project, product leaders' requirements regarding demonstration activities were collected in the *product cards*. These cards, coordinated by the project leader (ETRA), are presented in the following sections.

2.1.1 CLICK product card

VMZ&ETRA prepared the CLICK product cards for each city. *Figure 2* shows the card sent to RSM working group, in order they could review and modify those parts highlighted in yellow spot. Similar cards were prepared for BER, BUD, RSM and TUR.

As stated in the product card presented in *Figure 2*, *CLICK will be an easy to use question-and-answer online tool for the top-down location planning for charging infrastructure, which purpose is to optimise the location and planning of new charging infrastructure in cities and TEN-T corridors*. Regarding the main technical objectives of *CLICK*, we find the following:

- CLICK will be deployed as a web service and access will be provided to all pilot cities.
- With a tutorial and webinars developed for the usage of CLICK, an introduction will be given on how to handle the software frontend in order to get the desired results.
- The pilot cities will run through the planning process and will be provided with recommendations for their charging infrastructure development.
- Special user groups (e.g. housing company) will be involved to test the results for their planning purposes.

Related on social objectives, *CLICK aims to improve and ease the planning process for charging infrastructure in cities by delivering a toolset for the top-down-planning.*

2.1.2 INDUCAR product card

IPT&ETRA prepared the product card for INDUCAR (*Figure 3*), a product that only is going to be tested in AMB. This card was sent to AMB working group, in order they could review and modify those parts highlighted in yellow.

Regarding the technical objectives of INDUCAR, the product card included:

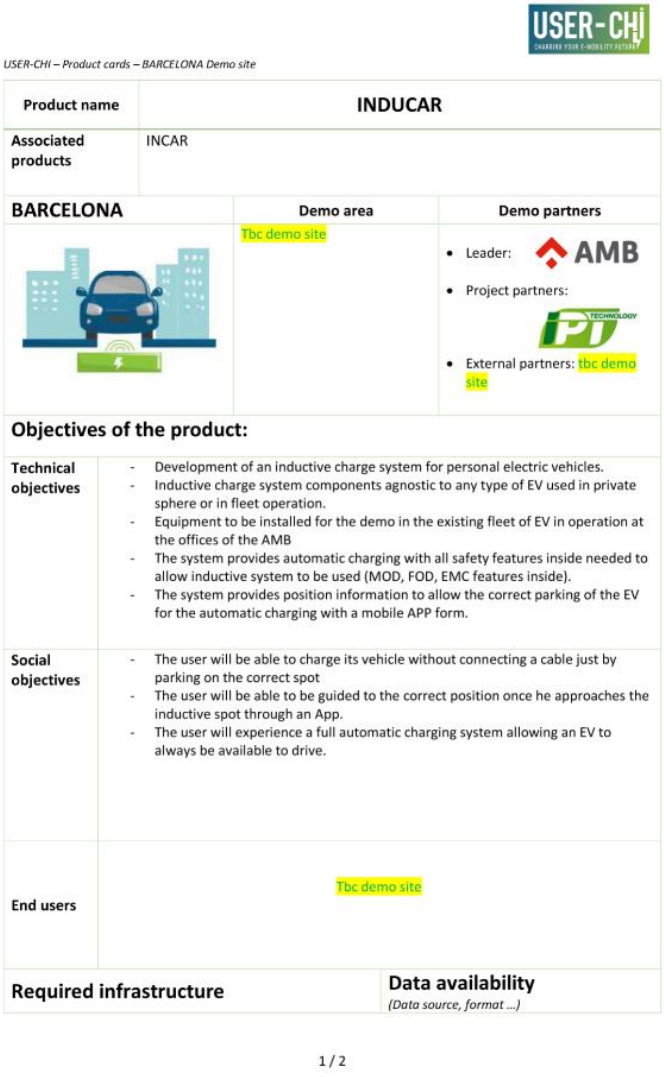
- Development of an inductive charge system for personal electric vehicles.
- Inductive charge system components agnostic to any type of EV used in private sphere or in fleet operation.
- Equipment to be installed for the demo in the existing fleet of EV in operation at the offices of the AMB
- The system provides automatic charging with all safety features inside needed to allow inductive system to be used: Metal Object Detection (MOD), Foreign Object Detection (FOD) and Electro Magnetic Compatibility (EMC).
- The system provides position information to allow the correct parking of the EV for the automatic charging with a mobile APP form.

On the other hand, the social objectives identified by the product leader are:

- The user will be able to charge its vehicle without connecting a cable just by parking on the correct spot
- The user will be able to be guided to the correct position once he approaches the inductive spot through an App.

- The user will experience a full automatic charging system allowing an EV to always be available to drive.

Figure 3: INDUCAR product card for AMB



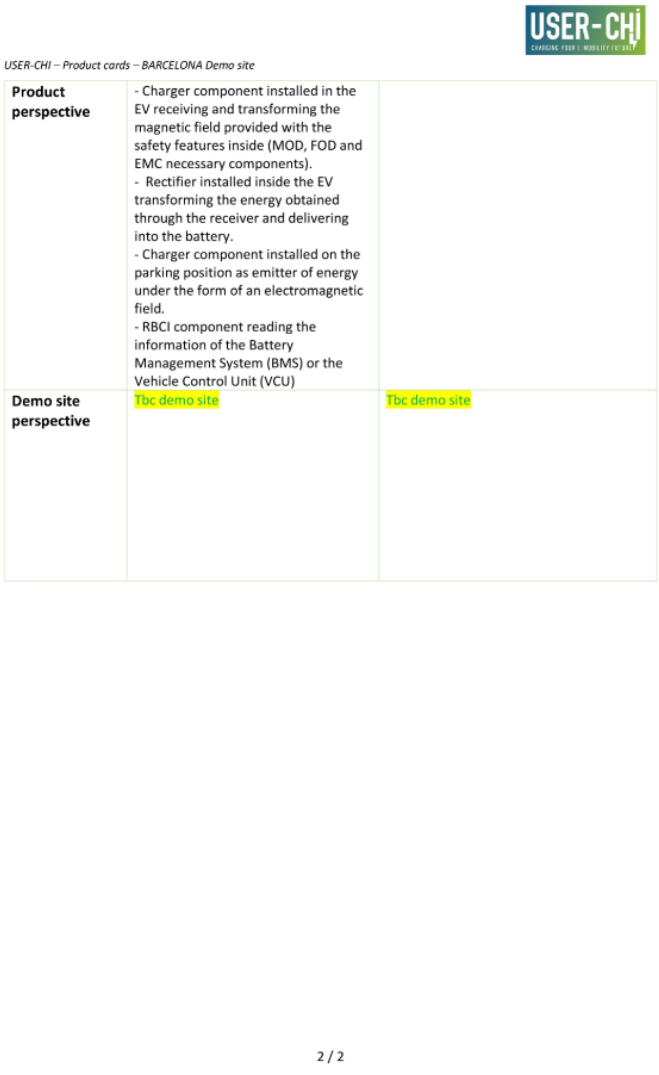
USER-CHI – Product cards – BARCELONA Demo site

Product name	INDUCAR	
Associated products	INCAR	
BARCELONA	Demo area	Demo partners
	Tbc demo site	• Leader: AMB • Project partners: IPT TECHNOLOGY • External partners: tbc demo site

Objectives of the product:

Technical objectives	- Development of an inductive charge system for personal electric vehicles. - Inductive charge system components agnostic to any type of EV used in private sphere or in fleet operation. - Equipment to be installed for the demo in the existing fleet of EV in operation at the offices of the AMB - The system provides automatic charging with all safety features inside needed to allow inductive system to be used (MOD, FOD, EMC features inside). - The system provides position information to allow the correct parking of the EV for the automatic charging with a mobile APP form.
Social objectives	- The user will be able to charge its vehicle without connecting a cable just by parking on the correct spot - The user will be able to be guided to the correct position once he approaches the inductive spot through an App. - The user will experience a full automatic charging system allowing an EV to always be available to drive.
End users	Tbc demo site
Required infrastructure	**Data availability** *(Data source, format ...)*

1 / 2



USER-CHI – Product cards – BARCELONA Demo site

Product perspective	- Charger component installed in the EV receiving and transforming the magnetic field provided with the safety features inside (MOD, FOD and EMC necessary components). - Rectifier installed inside the EV transforming the energy obtained through the receiver and delivering into the battery. - Charger component installed on the parking position as emitter of energy under the form of an electromagnetic field. - RBCI component reading the information of the Battery Management System (BMS) or the Vehicle Control Unit (VCU)	
Demo site perspective	Tbc demo site	Tbc demo site

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Finally, the technical components of the required facilities to test INDUCAR are also listed in the product card:

- Charger component installed in the EV receiving and transforming the magnetic field provided with the safety features inside (MOD, FOD and EMC necessary components).
- Rectifier installed inside the EV transforming the energy obtained through the receiver and delivering into the battery.
- Charger component installed on the parking position as emitter of energy under the form of an electromagnetic field.
- RBCI component reading the information of the Battery Management System (BMS) or the Vehicle Control Unit (VCU)

2.1.3 INSOC product card

ETRA prepared the product card for INSOC. *Figure 4* shows the card sent to TUR working group, in order they could review and modify those parts highlighted in yellow spot. Similar cards were prepared for AMB, BUD and RSM.

Figure 4: INSOC product card for TUR

USER-CHI – Product cards – TURKU Demo site

Product name	INSOC	
Associated products	INCAR	
TURKU	Demo area	Demo partners
	Tbc demo site	TURKU ÅBO • Leader: • Project partners: • External partners: tbc demo site
Objectives of the product:		
Technical objectives	- Development of a charging station for LEVs (e-bikes, e-scooters). - The charging station will integrate on-site renewable energy production - The charging station will allow DC charging connection - The solution will integrate payment and billing services, making it especially convenient for new urban mobility modes, such as sharing services. - The solution will allow the integration with other USER-CHI solutions (ie INCAR platform).	
Social objectives	- The user will be able to park and charge its own light electric vehicle or use a new sharing service of electric bikes, e-scooters - The user will be able to manage the different services (reservation, guiding, payment) through an APP.	
End users	Tbc demo site Private users, sharing service	
Required infrastructure	**Data availability** *(Data source, format ...)*	

1 / 2

USER-CHI – Product cards – TURKU Demo site

Product perspective	- Availability of space (ie permits, licenses) - Access to the electrical network or connection to public infrastructure (ie street lighting) - Renewable energy installation in cities permits	
Demo site perspective	Tbc demo site	Tbc demo site

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Regarding the technical objectives of INSOC, the product card included:

- Development of a charging station for LEVs (e-bikes, e-scooters).
- The charging station will integrate on-site renewable energy production
- The charging station will allow DC charging connection
- The solution will integrate payment and billing services, making it especially convenient for new urban mobility modes, such as sharing services.

- The solution will allow the integration with other USER-CHI solutions (i.e. INCAR platform).

For social objectives the product card stated:

- The user will be able to park and charge its own light electric vehicle or use a new sharing service of electric bikes, e-scooters
- The user will be able to manage the different services (reservation, guiding, payment) through an APP.

On regard to technical requirements, the facilities to test INDUCAR includes:

- Availability of space (i.e. permits, licenses)
- Access to the electrical network or connection to public infrastructure (i.e. street lighting)
- Renewable energy installation in cities permits

2.1.4 INCAR product card

ETRA prepared the product card for INCAR. *Figure 5* shows the card sent to BER working group, in order they could review and modify those parts highlighted in yellow spot. Similar cards were prepared for AMB, BUD, RSM and TUR.

Regarding the technical objectives of INCAR, the product card included:

- Development of a HUB to allow roaming and extra services to the CPOs management systems through OCPI 2.2 communication.
- Services offered in the hub: (Reservation, real-time information, smart charging features, secure accounting (blockchain), anonymous authentication (keycloack) and payment between CPOs.
- APP mobile development- as an INCAR platform service for mobile devices
- Dashboards for the city managers (real-time information of charging points, usage statistics)

Related to social objectives, the product card included:

- The user will be able to book a charging point with the USER-CHI app[2].
- The user will be able to manage the charge with the USER-CHI app.
- The user will be able to be guided to a charging point.
- The CPOs will be able to have a secure accounting of the transactions made from external users.

[2] Some legal constraints could be related to this action (book&charge), as it is not allowed or desired by some countries and cities

- The CPOs will be able to pay the other CPOs from the transactions of external users made in their charging points[3].
- The services of the platform are available in all the charging points of the USER-CHI network

Finally, the technical components of the required facilities to test INCAR are also listed in the product card:

- Charging points
- Communication with CPO's and EMSP's management systems
- Communication through OCPI protocol

[3] In *ad-hoc charging* cases the user pays directly to the *ad-hoc* CPO. In other charging modalities, payments are made through the EMSP, as this is the entity contracted by the user.

Figure 5: INCAR product card for BER

USER-CHI – Product cards – BERLIN Demo site

Product name	INCAR Platform	
Associated products	INFRA SMAC	
BERLIN	Demo(s) area(s)	Demo partners
	Tbc demo site	• Leader: vmz Verkehr Mobilität Zukunft • Project partners: tbc demo site • External partners: tbc demo site
Objectives of the product:		
Technical objectives	- Development of a HUB to allow roaming and extra services to the CPOs management systems through OCPI 2.2 communication. - Services offered in the hub: (Reservation, real-time information, smart charging features, secure accounting (blockchain), anonymous authentication (keycloack) and payment between CPOs. - APP mobile development- as an INCAR platform service for mobile devices - Dashboards for the city managers (real-time information of charging points, usage statistics)	
Social objectives	- The user will be able to book a charging point with the USER-CHI app - The user will be able to manage the charge with the USER-CHI app - The user will be able to be guided to a charging point. - The CPOs will be able to have a secure accounting of the transactions made from external users. - The CPOs will be able to pay the other CPOs from the transactions of external users made in their charging points. - The services of the platform are available in all the charging points of the USER-CHI network	
End users	Long range scenario (EV-private users...) Tbc demo site	Low-medium range scenario (EV-private users, taxis, fleets, other specific group of users...) Tbc demo site
Required infrastructure		**Data availability**

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USER-CHI – Product cards – BERLIN Demo site

		(Data source, format ...)
Products perspective	- Charging points - Communication with CPO's and EMSP's management systems - Communication through OCPI protocol	-CPO's management systems - EMSP's management systems - OCPI 2.2
Demo sites perspective	Tbc demo site	Tbc demo site

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2.1.5 SMAC product card

ETRA prepared the product card for SMAC. *Figure* 6 shows the card sent to BUD working group, in order they could review and modify those parts highlighted in yellow spot. Similar cards were prepared for AMB, BER, RSM and TUR.

For technical objectives the product card included:

- Development of a software tool which will calculate the optimal charging profile (amount of energy to provide) in the charging stations.
- In order to perform the optimal calculations, different smart charging inputs will be informed to SMAC (from CPOs, EV drivers, etc.).

- SMAC will offer smart charging services to charging stations connected to INCAR platform, so communications will be performed by means of OCPI 2.2.
- SMAC will inform the optimal charging profile to CPOs, but it is responsibility of CPOs to finally perform the smart charging operations.

Figure 6: SMAC product card for BUD

SER-CHI – Product cards – BUDAPEST Demo site

Product name	SMAC Tool	
Associated products	INCAR	
BUDAPEST	Demo(s) area(s)	Demo partners
	Tbc demo site	• Leader: BUDAPEST • Project partners: tbc demo site • External partners: tbc demo site

Objectives of the product:

Technical objectives	- Development of a software tool which will calculate the optimal charging profile (amount of energy to provide) in the charging stations. - In order to perform the optimal calculations, different smart charging inputs will be informed to SMAC (from CPOs, EV drivers, etc.). - SMAC will offer smart charging services to charging stations connected to INCAR platform, so communications will be performed by means of OCPI 2.2. - SMAC will inform the optimal charging profile to CPOs, but it is responsibility of CPOs to finally perform the smart charging operations.	
Social objectives	- The CPOs will be able to manage the power provided by their charging stations. - The user will be able to provide his/her charging preferences (charge as fast as possible, as cheap as possible, etc.)	
End users	Long range scenario (EV-private users…) Tbc demo site	Low-medium range scenario (EV-private users, taxis, fleets, other specific group of users…) Tbc demo site

1 / 2

USER-CHI – Product cards – BUDAPEST Demo site

Required infrastructure		Data availability *(Data source, format …)*
Products perspective	- Charging points - Communication with CPO's and EMSP's management systems - Communication through OCPI protocol	-CPO's management systems - EMSP's management systems - OCPI 2.2
Demo sites perspective	Tbc demo site	Tbc demo site

2 / 2

On the other hand, for social objectives we had:

- The CPOs will be able to manage the power provided by their charging stations.
- The user will be able to provide his/her charging preferences (charge as fast as possible, as cheap as possible, etc.)

Finally, the required infrastructure to test this product includes:

- Charging points
- Communication with CPO's and EMSP's management systems
- Communication through OCPI protocol

2.2 Cities' interests

After receiving the detailed information about USER-CHI products contained in *product cards*, cities' working groups defined their interests and capabilities to tackle the pilot test. These interests were exposed and discussed in the bilateral meetings, which were participated by cities' teams[4], the product leaders (VMZ, ETRA, IPT and ENELX), demonstration leader (VMZ), project leader (ETRA) and IBV (on charge of *Usage Scenarios*' definition).

2.2.1 Barcelona Metropolitan Area (AMB)

On Monday 2nd of November we performed the bilateral meeting with AMB, the partner which is on charge of the pilot test in Barcelona metropolitan area. *Figure 7* presents the situation presented by AMB's team, related to existing resources and expected facilities in Barcelona to perform the demonstration tests.

Figure 7: Facts for demo presented by AMB

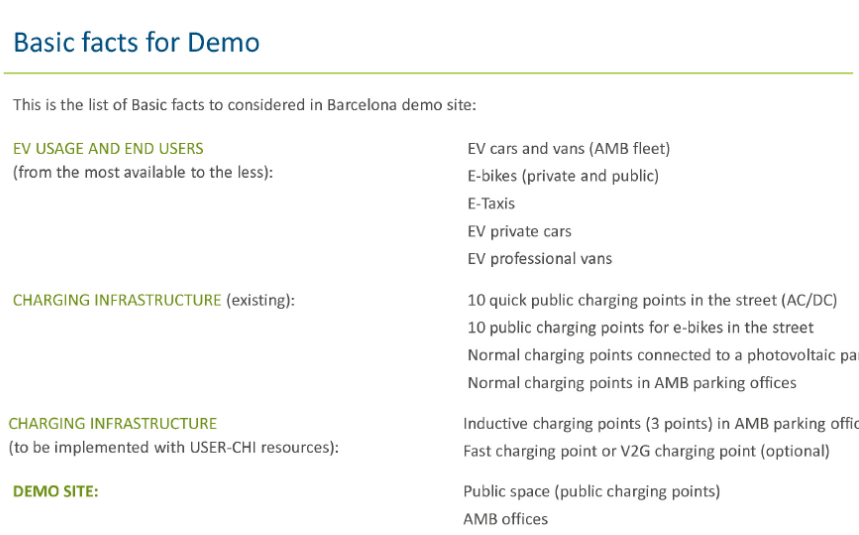
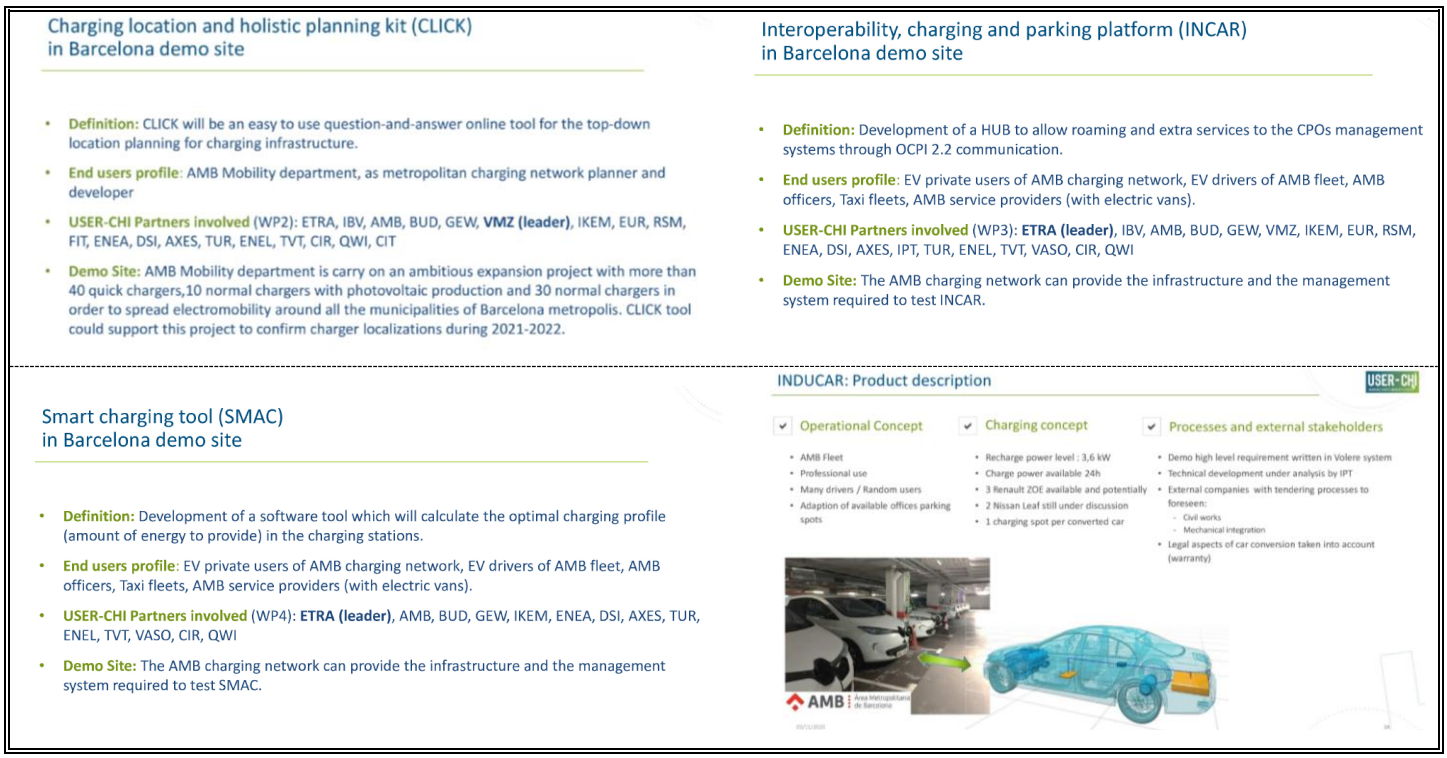


Table 1 summarizes the initial description of the demonstration facilities reported by AMB's team. They consider it to be feasible to test CLICK for planning the deployment of new charging infrastructure in the city, and use the available charging infrastructure to demonstrate innovating features of INCAR and SMAC. AMB is the unique location to test INDUCAR, and the scenario to

[4] Each city's team attended one meeting, just the one dedicated to the pilot test to be performed in its city

demonstrate this product is the most elaborated. On the contrary, AMB's team require additional information to sketch a feasible demonstration scenario to test INSOC.

Table 1: Initial description of demonstration facilities for CLICK, INCAR, SMAC and INDUCAR in AMB



2.2.2 City of Rome (RSM)

On Tuesday 3rd of November we performed the bilateral meeting with RSM, the coordinator of the pilot test in Rome area. This pilot test includes the participation of the following entities:

- RSM Rome Mobility Agency: Demo site coordinator. Represents the City of Rome, coordinates the deployment of the Electric Mobility Plan, coordinating local partners – Manages the SUMP drafting and implementation.
- ENEL X: Charging Point Operator. Leading the investments on charging infrastructure and civil works needed for the demonstration activities of Rome and will provide the ground for one test site.
- ENEA: Supports the research and innovation aspects in the Pilot. Leading a task in WP4 about modelling EV batteries and charging solutions; will investigate possibilities for the usage of second-life batteries in stationary applications.
- DSI: Supports deployment of the pilot in Rome. Providing strategic vision and execution capacity, analysis of macro trends and needs.

Figure 8: General approach presented by RSM

Figure 8 shows the overall approach presented by RSM to tackle the demonstration tasks. The city is interested in defining and installing multi-purpose charging facilities. As shown in *Table 2*, RSM's team is considering two locations to test INCAR, SMAC and INSOC: Corso Francia charging station and Via Cristoforo Colombo charging station. Regarding CLICK, RSM is also interested in employing this tool to improve its charging network, and making it more adapted to user preferences. In addition, the city intends to use a local user data base in order to contact to contact end users interested in participating in the demonstration tests.

Table 2: Initial description of demonstration facilities for CLICK, INCAR, SMAC and INSOC in Rome

2.2.3 City of Turku (TUR)

On Tuesday 3rd of November we performed the bilateral meeting with TUR, the coordinator of the pilot test in Turku area, that also includes the participation of TVT, Vaso and Turku Energia. TUR's team presented an elaborated proposal of five demonstration scenarios, which are shown in *Table 3*.

The 1st *demo* presented in *Table 3* were conceived to test CLICK. Additionally, the 2nd *demo* and the 3rd *demo* were scenarios suitable to demonstrate the innovations related to INSOC, as they included facilities designed to charge LEVs. Finally, 4th *demo* and 5th *demo* were scenarios to test INCAR and SMAC, as they included charging points for EVs with V2G capabilities and synergy systems.

Table 3: Demonstration scenarios proposed by TUR's team

1st demo

- Turku will create a city-wide masterplan for EV charging points and will demo the CLICK in this task. Important part for this is how the CLICK can visualise and take input from stakeholders.
- We will co-operate in this with TVT, Vaso and Turku Energia
- In support of the masterplan, Turku will create marketing campaign for citizens of Turku in years 2021-2023
- At this point we are collecting information from current charging infrastructure and EV-user patterns and plans for future charging infrastructure
- At the end of the year 2020 we will have a good data from current charging points and future plans from the 3rd parties.
- Turku will also create 10 electrification plans for city owned properties as part of the USER-Chi project

2nd demo

- Turku will demo a LEV charging boxes with PV installed with them
- This project will demo the INSOC product
- Demo sites locations are not decided at this moment, but the planning will start early 2021 and construction will happen in 2022-2023
- In Turku, boxes will be connected to grid and will most likely have a solution for keeping LEVs safe from snow and ice in winter.
- A need for cheap, easy use solution is high.

3rd demo

- TVT will create a LEV and EV charging plan for Mäntymäki area
- Mäntymäki area will be built in next 10 years, construction is already started
- LEV charging will be built inside of the first building, demo will hopefully finish in end of 2021
- Modified charging boxes like in 2nd demo are considered to be built outside buildings and will be worked together with city.
- Charging points are built to be equal and suited for all LEV from e-bikes to mobility scooters.

4th demo

- Vaso will build charging points in Pääskyvuorenrinne housing area
- Vaso housing in Pääskyvuorenrinne will have a 76 new apartments
- Charging spots will be built under the building in a parking hall
- Chargers are 22kW AC chargers
- Housing will incorporate solar energy and battery system with automated smart charging
- Project will demo the SMAC tool and will be worked with Turku Energia and Huippuenergia
- The parking spots are in location that can´t be made public, so the INCAR can´t be implemented, this must be solved on requirements
- Charging points will be used by house residents

2.2.4 City of Berlin (BER)

On Wednesday 4th of November we performed the bilateral meeting with BER. VMZ is the leader of this demonstration site, which also includes the participation of IKEM, Gewobag and Qwello. *Figure 9* presents the situation presented by BER's team, related to existing resources and expected use cases in Berlin to perform the demonstration tests.

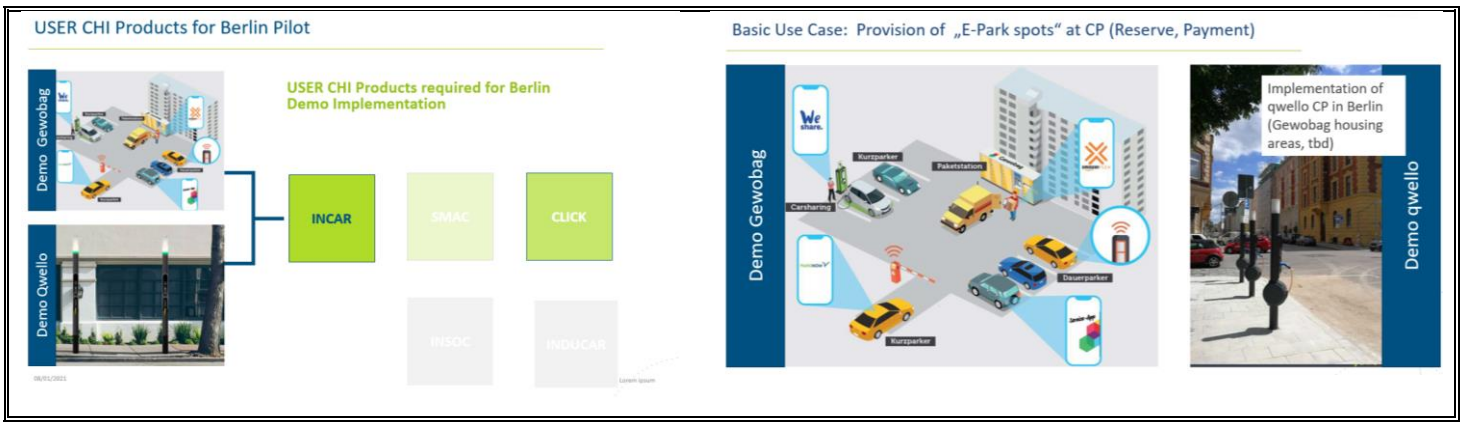
Figure 9: Facts for demo presented by BER

Basic facts for Demo

- EV-Usage: E-Cars
- Basic Use Case: Provision of „E-Park spots" at CP (Routing, Navigation Reserve, Payment)
- End Users profile: private: Gewobag residents, other private users; Professional: E-Car Sharing Providers
- Charging Infrastructure (Type: AC, DC)
- Partners involved (Gewobag, qwello, VMZ, other CPO or MSP)
- Exact Demo Site: tbc

Table 4 shows the demonstration scenarios proposed by BER. *Demo Gewobag* and *Demo Qwello* are adequate scenarios to test innovations related to INCAR and SMAC, as they involve reservation and payment for a charge. On the other side, it is still pendent to define a scenario to demonstrate CLICK innovations.

Table 4: Demonstration scenarios proposed by BER's team



2.2.5 City of Budapest (BUD)

On Monday 9th of November we performed the bilateral meeting with BUD. *Figure 10* presents the situation presented by BUD's team, describing the existing resources and expected facilities in Budapest to perform the demonstration tests.

Figure 10: Facts for demo presented by BUD

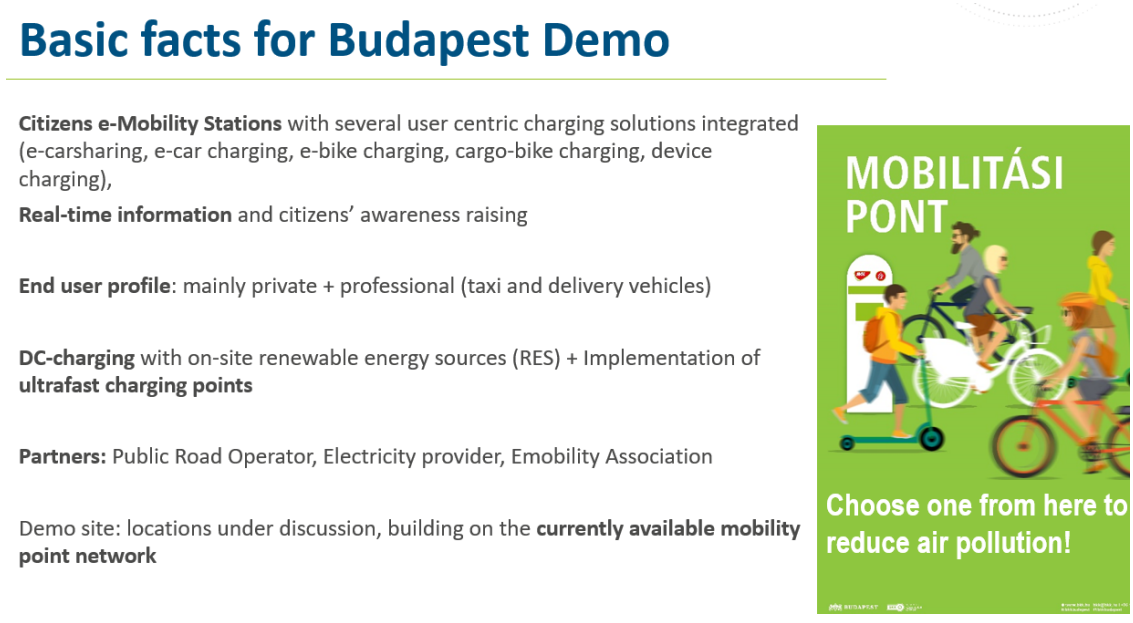


Table 5 summarizes the overall approach for demonstration presented by BUD's team. The available charging network in the city should be employed to demonstrate INCAR and SMAC. On the other hand, it is expected to install one or two INSOC charging stations, although it is not clear which is the user profile who is going to employ these facilities. Additionally, demonstration scenario for CLICK is still pendent.

Table 5: Demo case objectives&barriers

Budapest Demo Case

Setting up **User-centric e-mobility point to concentrate services related to e-mobility** and provide better utilization of public spaces

Main objective is creating more liveable and multifunctional public spaces where different e-mobility functions (such as e-car, e-scooter, e-bike chargers) and other services (tablet charger, public lighting with sensors, car sharing docking station) are available and complement (interoperability) each other in terms of a smart city system. We would like to develop urban e-mobility charging packages where we can provide real-life solutions for slow charging in densely populated areas in cities.

Background:

E-charging points in Budapest: https://toltopont.eu/
E-mobility concept developed in 2017, legal background is complex, review needed
Micromobility issue emerged
Mobility Point Network

Barriers + Next steps

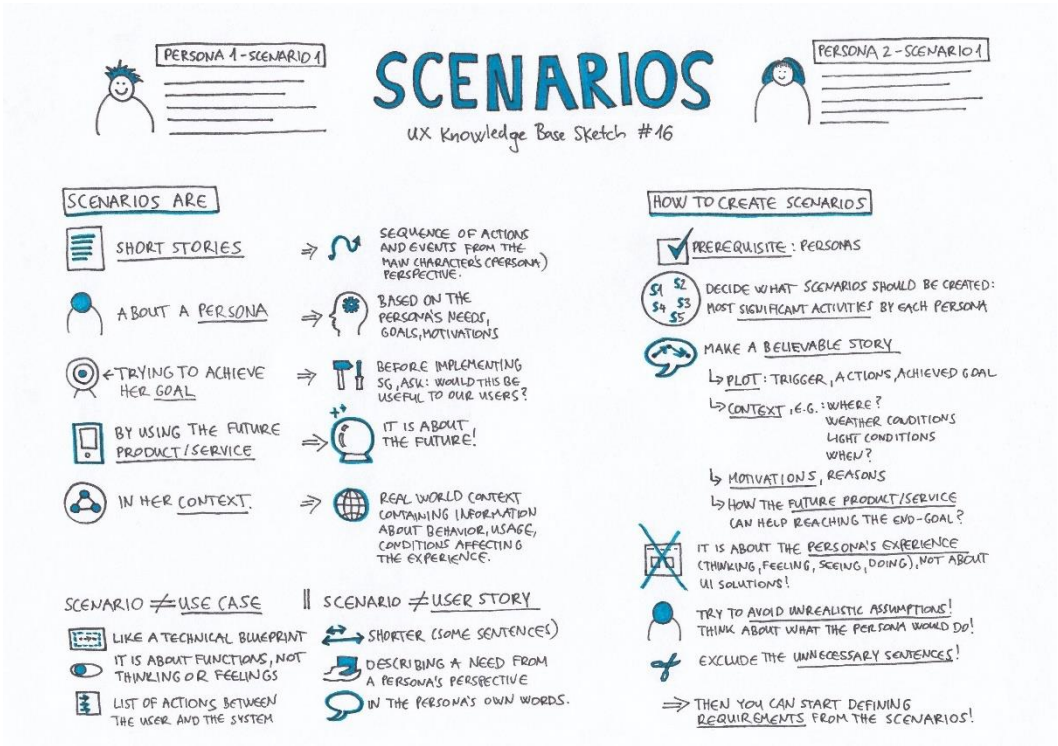
- Currently in Budapest there is no municipal e-bike sharing or e-scooter/motorbikes system
- Public space usage is managed on 2 levels: districts and Budapest Municipality
- Determine and address legal gaps of e-mobility (energy supply, parking, grid integration, RES, public space)
- Very complex stakeholder group

- **Defining use-cases** and **end-users**: charging service for e-cars, e-bikes, e-scooters – mainly private and occasional professional users (taxi, cargo bike)
- **Finding location for mobility points** equiped with charging infrastructure (possibly a residential area / TEN-T route city section / P+R parking area)

3. Workshops with cities

Combining USER-CHI demonstration cities' interests with USER-CHI product leaders' requirements, IBV generated a proposal of scenarios (Figure 11: Elements to consider when generating scenarios) to demonstrate USER-CHI product in each city. These scenarios aimed to define the way the products were going to be employed in each city, in order to demonstrate their innovative features, what in practice involved the definition of *Usage Scenarios*. A *Usage Scenario* is a description of a way someone uses an existing product or system. It describes a real-world example of how one or more people or organizations interact with a system, and the steps, events, and actions which occur during the interaction [1],[2],[3].

Figure 11: Elements to consider when generating scenarios



These *Usage Scenarios* were described in a document that was sent to the cities and the product leaders. Each scenario is described according to three main parameters: *Resources*, *User's sample* and *Objective*. Regarding the *User's sample*, DoA document stablished a total amount of

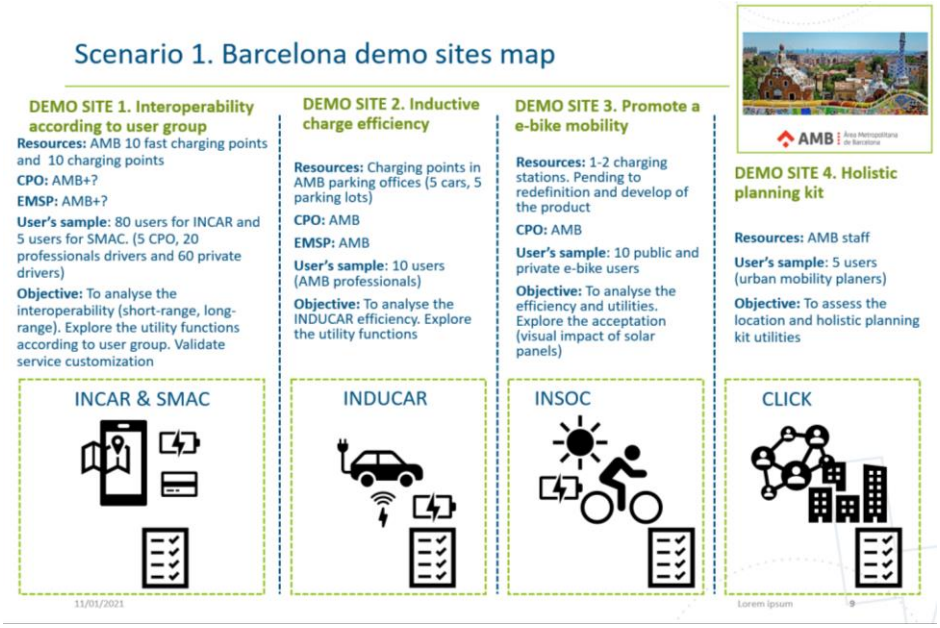
100 users per city test[5], so this is the initial reference although we intend to adapt this sample to the *Usage Scenario* we finally define for every USER-CHI product in each city. In order to have a better vision on what type of activities participants should perform to demonstrate the products, we generated *User stories* attached to each *Usage Scenario*. These *User stories* included not only the profile of the suitable user to take part in the tests, but also a description of the everyday activities related to the tests.

To facilitate profitable discussions between the product leaders and the cities' representatives, based on the proposal generated by IBV, we organised an online workshop with every city. The workshops were performed between 24th of November 2020 and 11th of December 2020. The initial version of *Usage Scenarios* was modified according to the discussion performed during the workshop, emerging the *Proposed Usage Scenarios* presented in the following sections.

3.1 Proposed *Usage Scenarios* for Barcelona (AMB)

On Tuesday 24th of November we performed the workshop with AMB's team. The workshop was leaded by IBV, with the participation of CLICK-INSOC-INDUCAR-INCAR&SMAC product leaders (VMZ-ENELX-IPT-ETRA).

Figure 12: Initial *Usage Scenarios* description for AMB



[5] Table 4 of the DoA document: *Methodologies for engaging end users in USER – CHI's products development*

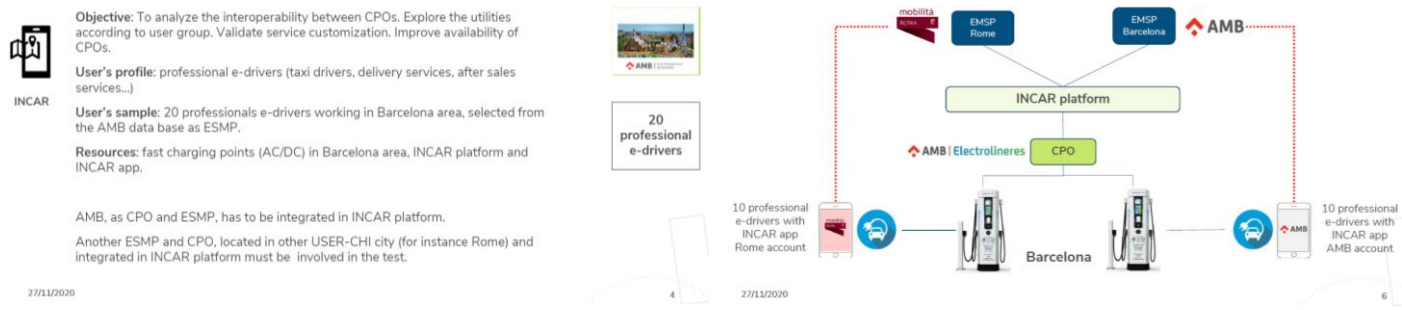
Figure 12 presents the initial description for the *Usage Scenarios* of USER-CHI products in Barcelona. There is a total number of four *Usage Scenarios*, conceived as demonstration sites to test four USER-CHI products: INCAR&SMAC, INDUCAR, INSOC and CLICK.

During the workshop, we discussed on every *Usage Scenario* presented in *Figure 12*, reviewing the available resources in the city to perform the tests, the suppliers of electromobility services (EMSPs) and charging point operators (CPOs) that would participate, what channels we could employ to contact the end users taking part in the tests, and the *User stories*. From this review and the later discussion, we generated the following proposed scenarios.

INCAR&SMAC

Table 6 shows the proposed *Usage Scenario* to demonstrate INCAR in AMB. This scenario is generated considering the use of the INCAR platform by professional e-drivers, that test the utilities of the app for booking and charging in AMB's network. The scenario also includes the access to AMB chargers with an account of another EMSP, preferably another USER-CHI partner.

Table 6: Proposed Usage Scenario for INCAR in AMB



User story:

Pedro is a e-taxi driver, he works in the Barcelona metropolitan area.

He received the invitation from AMB to participate in INCAR app validation. He will participate using the AMB quick charging points with a Rome ESMP account. He accepted, because usually he charges at home or uses the AMB charging network. Other e-drivers will participate with an AMB ESMP account.

Pedro download the INCAR app, available in Google Play, insert the code provided by AMB and start the use with a Rome ESMP account. The first day he explores all functionalities of the app. Pedro compares the INCAR navigator with the one he usually employs.

The second day, he books one point in AMB network, access and charge in this location. That recharge is accounted to his Rome account and he will pay it at the end of the month. As Pedro is a Rome customer, he will pay the service according to the Rome EMSP fares.

However, these INCAR recharges will be free for Pedro as a reward for his collaboration with USER-CHI Project.

This day, after the use of INCAR app, a validation screen is activated and Pedro answer some questions (a questionnaire related to utility, ease to use, satisfaction and use promotion).

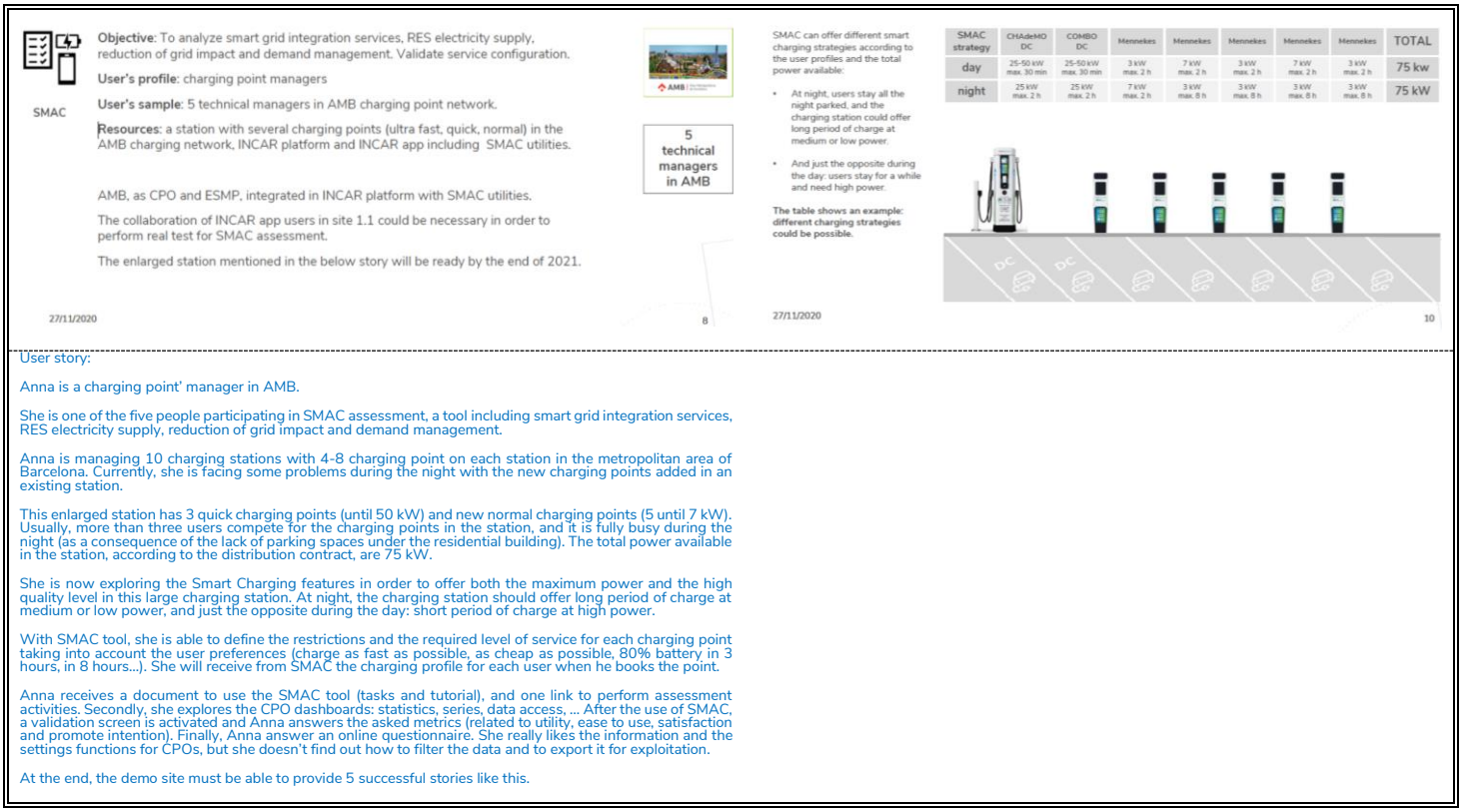
The third day, Pedro creates his user profile and explores different charging points using the filter function. When the profile is created, Pedro is invited to fulfil a new questionnaire.

The last day, Pedro performs a telephone interview and an online questionnaire. It's a bit long but the collaboration ends here. He just hopes to see improvements in the charging network.

At the end, the demo site must be able to provide 20 successful stories like that demonstrating the interoperability: 10 professional e-drivers charging in Barcelona area using INCAR app with a Rome ESMP account, and 10 professional e-drivers charging in Barcelona area using INCAR app with an AMB ESMP account. A parallel test should be done in Rome

Regarding SMAC, *Table 7* presents the proposed *Usage Scenario* for this product in Barcelona metropolitan area. This scenario is built around electromobility professionals, who employ SMAC on the INCAR platform to manage smart utilities of the charging network.

Table 7: Proposed Usage Scenario for SMAC in AMB



User story:

Anna is a charging point' manager in AMB.

She is one of the five people participating in SMAC assessment, a tool including smart grid integration services, RES electricity supply, reduction of grid impact and demand management.

Anna is managing 10 charging stations with 4-8 charging point on each station in the metropolitan area of Barcelona. Currently, she is facing some problems during the night with the new charging points added in an existing station.

This enlarged station has 3 quick charging points (until 50 kW) and new normal charging points (5 until 7 kW). Usually, more than three users compete for the charging points in the station, and it is fully busy during the night (as a consequence of the lack of parking spaces under the residential building). The total power available in the station, according to the distribution contract, are 75 kW.

She is now exploring the Smart Charging features in order to offer both the maximum power and the high quality level in this large charging station. At night, the charging station should offer long period of charge at medium or low power, and just the opposite during the day: short period of charge at high power.

With SMAC tool, she is able to define the restrictions and the required level of service for each charging point taking into account the user preferences (charge as fast as possible, as cheap as possible, 80% battery in 3 hours, in 8 hours...). She will receive from SMAC the charging profile for each user when he books the point.

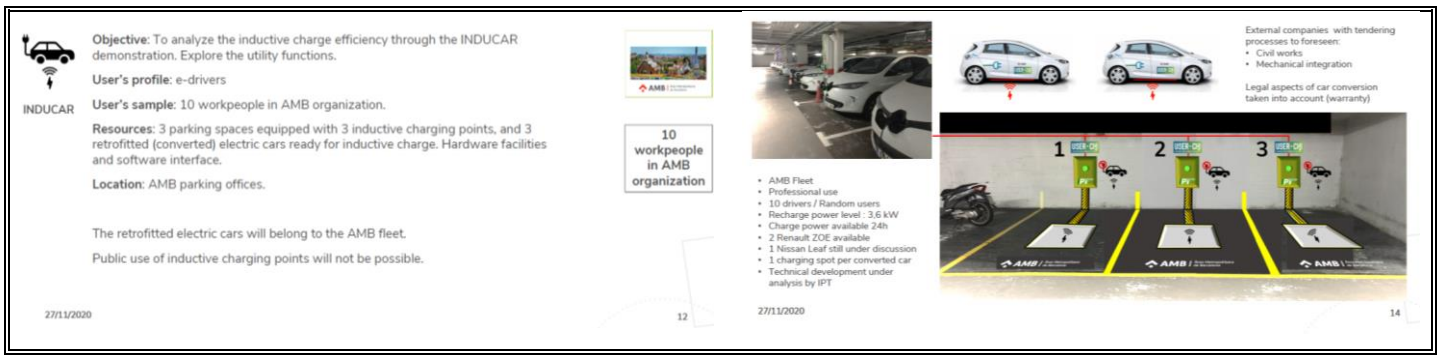
Anna receives a document to use the SMAC tool (tasks and tutorial), and one link to perform assessment activities. Secondly, she explores the CPO dashboards: statistics, series, data access, ... After the use of SMAC, a validation screen is activated and Anna answers the asked metrics (related to utility, ease to use, satisfaction and promote intention). Finally, Anna answer an online questionnaire. She really likes the information and the settings functions for CPOs, but she doesn't find out how to filter the data and to export it for exploitation.

At the end, the demo site must be able to provide 5 successful stories like this.

INDUCAR

Table 8 shows the proposed *Usage Scenario* to demonstrate INDUCAR in AMB. This scenario is generated considering the use of the INDUCAR platform by professionals, that employ adapted cars of AMB's fleet. The scenario also includes the installation of three inductive chargers in AMB's facilities.

Table 8: Proposed *Usage Scenario* for INDUCAR in AMB



User story:

Pau is a maintenance technician from AMB organization.

Every day he uses an electric vehicle of AMB fleet (usually a RENAULT ZOE) to perform maintenance tasks in the metropolitan area. He has been invited to participate in the INDUCAR demonstration by the USER-CHI project manager in AMB.

During the INDUCAR demonstration, he will use an inductive charge station based on: high level of automated power transfer, wireless charging systems, machine-to-machine (M2M) communication.

Pau receives a link with all the information related to INDUCAR. The vehicle has already been adapted for inductive charging.

Besides, he has a contact with the people of AMB that leads the INDUCAR demonstration. When he finishes the use of the INDUCAR system, he will call to him to perform an interview.

Twice a day for a three days period, Pau parks the car in the inductive charging point. When he takes the car, he registers the charged power, the delay time to charge start up, right car place on charging unit, easiness to right placement, the parking time, and his observations about the process.

After the use, Pau makes an appointment with the person in charge of the studio for a personal interview. Pau tells her his opinion and how has been the process of use.

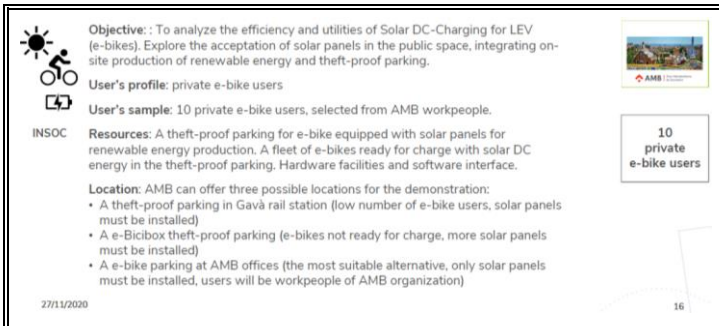
Further, the hardware facilities, the software interface, the efficiency of the inductive charge and how much time takes the fully charge will be study with the collaboration of the AMB parking and fleet manager.

At the end, the demo site must be able to provide 10 successful stories like this.

INSOC

Table 9 presents the proposed *Usage Scenario* to demonstrate INSOC in AMB. This scenario is created around the idea of testing the solar charging station by private e- riders, selected from AMB users' data base. The scenario also includes the availability a theft-proof charging station for e-bikes, equipped with PV (photovoltaic) panels.

Table 9: Proposed *Usage Scenario* for INSOC in AMB



User story:

Maria is a student working in AMB (work experience).

She goes daily on an e-bike to the AMB offices and rents a vehicle when he needs it (a car or a motorcycle), preferably electric. AMB has started a campaign to promote the use of e-bikes. The campaign offers an e-bike during three months maximum to the workpeople in AMB offices, specially student and young people.

Maria receives a link with all the information related to INSOC: Integrated Solar-DC charging for LEVs. The link includes the description of the low- power DC-charging solution, antitheft-proof parking system, payment and billing service and the use conditions (free for INSOC collaborators as a gratification). Besides this, she has a contact with the person of AMB that lead the INSOC study. At the time he finishes the use of the INSOC e-bike, she will receive a call to perform an interview.

Maria goes daily to the AMB offices with the e-bike and, when she arrives there, she notices that the e-bike needs recharging, so she goes to the charge point installed by AMB in the bike parking lot. Maria follows the usage procedure that appears graphically on the point, leaving the e-bike on charge, and he goes to her office. When he comes back to collect the e-bike, it continues securely parked. He is concerned about the e-bikes' robberies, but it seems that everything is correct.

After the use, Maria makes an appointment with the person in charge of the studio for a telephone interview. Maria tells her opinion and how has been the process of use. They talk about the aesthetics of the solar panels and the contact person asks him if she can use once more the e-bike, recording the process and reporting comments. Maria will do it tomorrow and will send the video by email.

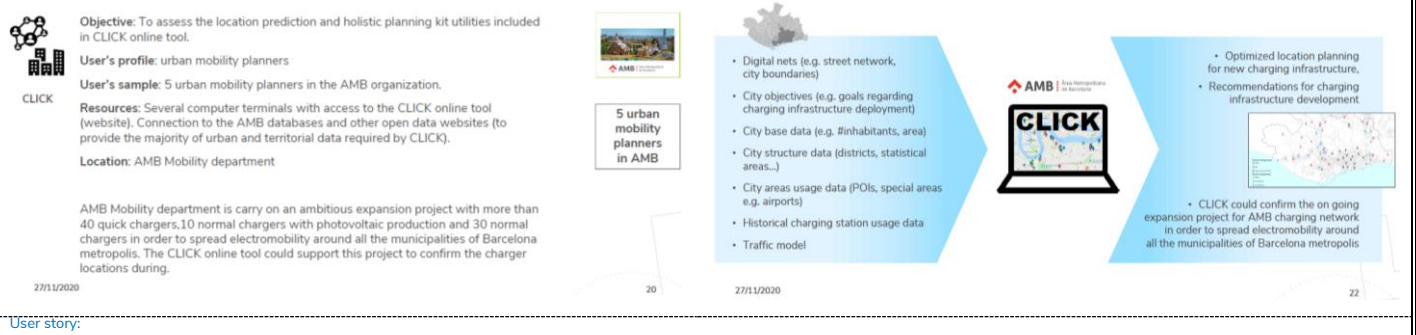
At the end, the demo site must be able to provide 10 successful stories like this.

CLICK

Table 10 presents the proposed *Usage Scenario* to demonstrate CLICK in AMB. This scenario is created around the idea of testing CLICK by professionals, mainly urban mobility planners but

also other professional profiles related to electromobility or urban planning. It is expected that the users participating in the tests are city council's workers or municipality workers.

Table 10: Proposed *Usage Scenario* for CLICK in AMB



User story:

Carlos is an urban mobility planner in AMB.

He is one of the five participants who are going to use and assess the Charging Location and Holistic Planning Kit (CLICK), an online tool for supporting city planners to define where to install the chargers.

Carlos receives a document for use the platform (tasks and tutorial), and one link to perform the assessment activities. In this link he will have a channel to register comments and insights (upload videos, photos, answer questionnaire, make comments, indicate elements and write on images).

He accesses the CLICK platform by inserting the code provided by AMB and begin the use. Firstly, He freely explores the web. After the use, He performs an online bulletin board activity assessing the utilities and the usage process.

Carlos reviews all the recommendations to install EVSE according to user demand, territory coverage, access and grid integration with AMB real data. After the use, Carlos performs the online bulletin board activities, assessing the following activities based on usability and usefulness criteria's:

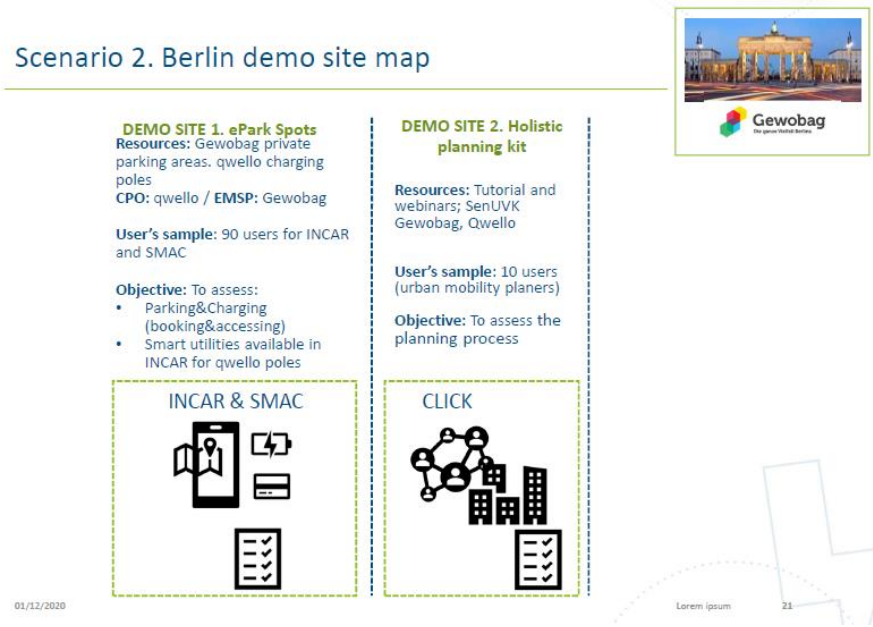
Type of input data
Updating input data
Tools for managing input data
Results presentation
Software Interface

At the end, the demo site must be able to provide 5 successful stories like this.

3.2 Proposed *Usage Scenarios* for Berlin (BER)

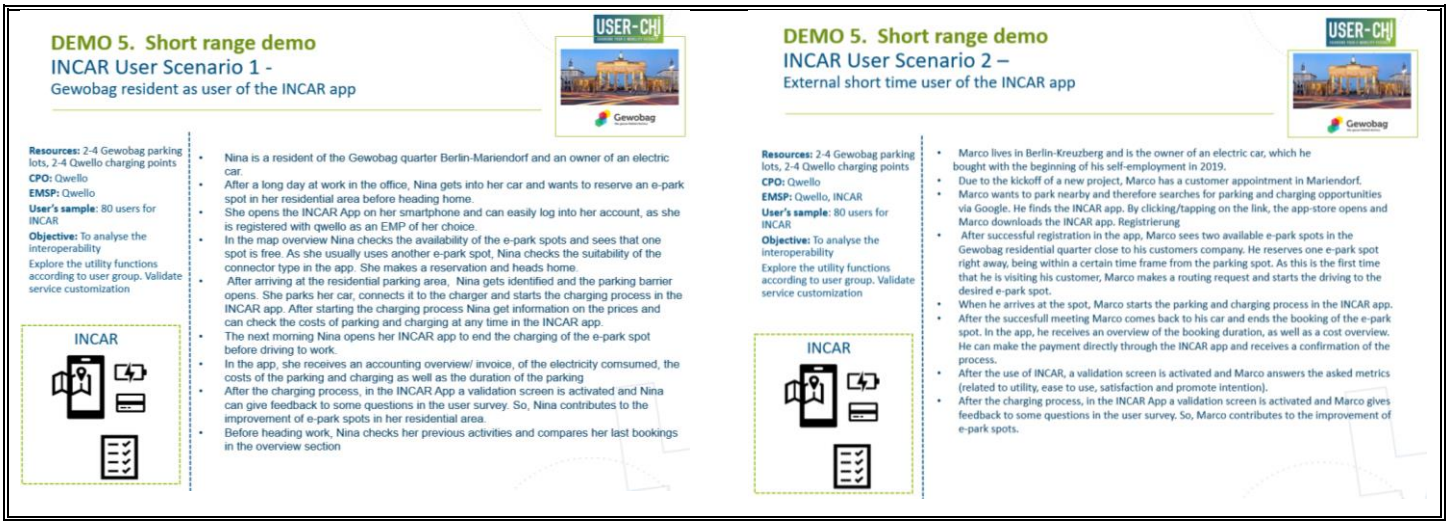
Berlin demonstration site is a consortium of entities where Berlin municipality is not represented. These entities (VMZ-Gewogab-Qwello) performed an internal workshop, taking as starting point the initial proposal generated by IBV, that included scenarios description and user stories. This initial proposal included the *Usage Scenario* description shown in *Figure 13*.

Figure 13: Initial *Usage Scenario* description for BER



The scenarios generated by BER's consortium were sent to IBV on 17th of December 2020. These scenarios are the Proposed *Usage Scenarios* presented in the following paragraphs.

Table 11: Proposed *Usage Scenario* for INCAR in BER



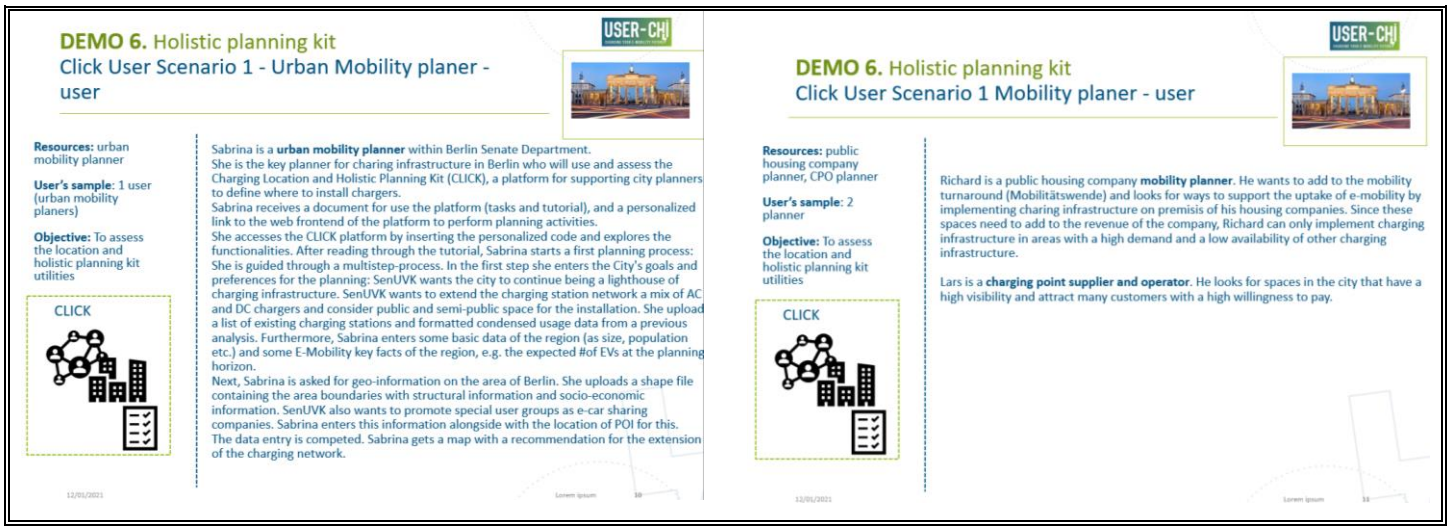
INCAR&SMAC

BER's team split in two the demonstration's scenarios for INCAR, according to two different user profiles: *Gewobag resident* and *external short time user* (*Table 11*). None of these scenarios included the demonstration of SMAC, so this *Usage Scenarios* was definition pending.

CLICK

Table 12 presents the proposed *Usage Scenario* to demonstrate CLICK in BER. This scenario is created around the idea of testing CLICK by three different professional profiles: an urban mobility planner, a public housing company planner and a CPO planner.

Table 12: Proposed *Usage Scenario* for CLICK in BER

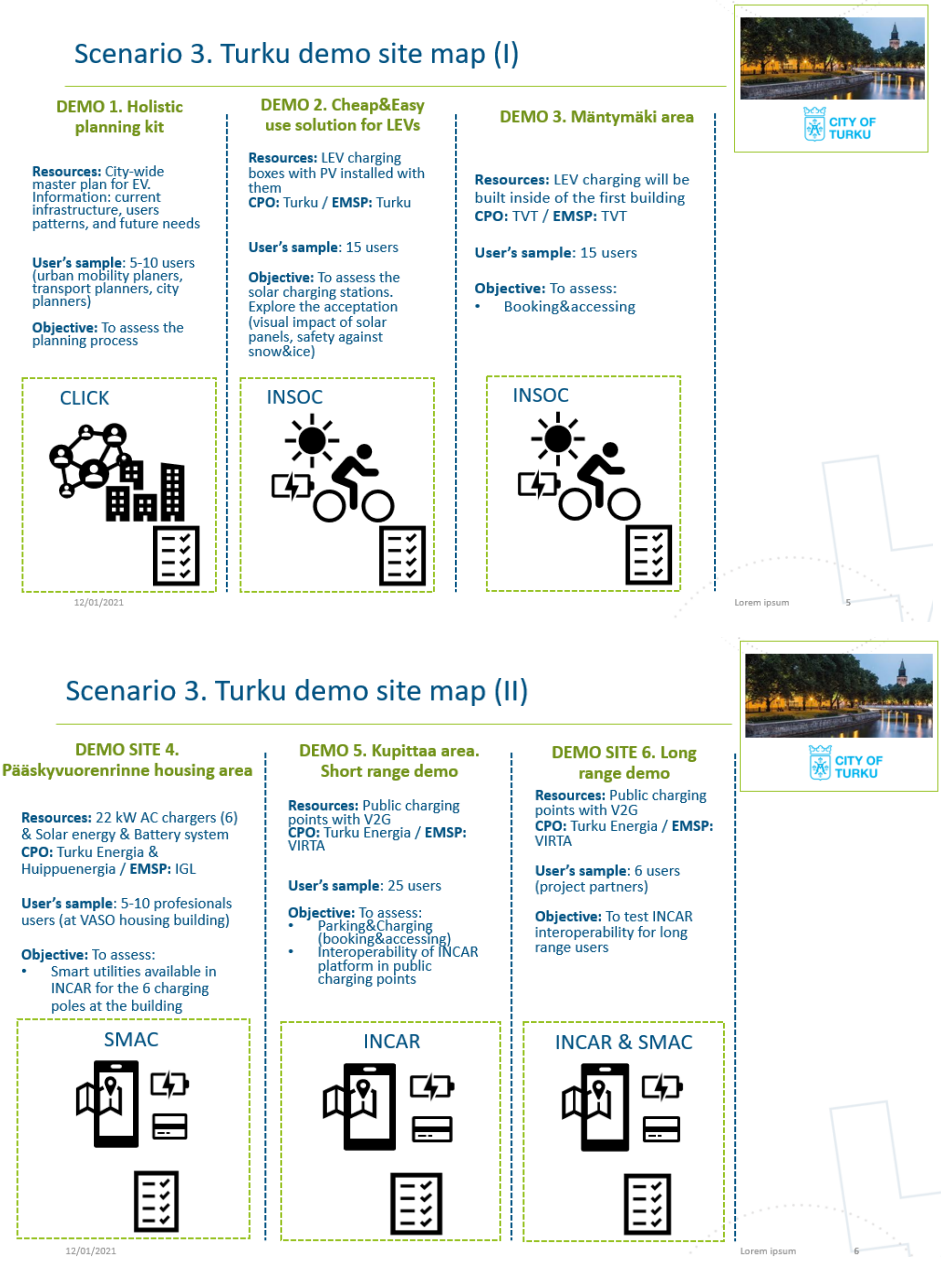


3.3 Proposed *Usage Scenarios* for Turku (TUR)

On Wednesday 9th of December we performed the workshop with TUR's team. The workshop was leaded by IBV, with the participation of CLICK-INSOC-INDUCAR-INSOC&SMAC product leaders (VMZ-ENELX-IPT-ETRA).

Figure 14 presents the initial description for the *Usage Scenarios* of USER-CHI products in Turku. There is a total number of six *Usage Scenarios*, conceived as demonstration sites to test three USER-CHI products: INCAR&SMAC (short range and long range), INSOC and CLICK. Following a similar methodology to that one described in section *3.1*, we generated the following proposed scenarios.

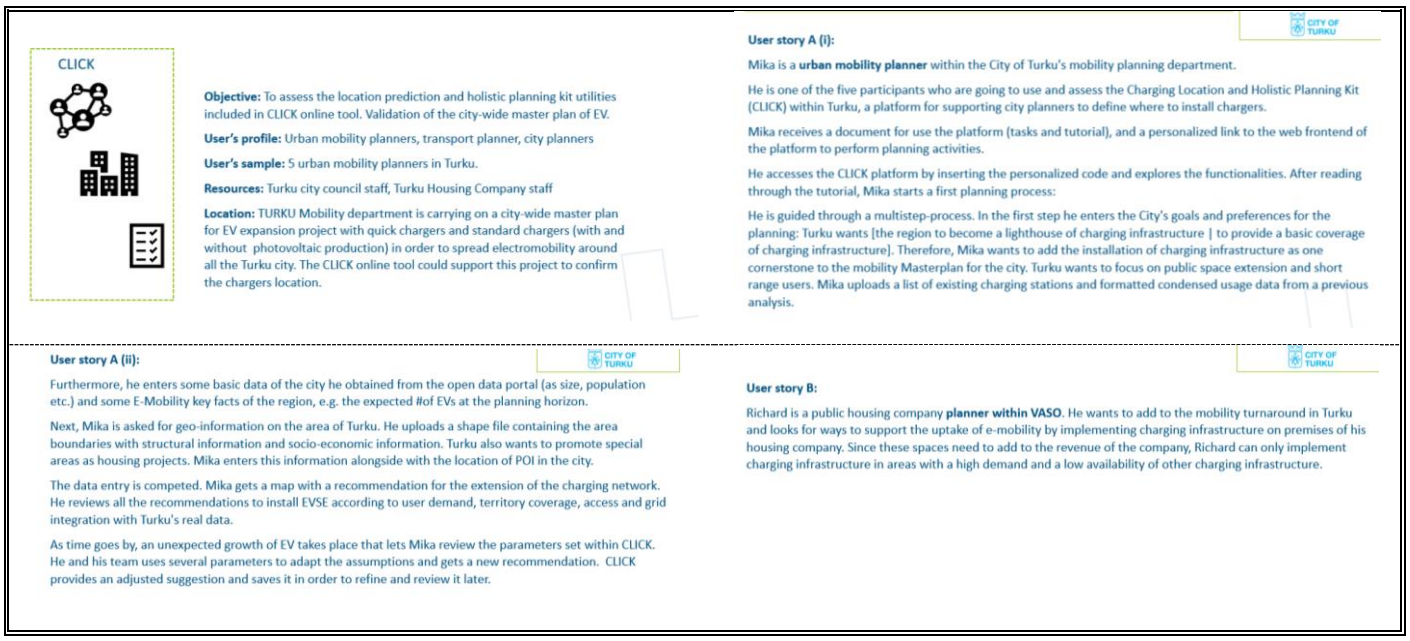
Figure 14: Initial *Usage Scenario* description for TUR



CLICK

Table 13 presents the proposed *Usage Scenario* to demonstrate CLICK in TUR. This scenario is created around the idea of employing CLICK to support the city-wide master plan for EV expansion that TURKU Mobility department is carrying on.

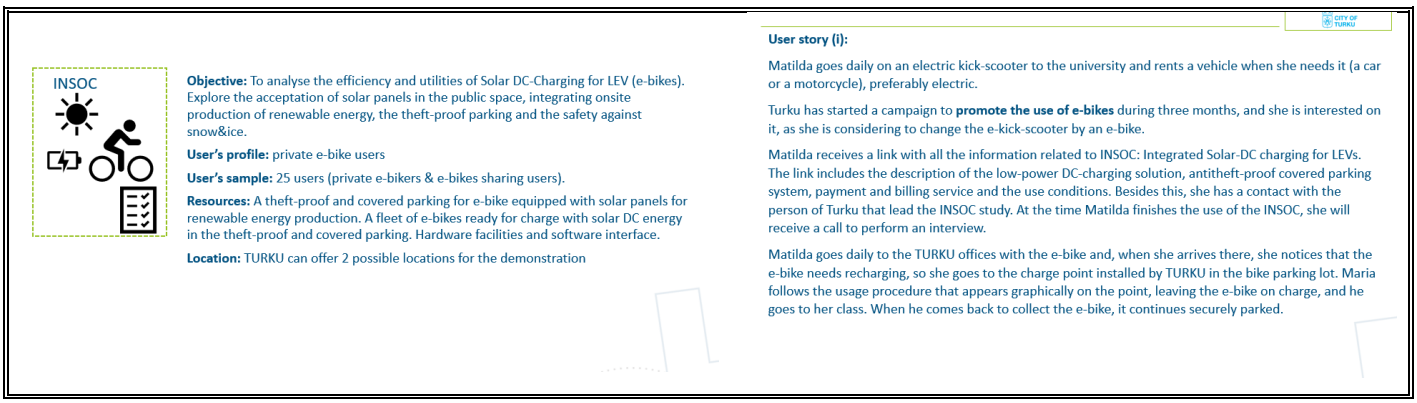
Table 13: Proposed *Usage Scenarios* for CLICK in TUR



INSOC

Table 14 presents the proposed *Usage Scenario* to demonstrate INSOC in TUR. This scenario is created around the idea of testing the solar charging station by private e- riders and e-bikes sharing users in two city locations. The scenario also includes the availability of a theft-proof and covered charging station for e-bikes, equipped with PV (photovoltaic) panels.

Table 14: Proposed *Usage Scenario* for INSOC in TUR



User story (ii):

During class time it was snowy, but since the parking space was covered the bike has not gotten wet. It's very cold, Matilda wants to propose that part of the energy produced were used to maintain a minimum comfort temperature.

After the use, Matilda makes an appointment with the person in charge of the studio for a telephone interview. Maria tells her opinion and how has been the process of use. They talk about the aesthetics of the solar panels and the contact person asks him if she can use once more the e-bike, recording the process and reporting comments. Matilda will do it tomorrow and will send the video by email.

At the end, the demo site must be able to provide 50 successful stories like this.

SMAC

Table 15 presents the proposed *Usage Scenario* to demonstrate SMAC in TUR. This scenario is created around the idea of testing SMAC utilities in the chargers of a residential building, by professionals. The building is equipped with 6 AC chargers, PV panels and a system to storage electricity (battery).

Table 15: Proposed *Usage Scenario* for SMAC in TUR

SMAC

SMAC – Use of the Smart e-Mobility Dashboards*

Objective: To analyse smart grid integration services, RES electricity supply, reduction of grid impact and demand management. Validate service configuration. Display real time and historic information for the management of the e-mobility.

User's profile: CP managers and EMSP managers

User's sample: 5-10 technical managers in Turku charging point network.

Resources: 22 kW AC chargers (6) & Solar energy & Battery system

CPO: Turku Energia

ESMP: IGL

User story (i):

Anne is a charging point' manager in Turku Energia.

She is one of the five-ten people participating in SMAC assessment, a tool including smart grid integration services, RES electricity supply, reduction of grid impact and demand management.

Anne is managing the six smart charging station located in the VASO housing building, in the area of Pääskyvuorenrinne.

She is now exploring the Smart Charging features in order to offer both the maximum power and the high-quality level in this charging stations. At night, the charging stations should offer long period of charge at medium or low power, and just the opposite during the day: short period of charge at high power.

With SMAC tool, she is able to define the restrictions and the required level of service for each charging point considering the user preferences (charge as fast as possible, as cheap as possible, 80% battery in 3 hours, in 8 hours...). She will receive from SMAC the charging profile for each user when he books the point.

Anne receives a document to use the SMAC tool (tasks and tutorial), and one link to perform assessment activities. Secondly, she explores the CPO dashboards: statistics, series, data access, ...

User story (ii):

Another day, Anne receives a City of Turku requirement asking for information related to performance electromobility. In order to answer the requirement, she employs the INCAR utilities for professionals (related to INCAR assessment/validation, see the section below).

After the use of SMAC, a validation screen is activated and Anne answers the asked metrics (related to utility, ease to use, satisfaction and promote intention). Finally, Anne answer an online questionnaire. She really likes the information and the settings functions for CPOs, but she doesn't find out how to filter the data and to export it for exploitation.

At the end, the demo site must be able to provide 5-10 successful stories like this.

INCAR

Table 16 shows the proposed *Usage Scenario* to demonstrate INCAR in TUR. This scenario is created around the idea of testing the interoperability of the INCAR platform, by employing the public chargers installed in the Kupitta area. Users participating in this demonstration tests will be private e-drivers, having electromobility contracts with different local providers.

On the other hand, *Table 17* presents the *Usage Scenario* created to demonstrate INCAR in TUR, when the platform is employed to charge an EV in long range displacements. This scenario

intends to demonstrate interoperability clearly showing that professional drivers (taxi-drivers or logistics company drivers) with an EMSP contract from another city of the USER-CHI consortium (e.g. Rome), are able to charge their EVs in Turku by using the INCAR platform.

Table 16: Proposed *Usage Scenario* for INCAR (short range) in TUR

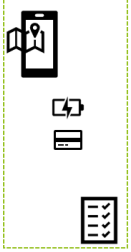
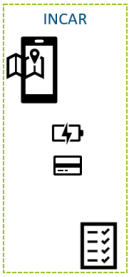
INCAR  **Objective:** To analyse the interoperability between CPOs. Explore the utilities according to user group. Validate service customization. Improve availability of CPOs. To assess parking&charging tasks and smarts utilities. **User's profile:** Private e-drivers **User's sample:** 25 private e-drivers (selected from the data bases of the EMSPs participating in the tests). **Resources:** Public charging points (AC/DC) in Kupittaa area, INCAR platform and INCAR app. **CPO:** Turku Energia **ESMP:** VIRTA **Another ESMP and CPO, located in other USER-CHI city and integrated in INCAR platform must be involved in the test.	**User story (i):** Aino lives in Turku (VASO housing building, Pääskyvuorenrinne area) and her boyfriend Leo lives at the Kupittaa area. During weekends, she uses to go with her e-car to Leo's home and she needs to charge her vehicle. She received the invitation from TURKU to participate in INCAR app validation. She will participate using a IGL account, in order to charge at Kupittaa's Turku Energia charging points. She accepted because she is committed with the promotion of electromobility in her city. Aino download the INCAR app, available in Google Play, insert the code provided by TURKU and start the use with IGL account. The first day she explores all functionalities of the app. Aino compares the INCAR navigator with the one she usually employs. The second day, she books one pole in Pääskyvuorenrinne housing area, accesses, parks and charges in this location. That recharge is accounted to her IGL account and she will pay it at the end of the month.
User story (ii): This day, after the use of INCAR app, a validation screen is activated and Aino answer some questions (a questionnaire related to utility, ease to use, satisfaction and use promotion). The third day, Aino creates her user profile. When the profile is created, Aino is invited to fulfill a new questionnaire. As an additional activity, Aino explores different charging points in Kupittaa area using the filter function. Aino select the menu option to display (map/list) charging stations close to her location. During the weekend, Aino selects the pole which is closer to her location in Kupittaa area, but when the whole information of the charging point is displayed, she observes that it is occupied. She comes back to the previous menu, but in this case she sets searching parameters in order to show available charging points and the application displays different options, related to INCAR assessment/validation (see the section below). Finally she charges the car in a public charging point managed by VIRTA, so she will pay the service according to the IGL fares. The last day, Aino performs a telephone interview and an online questionnaire. It's a bit long but the collaboration ends here. She just hopes to see improvements in the charging network. At the end, the demo site must be able to provide 25 successful stories like that demonstrating the interoperability in Pääskyvuorenrinne and Kupittaa areas.	

Table 17: Proposed *Usage Scenario* for INCAR (long range) in TUR

INCAR  **Objective:** To analyze the interoperability between CPOs. Explore the utilities according to user group. Validate service customization. Improve availability of CPOs. **User's profile:** professional e-drivers (taxi drivers, delivery services, after sales services...). **User's sample:** 6 professionals e-drivers / private e drivers. **Resources:** Public charging points (AC/DC) in Kupittaa area, INCAR platform and INCAR app. **CPO:** Turku Energia **ESMP:** VIRTA & Roma mobilità	**User story:** Johannes is a e-taxi driver, he works in the Turku metropolitan area. He received the invitation from TURKU to participate in INCAR app validation. He will participate using the TURKU public charging points with a Rome ESMP account. He accepted, because usually he charges at home or uses the TURKU charging network. Johannes download the INCAR app, available in Google Play, insert the code provided by TURKU and start the use with a Rome ESMP account. The first day he explore all functionalities of the app. Johannes compares the INCAR navigator with the one he usually employs. The second day, he books one point in TURKU network, access and charge in this location. That recharge is accounted to his Rome account and he will pay it at the end of the month. As Johannes is a Rome customer, he will pay the service according to the Rome EMSP fares. This day, after the use of INCAR app, a validation screen is activated and Johannes answer some questions (a questionnaire related to utility, ease to use, satisfaction and use promotion). The third day, Johannes creates his user profile and explores different charging points using the filter function. When the profile is created, Johannes is invited to fulfill a new questionnaire. The last day, Johannes performs a telephone interview and an online questionnaire. It's a bit long but the collaboration ends here. He just hopes to see improvements in the charging network. At the end, the demo site must be able to provide 6 successful stories like that demonstrating the interoperability.

3.4 Proposed *Usage Scenarios* for Rome (RSM)

On Thursday 10th of December we performed the workshop with RSM's team. The workshop was leaded by IBV, with the participation of CLICK-INSOC-INDUCAR-INSOC&SMAC product leaders (VMZ-ENELX-IPT-ETRA).

Figure 15: Initial *Usage Scenario* description for RSM

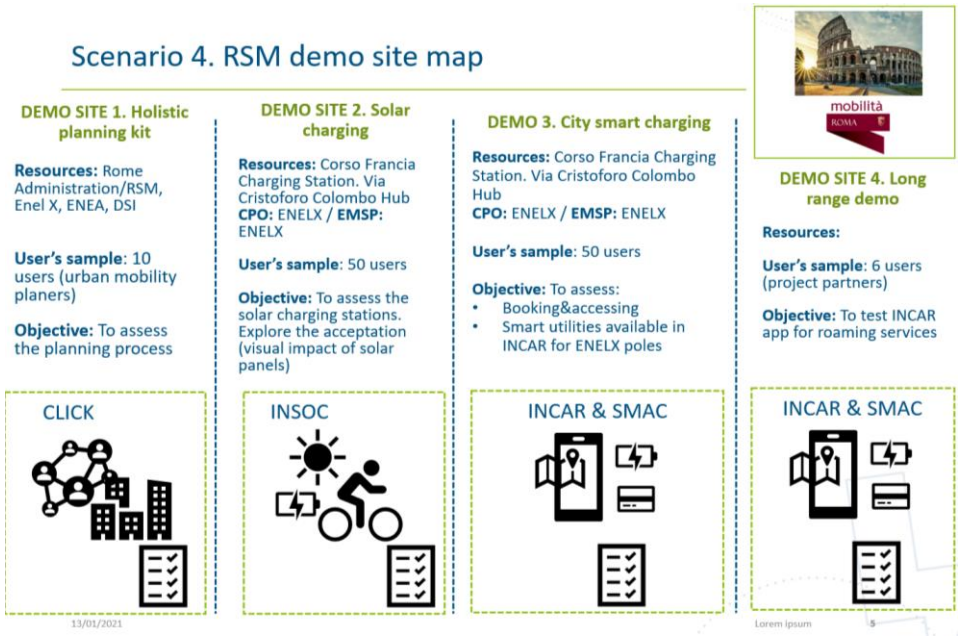
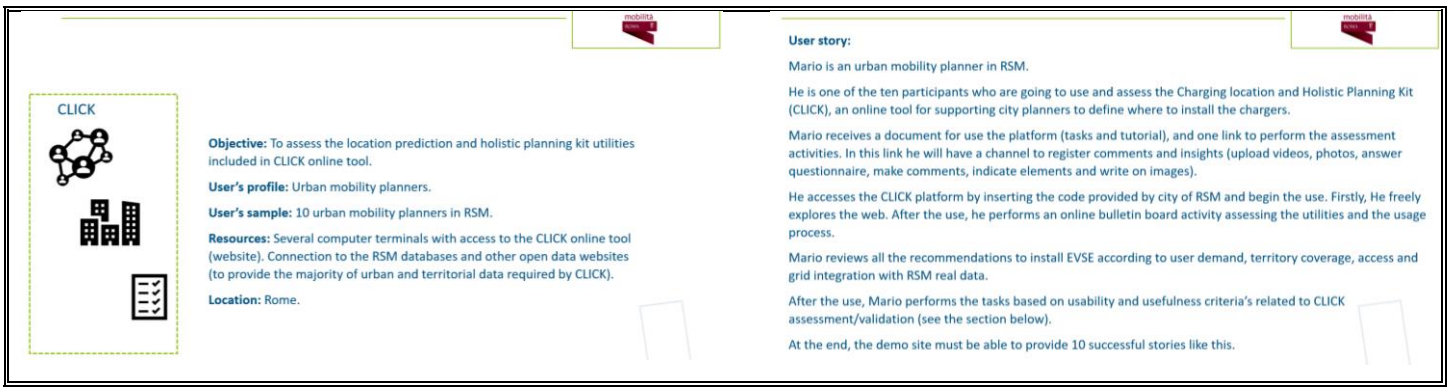


Figure 15 presents the initial description for the *Usage Scenarios* of USER-CHI products in Rome. There is a total number of four *Usage Scenarios*, conceived as demonstration sites to test three USER-CHI products: CLICK, INSOC and INCAR&SMAC (short range and long range). Following a similar methodology to that one described in section 3.1, we generated the following proposed scenarios.

CLICK

Table 18 presents the proposed *Usage Scenario* to demonstrate CLICK in Rome. This scenario is created around the idea of testing CLICK by urban mobility planners, who work in Rome council. CLICK will employ local available data to generate results adapted to city needs and requirements.

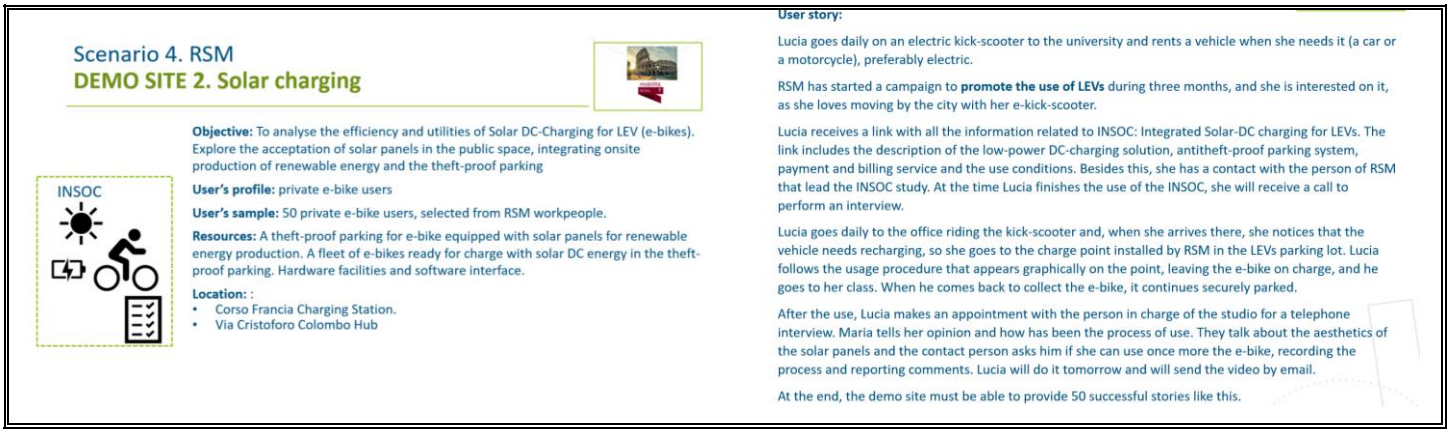
Table 18: Proposed *Usage Scenario* for CLICK in RSM



INSOC

Table 19 presents the proposed *Usage Scenario* to demonstrate INSOC in RSM. This scenario is created around the idea of testing the solar charging station by private e-riders, selected from RSM workpeople. The scenario also includes the availability of a theft-proof and covered charging station for e-bikes, equipped with PV (photovoltaic) panels, installed in Corso Francia charging station and Via Cristoforo Colombo hub.

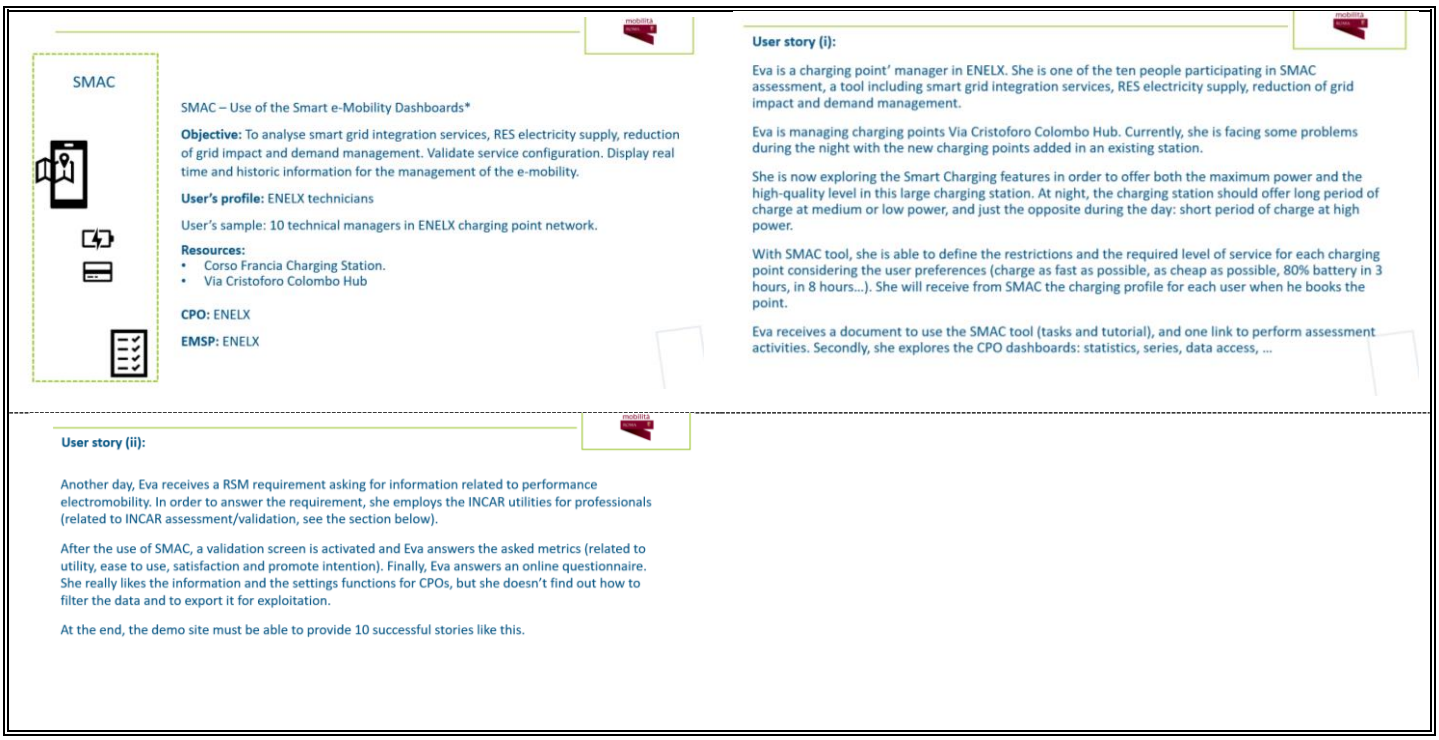
Table 19: Proposed *Usage Scenario* for INSOC in RSM



SMAC

Table 20 presents the proposed *Usage Scenario* to demonstrate SMAC in RSM. This scenario is created around the idea of testing SMAC utilities in the chargers of Corso Francia charging station and Via Cristoforo Colombo hub, by professionals. It is expected that the professionals who participate in test are charging points managers and charging points technicians.

Table 20: Proposed *Usage Scenario* for SMAC in RSM



INCAR

Table 21 presents the *Usage Scenario* created to demonstrate INCAR in RSM, when the platform is employed to charge an EV in long range displacements. This scenario intends to demonstrate interoperability clearly showing that professional users with an EMSP contract from another city of the USER-CHI consortium (e.g. Barcelona), are able to charge their EVs in Rome by using the INCAR platform.

Regarding the demonstration of INCAR platform's interoperability in the short range, it is required the participation of two local electromobility suppliers. This situation was not clear in the case of RSM, so during the workshop we were not able to create a proposed *Usage Scenario* for INCAR in the short range.

Table 21: Proposed *Usage Scenario* for INCAR long range in RSM

INCAR	**Objective:** To analyze the interoperability between CPOs. Explore the utilities according to user group. Validate service customization. Improve availability of CPOs. **User's profile:** professional e-drivers (taxi drivers, delivery services, after sales services...) **User's sample:** 6 professionals e-drivers working in RSM area, selected from the RSM data base as ESMP. **Resources:** fast charging points (AC/DC) in RSM area, INCAR platform and INCAR app. ENELX, as CPO and ESMP, has to be integrated in INCAR platform. Another ESMP and CPO, located in other USER-CHI city (for instance AMB-Barcelona) and integrated in INCAR platform must be involved in the test.	**User story:** Jordi is a e-taxi driver, he works in the RSM metropolitan area. He received the invitation from RSM to participate in INCAR app validation. He will participate using the RSM quick charging points with a AMB account. He accepted, because usually he charges at home or uses the RSM charging network. Other e-drivers will participate with a RSM ESMP account. Johannes download the INCAR app, available in Google Play, insert the code provided by RSM and start the use with a AMB account. The first day he explore all functionalities of the app. Jordi compares the INCAR navigator with the one he usually employs. The second day, he books one point in RSM network, access and charge in this location. That recharge is accounted to his AMB account and he will pay it at the end of the month. As Jordi is a AMB customer, he will pay the service according to the AMB fares. This day, after the use of INCAR app, a validation screen is activated and Jordi answer some questions (a questionnaire related to utility, ease to use, satisfaction and use promotion). The third day, Jordi creates his user profile and explores different charging points using the filter function. When the profile is created, Jordi is invited to fullfil a new questionnaire. The last day, Jordi performs a telephone interview and an online questionnaire. It's a bit long but the collaboration ends here. He just hopes to see improvements in the charging network. At the end, the demo site must be able to provide 6 successful stories like that demonstrating the interoperabilit

3.5 Proposed *Usage Scenarios* for Budapest (BUD)

On Friday 11th of December we performed the workshop with BUD's team. The workshop was leaded by IBV, with the participation of CLICK-INSOC-INDUCAR-INSOC&SMAC product leaders (VMZ-ENELX-IPT-ETRA).

Figure 16: Initial *Usage Scenario* description for BUD

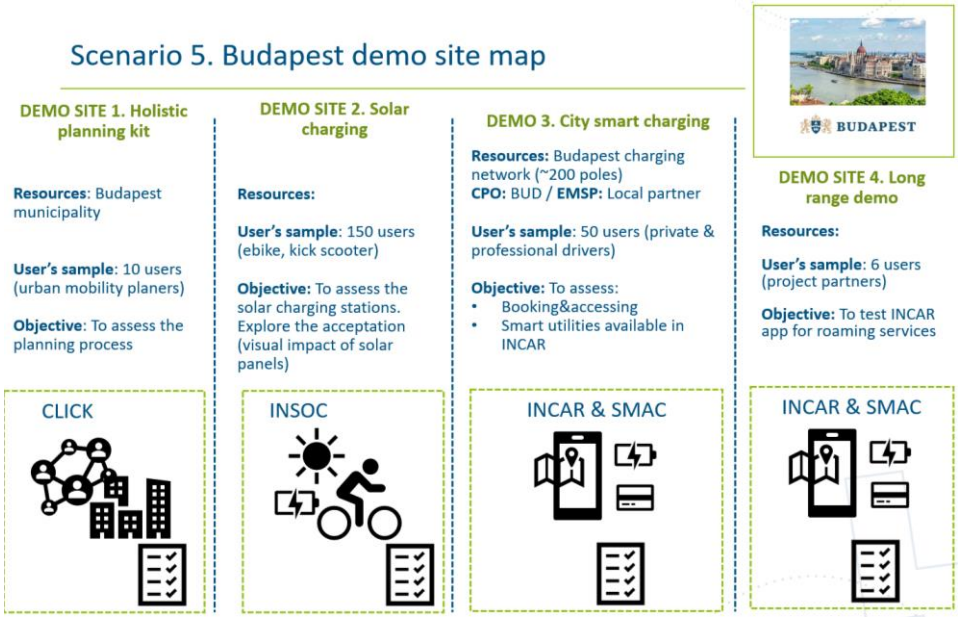


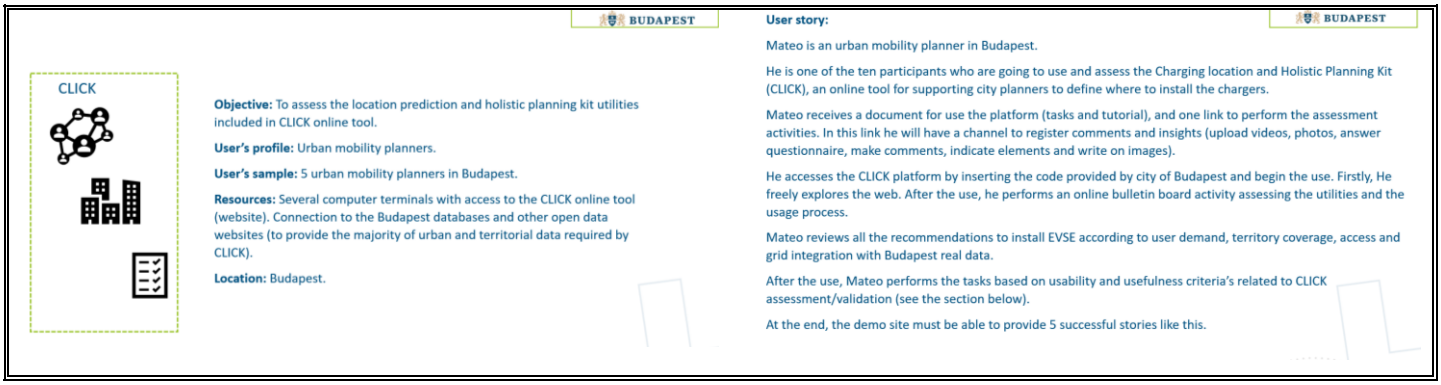
Figure 16 presents the initial description for the *Usage Scenarios* of USER-CHI products in Budapest. There is a total number of four *Usage Scenarios*, conceived as demonstration sites to test three USER-CHI products: CLICK, INSOC and INCAR&SMAC (short range and long range).

Following a similar methodology to that one described in section 3.1, we generated the following proposed scenarios.

CLICK

Table 22 presents the proposed *Usage Scenario* to demonstrate CLICK in Budapest. This scenario is created around the idea of testing CLICK by urban mobility planners, who work in Budapest council. CLICK will employ local available data to generate results adapted to city needs and requirements.

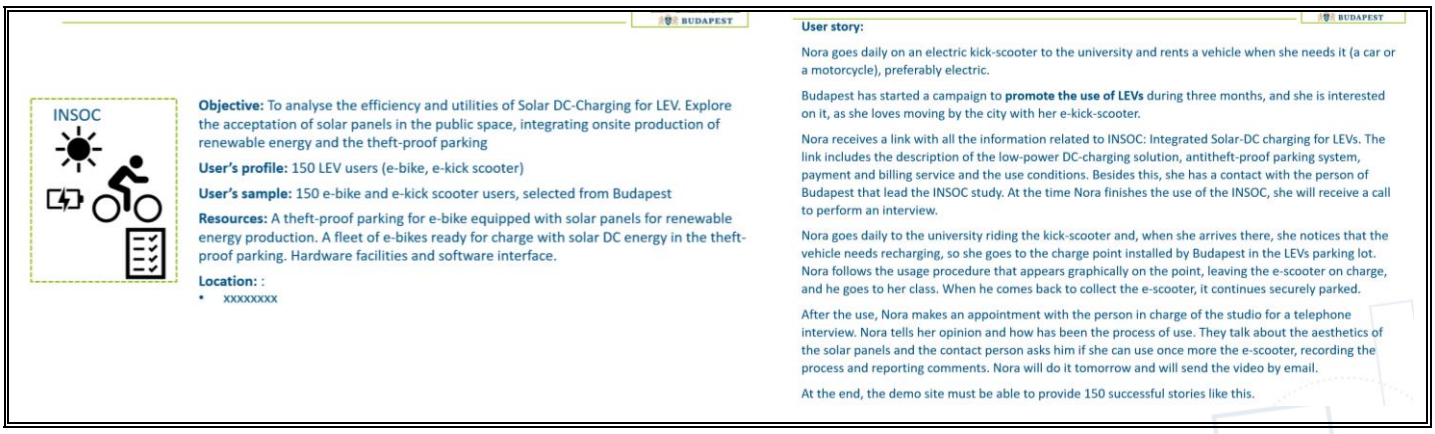
Table 22: Proposed *Usage Scenario* for CLICK in BUD



INSOC

Table 23 presents the proposed *Usage Scenario* to demonstrate INSOC in BUD. This scenario is created around the idea of testing the solar charging station by private e-riders. The scenario also includes the availability of a theft-proof and covered charging station for e-bikes, equipped with PV (photovoltaic) panels, although its location is not yet defined.

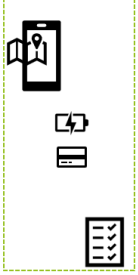
Table 23: Proposed *Usage Scenario* for INSOC in BUD



SMAC

Table 24 presents the proposed *Usage Scenario* to demonstrate SMAC in BUD. This scenario is created around the idea of testing SMAC utilities in the local charging network, by professionals. It is expected that the professionals who participate in test are charging points managers and charging points technicians.

Table 24: Proposed *Usage Scenario* for SMAC in BUD

BUDAPEST SMAC  INCAR – Use of the Smart e-Mobility Dashboards* **Objective:** To analyse smart grid integration services, RES electricity supply, reduction of grid impact and demand management. Validate service configuration. Display real time and historic information for the management of the e-mobility. **User's profile:** Budapest CPOs technicians **User's sample:** 5 technical managers in Budapest charging point network. **Resources:** Budapest charging network (~200 poles), INCAR platform and SMAC app. **CPO:** Budapest **EMSP:** Budapest	BUDAPEST **User story (i):** Hanna is a charging point' manager in Budapest mobility area. She is one of the ten people participating in SMAC assessment, a tool including smart grid integration services, RES electricity supply, reduction of grid impact and demand management. Hanna is managing charging points. Currently, she is facing some problems during the night with the new charging points added in an existing station. She is now exploring the Smart Charging features in order to offer both the maximum power and the high-quality level in this large charging station. At night, the charging station should offer long period of charge at medium or low power, and just the opposite during the day: short period of charge at high power. With SMAC tool, she is able to define the restrictions and the required level of service for each charging point considering the user preferences (charge as fast as possible, as cheap as possible, 80% battery in 3 hours, in 8 hours...). She will receive from SMAC the charging profile for each user when he books the point. Hanna receives a document to use the SMAC tool (tasks and tutorial), and one link to perform assessment activities. Secondly, she explores the CPO dashboards: statistics, series, data access, ...
User story (ii): BUDAPEST Another day, Hanna receives a requirement asking for information related to electromobility performance. In order to answer the requirement, she employs the INCAR utilities for professionals (related to INCAR assessment/validation, see the section below). After the use of SMAC, a validation screen is activated and Hanna answers the asked metrics (related to utility, ease to use, satisfaction and promote intention). Finally, Hanna answers an online questionnaire. She really likes the information and the settings functions for CPOs, but she doesn't find out how to filter the data and to export it for exploitation. At the end, the demo site must be able to provide 5 successful stories like this.	

INCAR

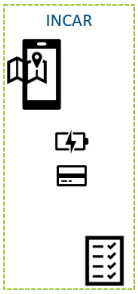
Table 25 shows the proposed *Usage Scenario* to demonstrate INCAR in BUD. This scenario is created around the idea of testing the interoperability of the INCAR platform, by employing the Budapest charging network. Users participating in this demonstration tests will be private e-drivers and professional drivers, that charge their EVs without being subscribed to any electromobility service (Ad-hoc charging).

On the other hand, *Table 26* presents the *Usage Scenario* created to demonstrate INCAR in BUD, when the platform is employed to charge an EV in long range displacements. This scenario intends to demonstrate interoperability clearly showing that professional users with an EMSP contract from another city of the USER-CHI consortium (e.g. Rome), are able to charge their EVs in Budapest by using the INCAR platform.

Table 25: Proposed *Usage Scenario* for INCAR short range in BUD

BUDAPEST

INCAR



Objective: To analyse the interoperability between CPOs. Explore the utilities according to user group. Validate service customization. Improve availability of CPOs. To assess booking&accessing, parking&charging tasks and smarts utilities.

User's profile: private e-drivers

User's sample: 50 users (private & professional drivers)

Resources: Budapest charging network (~200 poles), INCAR platform and INCAR app.

CPO: Budapest

ESMP: Ad-hoc charging

**Another ESMP and CPO, located in other USER-CHI city and integrated in INCAR platform must be involved in the test.

BUDAPEST

User story (i):

Emma lives in Budapest and she drives an EV. She usually charges at home but sometimes she needs to charge in the city. For this reason, she is subscribed in the Budapest charging network.

She receives the invitation from Budapest to participate in INCAR app validation. She will participate employing INCAR app to charge in one of the 200 poles of Budapest charging network. She accepted because she is very committed with the promotion of electromobility in her country.

Emma download the INCAR app, available in Google Play, insert the code provided by Budapest and start the use. The first day she explores all functionalities of the app. Emma compares the INCAR navigator with the one she usually employs.

The second day, she books one pole close to her office, accesses, parks and charges in this location. That recharge has to be paid using a credit card when she unplugs the car.

This day, after the use of INCAR app, a validation screen is activated and Emma answer some questions (a questionnaire related to utility, ease to use, satisfaction and use promotion).

The third day, Emma creates her user profile. When the profile is created, Emma is invited to fulfill a new questionnaire.

BUDAPEST

User story (ii):

As an additional activity, Emma explores different charging points in Budapest area using the filter function. Emma selects the menu option to display (map/list) charging stations near to her.

Another day, Emma selects the pole which is closer to her location, but when the whole information of the charging point is displayed, she observes that it is occupied. She comes back to the previous menu, but in this case she sets searching parameters in order to show available charging points and the application displays different options, related to INCAR assessment/validation (see the section below).

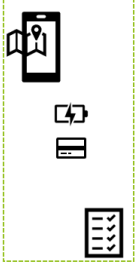
The last day, Emma performs a telephone interview and an online questionnaire. It's a bit long but the collaboration ends here. She just hopes to see improvements in the charging network.

At the end, the demo site must be able to provide 25 successful stories like that demonstrating the interoperability in Budapest area.

Table 26: Proposed *Usage Scenario* for INCAR long range in BUD

BUDAPEST

INCAR



Objective: To analyze the interoperability between CPOs. Explore the utilities according to user group. Validate service customization. Improve availability of CPOs.

User's profile: professional e-drivers (taxi drivers, delivery services, after sales services...)

User's sample: 6 professionals e-drivers working in Budapest area, selected from the Budapest data base as ESMP.

Resources: fast charging points (AC/DC) in Budapest area, INCAR platform and INCAR app.

Budapest, as CPO and ESMP, has to be integrated in INCAR platform.

Another ESMP and CPO, located in other USER-CHI city (for instance Berlin-Rome) and integrated in INCAR platform must be involved in the test.

BUDAPEST

User story:

Peter is a e-taxi driver, he works in the Budapest metropolitan area.

He received the invitation from Budapest to participate in INCAR app validation. He will participate using the Budapest quick charging points with a Berlin account. He accepted, because usually he charges at home or uses the Budapest charging network. Other e-drivers will participate with a Budapest ESMP account.

Peter download the INCAR app, available in Google Play, insert the code provided by Budapest and start the use with a Berlin account. The first day he explore all functionalities of the app. Peter compares the INCAR navigator with the one he usually employs.

The second day, he books one point in Budapest network, access and charge in this location. That recharge is accounted to his Berlin account and he will pay it at the end of the month. As Peter is a Berlin customer, he will pay the service according to the Berlin fares.

This day, after the use of INCAR app, a validation screen is activated and Peter answer some questions (a questionnaire related to utility, ease to use, satisfaction and use promotion).

The third day, Peter creates his user profile and explores different charging points using the filter function. When the profile is created, Peter is invited to fulfil a new questionnaire.

The last day, Peter performs a telephone interview and an online questionnaire. It's a bit long but the collaboration ends here. He just hopes to see improvements in the charging network.

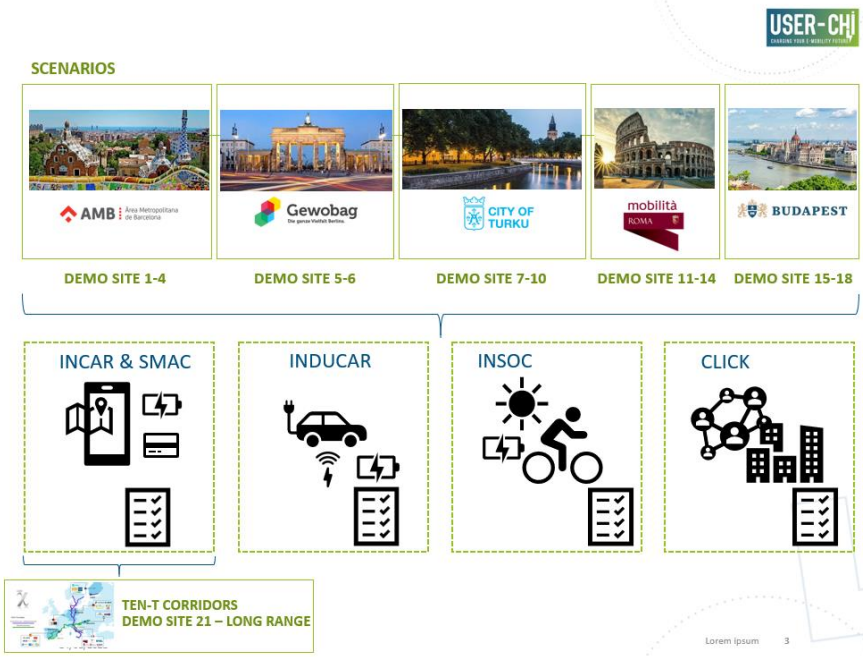
At the end, the demo site must be able to provide 6 successful stories like that demonstrating the interoperability

4. Results: updated *Usage Scenarios*

The updated *Usage Scenarios* presented in this section are the result of reviewing the Proposed scenarios, mainly by performing three actions:

- Firstly, reorganizing the scenarios using a common numbering, in order to get a clearer vision of all the tests we propose to perform.
- Secondly, reviewing the demonstration scenarios for INCAR&SMAC, considering two basic situations: users having a contract with a local EMSP, and users without any contract. When studying these situations, we noticed that a combination of end users (drivers) and intermediate users (EMSPs and CPOs) is required for each scenario, as interoperability requires information flows between EMSPs and CPOs, that have to be validated by these professionals.
- Thirdly, considering that a more realistic user story is required to demonstrate interoperability in the long range, so consequently we modified all these stories.

Figure 17: Common reference for USER-CHI *Usage Scenarios*[9]



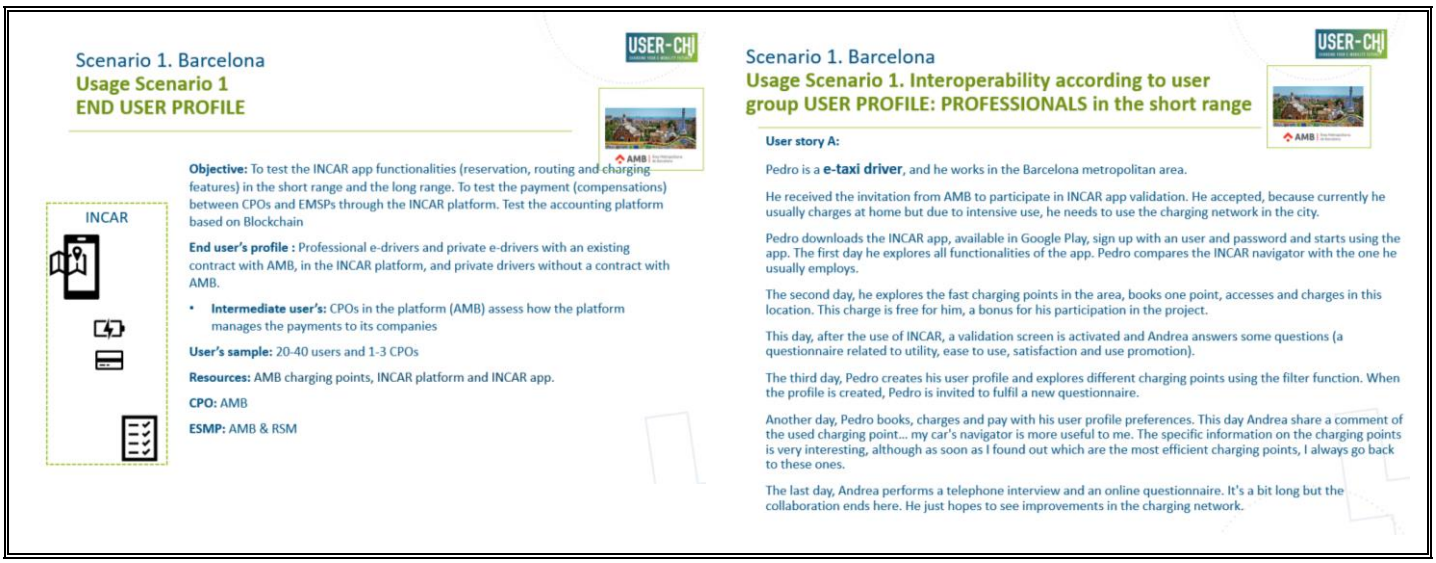
IBV, in close collaboration with ETRA, generated a new version of the *Usage Scenarios*, that was reviewed and modified by the cities' team, as a previous step to generate the updated versions of the *Usage Scenarios* presented below.

Figure 17 presents the common numbering adopted to identify all the *Usage Scenarios* on a unique reference. Finally, we get a total number of 18 *Usage Scenarios*, distributed in five different demonstration sites.

4.1 AMB's *Usage Scenarios* (1-4)

In the following tables, the updated *Usage Scenarios* from 1 to 4, to be deployed in Barcelona metropolitan area (AMB), are presented. The *Usage Scenarios* are characterized by a basic description, and the user stories of the different participants' profiles.

Table 27: *Usage Scenario* 1. INCAR&SCMAC demonstration in AMB



Scenario 1. Barcelona
Usage Scenario 1. Interoperability according to user group USER PROFILE: PRIVATE DRIVERS in the long range

User story B:

Paolo is an EV owner living in Rome, that employs his car for daily displacements. He is subscribed to Roma Mobilità, so he can charge his car in different charging poles all around the city. He is planning one week holidays with his family in Sitges, a fancy small village in the Mediterranean sea, close to Barcelona.

He is thinking in renting a car for going from the BCN airport to his hotel in Sitges, and for visiting Barcelona durin the week. He would like to rent an EV, but difficulties with accessing to the charging network makes him doubt. Sc when he receives the invitation from Roma Mobilità to participate in INCAR validation, that includes the possibilit of charging in AMB chargers with his RSM subscription, his doubts disappear.

Paolo downloads the INCAR app, available in Google Play , signs up with an user and password and starts using th app. The first day he explores all functionalities of the app. Paolo compares the INCAR navigator with the one he usually employs.

The second day, Paolo creates his user profile and explores different charging points using the filter function. When the profile is created, Paolo is invited to fulfil a new questionnaire.

A day during his holidays, he plans a trip to Barcelona. He explores the fast charging points in the area, books one point, accesses and charges in this location. That recharge is paid through the USER-CHI app when he unplugs the car.

This day, after the use of INCAR, a validation screen is activated and Andrea answers some questions (a questionnaire related to utility, ease to use, satisfaction and use promotion).

The last day, Paolo performs a telephone interview and an online questionnaire. It's a bit long but the collaboration ends here. He just hopes to see improvements in the charging network to EU level.

Scenario 1. Barcelona
Usage Scenario 1. Interoperability according to user group USER PROFILE: CPOs in the long range

User story C:

Anna is charging point's manager in AMB charging network. She is one of the three professionals' participants who are going to use and assess the Interoperability Platform (INCAR).

Anna receives a document for use the platform (tasks and tutorial), and a personalised link to the web frontend of the platform.

She accesses the INCAR platform by filling the registration form.

A couple of days later, Anna enters into the app and notices that has five new charges from different users in the charging poles network. In the Dashboard she reviews the energy and cost of these charges. She have specified that wants to receive payments at the end of each month, and that has been specified in a Smart Contract.

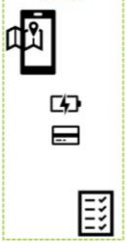
At the end of the month Anna checks her account in the INCAR platform and the bank all prove that the payments of that month has been made effective automatically.

AMB charging network has a node in the Blockchain network of INCAR, therefore Hanna can verify all the transactions in every moment.

After all the checks, Anna evaluates the INCAR platform and its functionalities.

Scenario 1. Barcelona
Usage Scenario 1. Interoperability according to user group CPOs

SMAC



SMAC: Smart Charging Tool to dynamically optimise the power supplied to the Charging Points.

Objective: Allow an intelligent and dynamic management of demand based on this analysis, which will allow CPOs to manage in a more efficient and economical way the energy supplied at their charging points by, at the same time, improving the service to the end-user.

User's profile: Charging Point Operators. CPOs using the SMAC website interface

- End-users participate selecting options offered by the smart charge

User's sample: 5-10 technical managers in AMB charging point network.

Resources: a station with several charging points (ultra fast, quick, normal) in the AMB charging network (end 2021), INCAR platform and INCAR app including SMAC utilities.

CPO: AMB

EMSP: AMB

Scenario 1. Barcelona
Usage Scenario 1. Interoperability according to user group USER PROFILE: CPOs

User story D (i):

Anna is a charging point' manager in AMB.

She is one of the five-ten people participating in SMAC assessment, a tool including smart grid integration services, RES electricity supply, reduction of grid impact and demand management.

Anna is managing charging points. She receives a document to use the SMAC tool (tasks and tutorial), and one link to perform assessment activities.

She is now exploring the Smart Charging features in the online website (statistics, series, data access, ...), in order to offer both the maximum power and the high-quality level in this charging stations. At night, the charging stations should offer long period of charge at medium or low power, and just the opposite during the day: short period of charge at high power. Anyway, Anna is able to define the restrictions and the required level of service for each charging point considering the user preferences (charge as fast as possible, as cheap as possible, 80% battery in 3 hours, in 8 hours...). She will receive from SMAC the charging profile for each user when he books the point.

Pedro, an INCAR user with a subscription with AMB, books a charging pole and selects a low cost charging. The INCAR app sends a request to the system, and SMAC generates a charging profile which is sent back to the CPO system and then to the charging point.

Scenario 1. Barcelona
Usage Scenario 1. Interoperability according to user group USER PROFILE: CPOs

User story D (ii):

Another day, Anna receives a requirement asking for information related to electromobility performance. In order to answer the requirement, she employs the INCAR utilities for professionals (related to INCAR Monitoring & Assessment, see the section below).

After the use of SMAC, a validation screen is activated and Anna answers the asked metrics (related to utility, ease to use, satisfaction and promote intention). Finally, Anna answers an online questionnaire. She really likes the information and the settings functions for CPOs, but she doesn't find out how to filter the data and to export it for exploitation.

At the end, the demo site must be able to provide 5-10 successful stories like this.

Table 28: Usage Scenario 2. INDUCAR demonstration in AMB

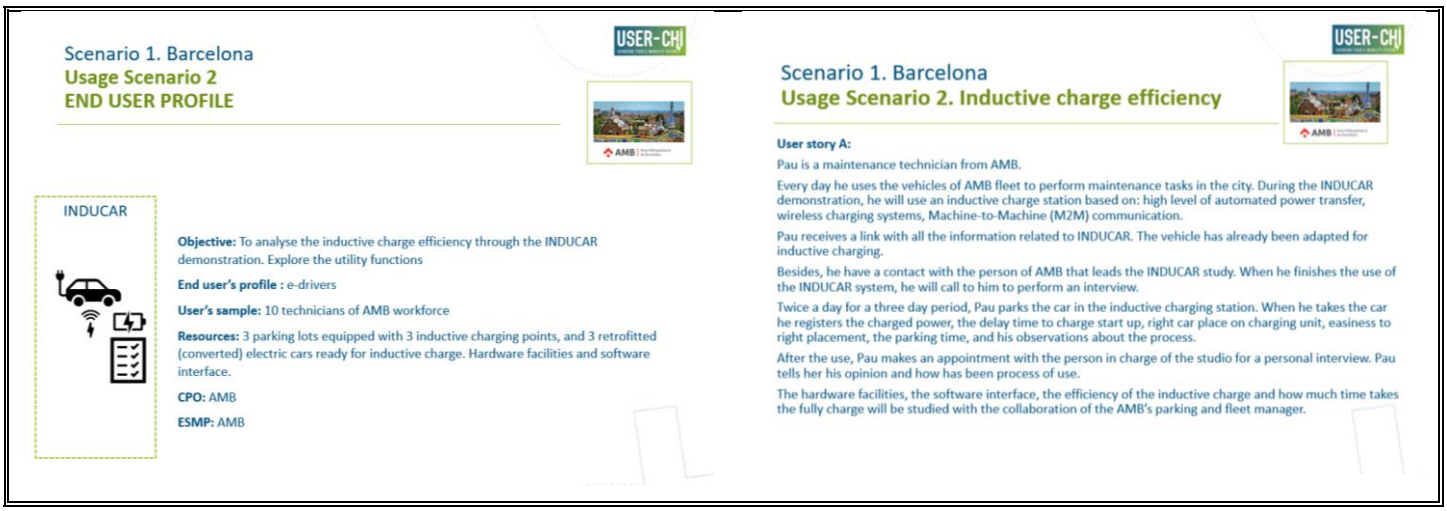


Table 29: Usage Scenario 3. INSOC demonstration in AMB

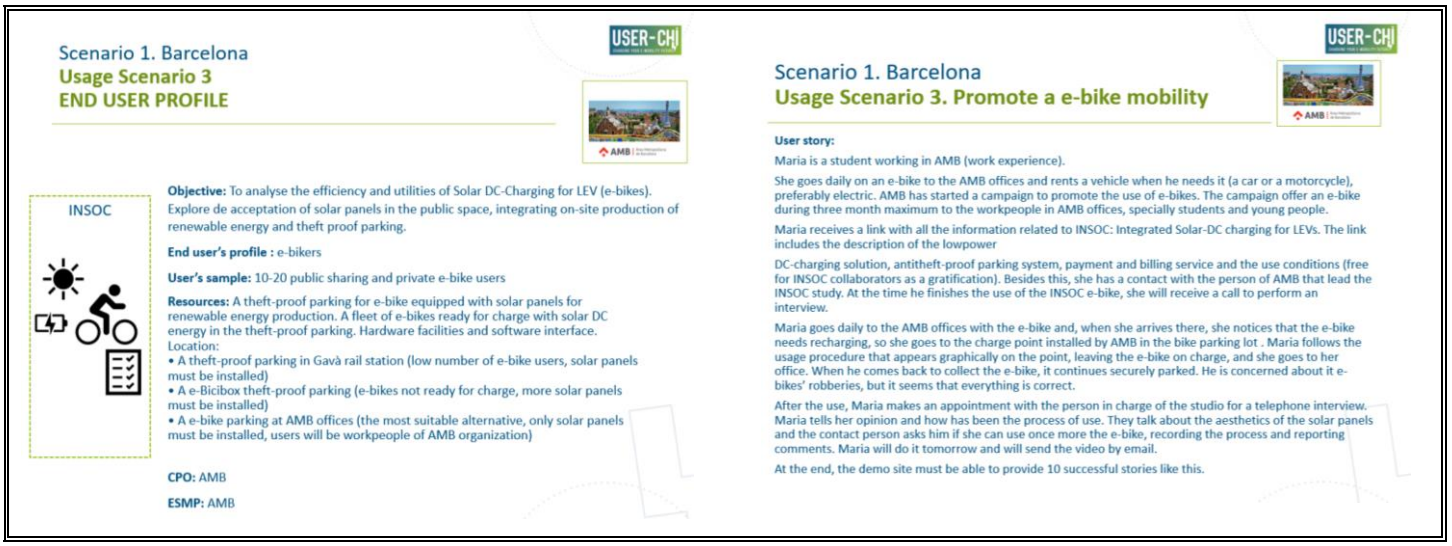


Table 30: *Usage Scenario* 4. CLICK demonstration in AMB

4.2 BER's *Usage Scenarios* (5-6)

In the following tables, the updated *Usage Scenarios* from 5 to 6, to be deployed in the city of Berlin (BER), are presented. The *Usage Scenarios* are characterized by a basic description, and the user stories of the different participants' profiles.

Table 31: Usage Scenario 5. INCAR demonstration in BER

Scenario 2. Berlin
Usage Scenario 5
USER PROFILE

INCAR

Objective: To test the INCAR app functionalities (reservation, routing and charging features). To test the payment (compensations) between CPOs and EMSPs through the INCAR platform. Test the accounting platform based on Blockchain

End user's profile : Private e-drivers with an existing contract with an EMSP(s) of the INCAR platform.

User's sample: 80 users

Resources: 2-4 Gewobag parking lots, 2-4 Qwello charging points in semi-public space and INCAR platform.

CPO: qwello

ESMP: qwello

Usage Scenario 5. Short range demo
INCAR Usage Scenario
Gewobag resident as a potential user of the INCAR app – End User

User story A:

Nina is a resident of the Gewobag quarter Berlin-Mariendorf and an owner of an electric car.

After a long day at work in the office, Nina gets into her car and wants to reserve an e-park spot in her residential area before heading home.

She opens the INCAR App on her smartphone and can easily log into her account, as she is registered with qwello as an EMP of her choice.

In the map overview Nina checks the availability of the e-park spots and sees that one spot is free. As she usually uses another e-park spot, Nina checks the suitability of the connector type in the app. She makes a reservation and heads home.

After arriving at the residential parking area, Nina gets identified and the parking barrier opens. She parks her car, connects it to the charger and starts the charging process in the INCAR app. After starting the charging process Nina get information on the prices and can check the costs of parking and charging at any time in the INCAR app.

The next morning Nina opens her INCAR app to end the charging of the e-park spot before driving to work.

In the app, she receives an accounting overview/ invoice, of the electricity comsumed, the costs of the parking and charging as well as the duration of the parking

After the charging process, in the INCAR App a validation screen is activated and Nina can give feedback to some questions in the user survey. So, Nina contributes to the improvement of e-park spots in her residential area.

Before heading work, Nina checks her previous activities and compares her last bookings in the overview section

Scenario 2. Berlin
Usage Scenario 5
USER PROFILE

INCAR

Objective: To analyse the interoperability between CPOs and INCAR (ad-hoc charging). Test the INCAR app functionalities (reservation, routing and charging features in a roaming scenario). Test the payment (compensations) between CPOs and EMSPs through the INCAR platform. Test the accounting platform based on Blockchain

End user's profile : Private e-drivers without any contract with an EMSP(s) of the INCAR platform.

- **Intermediate user's:** CPOs in the platform (qwello) assess how the platform manages the payments to its companies

User's sample: 80 users and 1-3 CPO staff

Resources: 2-4 Gewobag parking lots, 2-4 Qwello charging points in semi-public space and INCAR platform.

CPO: qwello + ?

ESMP: qwello + ?

Usage Scenario 5. Short range demo
INCAR Usage Scenario
External short time user of the INCAR app – End User

User story B:

Marco lives in Berlin-Kreuzberg and is the owner of an electric car, which he bought with the beginning of his self-employment in 2019.

Due to the kickoff of a new project, Marco has a customer appointment in Mariendorf.

Marco wants to park nearby and therefore searches for parking and charging opportunities via Google. He finds the INCAR app. By clicking/tapping on the link, the app-store opens and Marco downloads the INCAR app.

After successful registration in the app, Marco sees two available e-park spots in the Gewobag residential quarter close to his customers company. He reserves one e-park spot right away, being within a certain time frame from the parking spot. As this is the first time that he is visiting his customer, Marco makes a routing request and starts the driving to the desired e-park spot.

When he arrives at the spot, Marco starts the parking and charging process in the INCAR app.

After the succesfull meeting Marco comes back to his car and ends the booking of the e-park spot. In the app, he receives an overview of the booking duration, as well as a cost overview. He can make the payment directly through the INCAR app and receives a confirmation of the process.

After the charging process, in the INCAR App a validation screen is activated and Marco gives feedback to some questions in the user survey. So, Marco contributes to the improvement of e-park spots.

Usage Scenario 5. Short range demo
INCAR Usage Scenario
External short time user of the INCAR app - CPO

User story C:

Marie is charging point's manager in qwello. She is one of the three professionals' participants who are going to use and assess the Interoperability Platform (INCAR).

Marie receives a document for use of the platform (tasks and tutorial), and a personalized link to the web frontend of the platform.

She accesses the INCAR platform by filling the registration form.

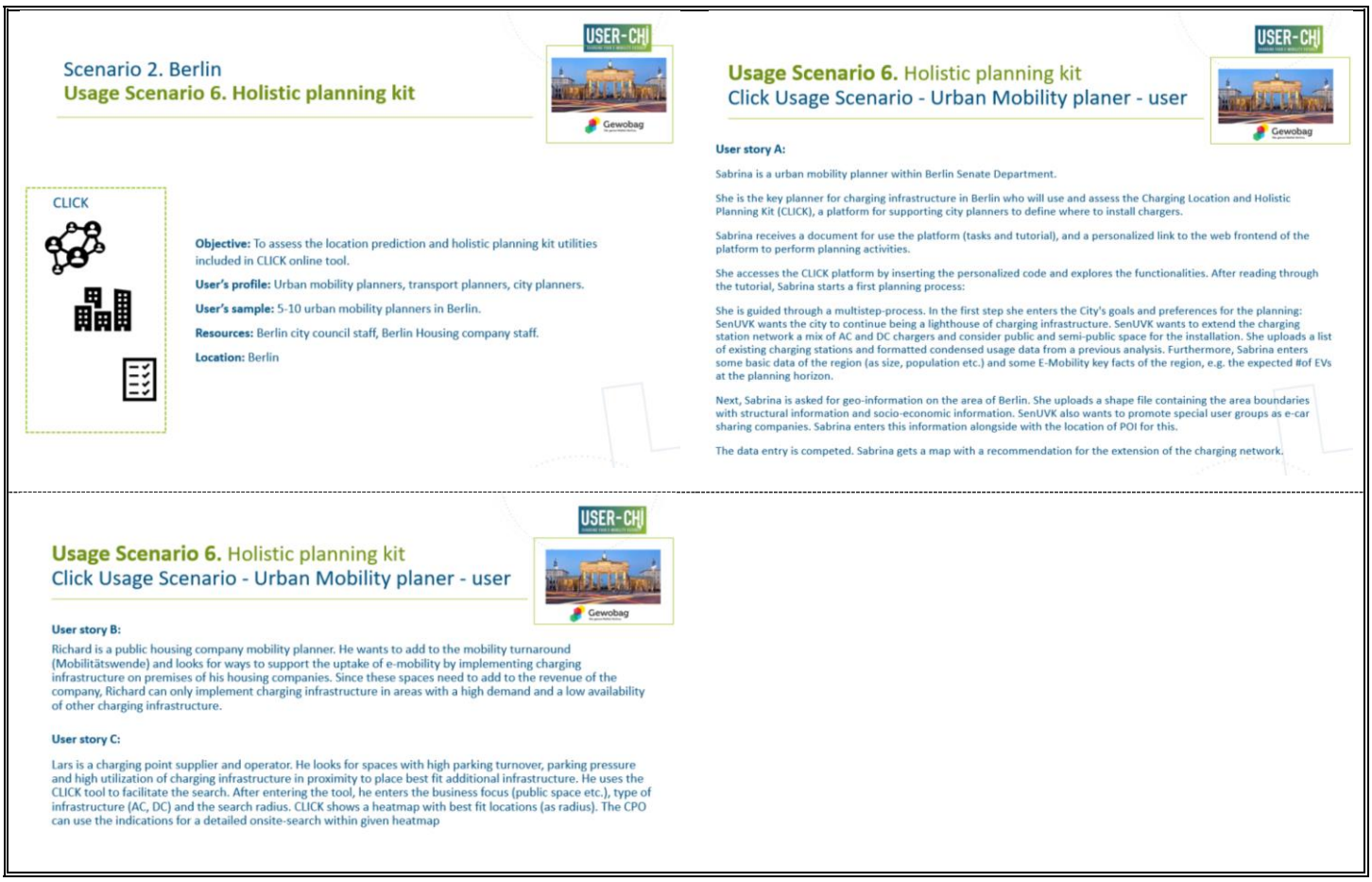
A couple of days later, Marie enters into the app and notices, that there are five new charges from different users in the charge poles network. In the Dashboard she reviews the energy consumption, charging time and cost of these charges. She specifies the invoices at the end of each month, based on terms and conditions of a Smart Contract.

At the end of the month Marie aligns her account in the INCAR platform with the bank account to ensure that the payments of that month have been made effective automatically.

qwello has an account in INCAR, therefore Marie can verify all the transactions in every moment.

After all the checks, Marie evaluates the INCAR platform and its functionalities.

Table 32: *Usage Scenario* 6. CLICK demonstration in BER



4.3 TUR's *Usage Scenarios* (7-10)

In the following tables, the updated *Usage Scenarios* from 7 to 10, to be deployed in the city of Turku (TUR), are presented. The *Usage Scenarios* are characterized by a basic description, and the user stories of the different participants' profiles.

Table 33: *Usage Scenario* 7. CLICK demonstration in TUR

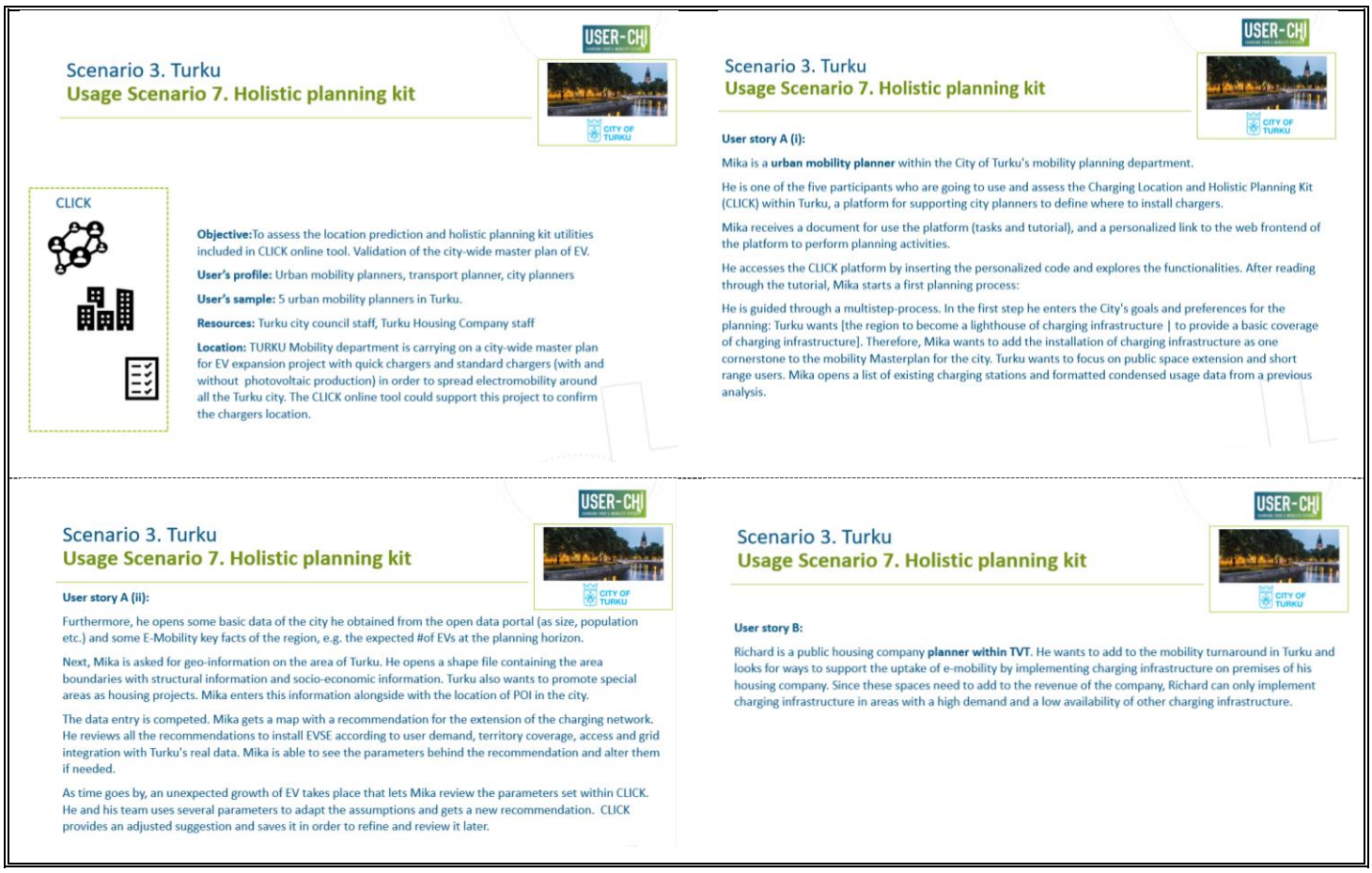


Table 34: *Usage Scenario* 8. INSOC demonstration in TUR

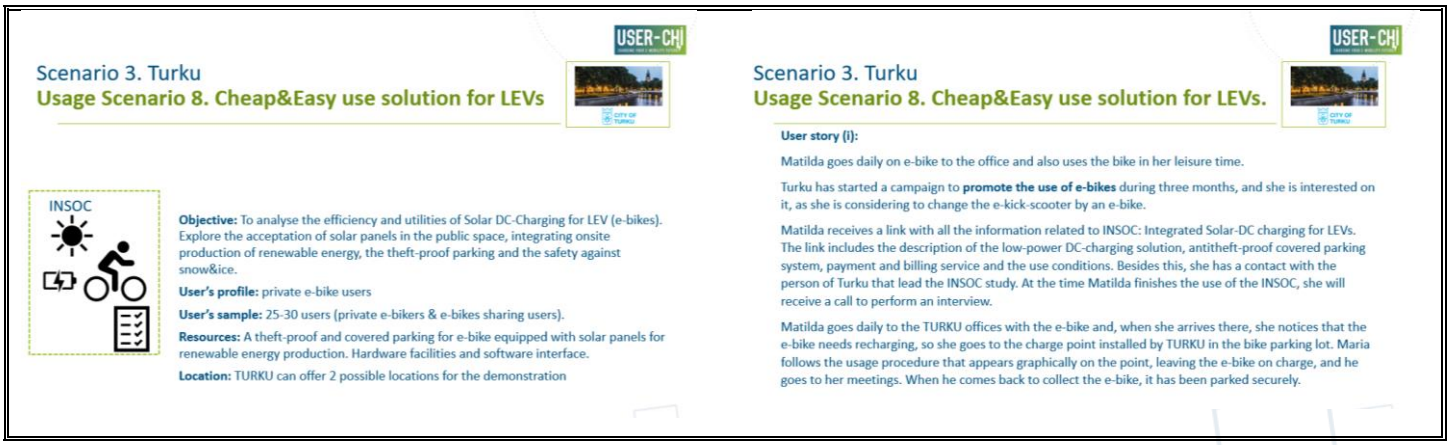


Table 35: Usage Scenario 9. SMAC demonstration in TUR

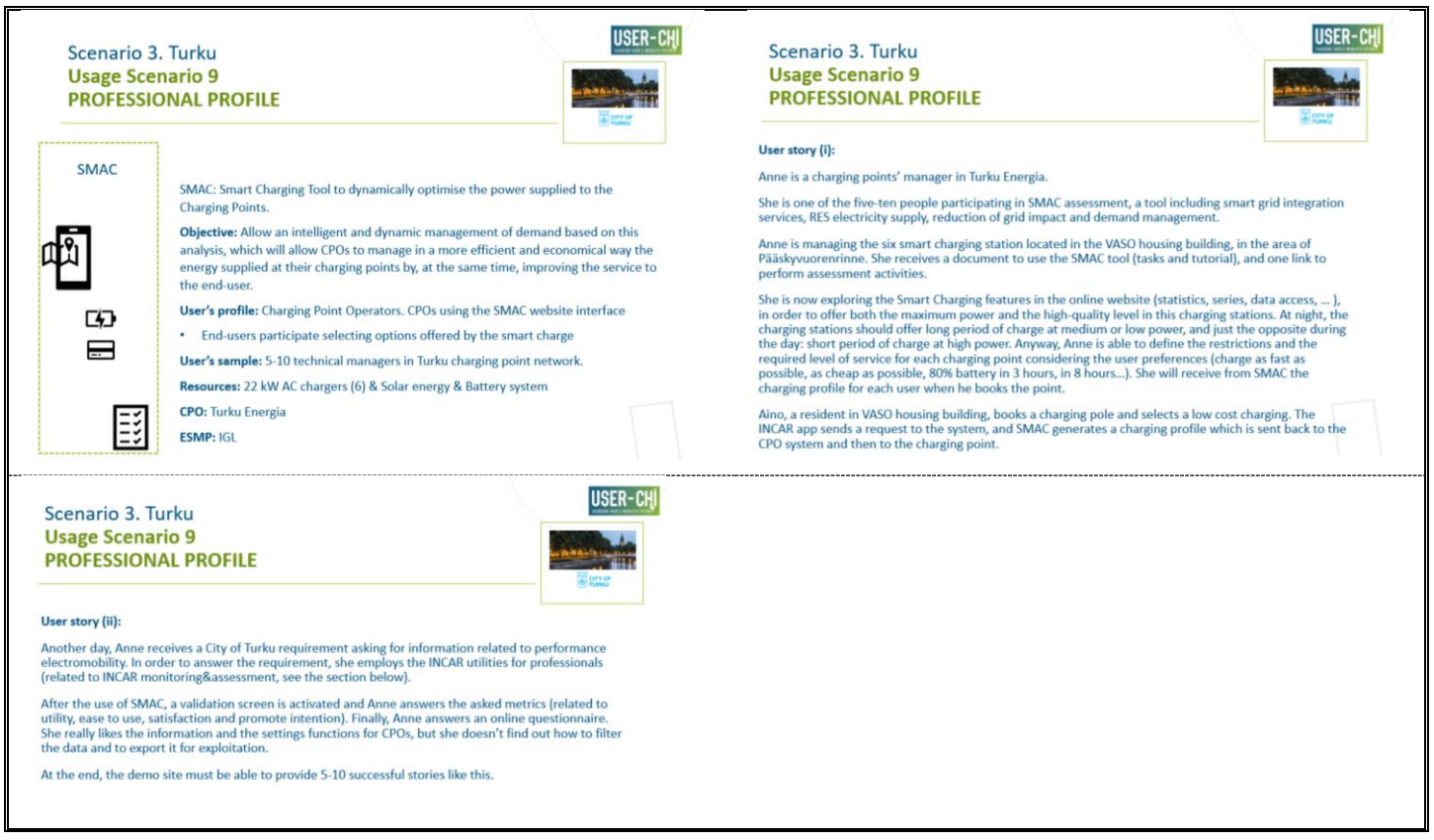


Table 36: Usage Scenario 10. INCAR demonstration in TUR

Scenario 3. Turku
Usage Scenario 10
END USER without an EMSP contract (ad-hoc charging)

INCAR

Objective: To test the INCAR app functionalities (registration, reservation, routing, charging features) and the possibility to charge in any of the demo site. Test the direct payment through the app. CPO to test the payment process through the INCAR platform. Test the accounting platform based on Blockchain

User's profile: Private e-drivers without any contract with an EMSP(s) of the INCAR platform.

- **Intermediates User's profile:** CPOs in the platform (Turku Energia) assess how the platform manages the payments to its companies

User's sample: 25 private e-drivers and 1-3 CPOs staff.

Resources: Public charging points (AC/DC) in Kupittaa area, INCAR platform and INCAR app.

CPO: Turku Energia

ESMP: —

Scenario 3. Turku
Usage Scenario 10
END USER without an EMSP contract (ad-hoc charging)

User story C (i):

Ari lives in Turku and he drives an EV everyday for going to the office. He usually charges at home and if he needs to charge outside, he knows some free chargers that he can employ. For this reason, he is not subscribed to any company supplying electromobility services in his city.

He receives the invitation from Turku to participate in INCAR app validation. He will participate employing INCAR app to charge in the charging poles of included in the platform at Turku. He accepted because the idea of accessing to charging points without subscription is very attractive for him.

Ari downloads the INCAR app, available in Google Play, sign up with an user and password and starts using the app. The first day he explores all functionalities of the app. Ari compares the INCAR navigator with the one he usually employs.

The second day, he books one pole close to his office, accesses, parks and charges in this location. That recharge is paid through the USER-CHI app when he unplugs the car.

This day, after the use of INCAR app, a validation screen is activated and Ari answers some questions (a questionnaire related to utility, ease to use, satisfaction and use promotion).

The third day, Ari creates his user profile. When the profile is created, Ari is invited to fulfil a new questionnaire.

Scenario 3. Turku
Usage Scenario 10
END USER without an EMSP contract (ad-hoc charging)

User story C (ii):

As an additional activity, Ari explores different charging points in Turku area using the filter function. Ari selects the menu option to display (map/list) charging stations near to her.

Another day, Ari selects the pole which is closer to his location, but when the whole information of the charging point is displayed, he observes that it is occupied. She comes back to the previous menu, but in this case he sets searching parameters in order to show available charging points and the application displays different options, related to INCAR Monitoring&Assessment (see the section below).

The last day, Emma performs a telephone interview and an online questionnaire. It's a bit long but the collaboration ends here. He just hopes to see improvements in the charging network.

At the end, the demo site must be able to provide 25 successful stories like that demonstrating the interoperability in Budapest area.

Scenario 3. Turku
Usage Scenario 10
INTERMEDIATE USER PROFILE: CPO

User story D:

Anne is the Charging Point Operation manager in Turku Energia. She is one of the three professionals' participants who are going to use and assess the Interoperability Platform (INCAR).

Anne receives a document for use the platform (tasks and tutorial), and a personalised link to the web frontend of the platform.

She accesses the INCAR platform by filling the registration form.

A couple of days later, Anne enters into the app and notices that has five new charges from different users in the charging poles of Kupittaa area. In the Dashboard she reviews the energy and cost of these charges. She have specified that wants to receive payments at the end of each month, and that has been specified in a Smart Contract.

At the end of the month Anne checks her account in the INCAR platform and the bank all prove that the payments of that month has been made effective automatically.

Turku Energia has a node in the Blockchain network of INCAR, therefore Anne can verify all the transactions in every moment.

After all the checks, Anne evaluates the INCAR platform and its functionalities.

Scenario 3. Turku
Usage Scenario 10

INCAR

Objective: To analyze the interoperability between CPOs. Explore the utilities according to user group. Validate service customization. Improve availability of CPOs.

User's profile: professional e-drivers (taxi drivers, delivery services, after sales services…) and private e-drivers.

User's sample: 6 professionals e-drivers / private e drivers.

Resources: Public charging points (AC/DC) in Kupittaa area, INCAR platform and INCAR app.

CPO: Turku Energia

ESMP: VIRTA & AMB

Scenario 3. Turku
Usage Scenario 10
PROFESSIONAL PROFILE

User story E:

Joan is an EV owner living in Barcelona, that employs his car for daily displacements. He is subscribed to AMB charging network, so he can charge his car in different charging poles all around the city. He is planning one week holidays with his family in Turku, the pretty Finnish city.

He is thinking in renting a car for going from the TUR airport to his hotel in the city, and for visiting the city surroundings during the week. He would like to rent an EV, but difficulties with accessing to the charging network makes him doubt. So when he receives the invitation from AMB to participate in INCAR validation, that includes the possibility of charging in Turku Energia chargers with his AMB subscription, his doubts disappears.

Joan downloads the INCAR app, available in Google Play , signs up with an user and password and starts using the app. The first day he explores all functionalities of the app. Joan compares the INCAR navigator with the one he usually employs.

The second day, Joan creates his user profile and explores different charging points using the filter function. When the profile is created, Joan is invited to fulfil a new questionnaire.

A day during his holidays, he plans a trip to a small village, 60 km from his hotel. He explores the fast charging points in the area near the hotel, books one point, accesses and charges in this location. That recharge is paid through the USER-CHI app when he unplugs the car.

This day, after the use of INCAR, a validation screen is activated and Joan answers some questions (a questionnaire related to utility, ease to use, satisfaction and use promotion).

The last day, Joan performs a telephone interview and an online questionnaire. It's a bit long but the collaboration ends here. He just hopes to see improvements in the charging network to EU level.

4.4 RSM's *Usage Scenarios* (11-14)

In the following tables, the updated *Usage Scenarios* from 11 to 14, to be deployed in the city of Rome (RSM), are presented. The *Usage Scenarios* are characterized by a basic description, and the user stories of the different participants' profiles.

Table 37: *Usage Scenario* 11. CLICK demonstration in RSM

Table 38: Usage Scenario 12. INSOC demonstration in RSM

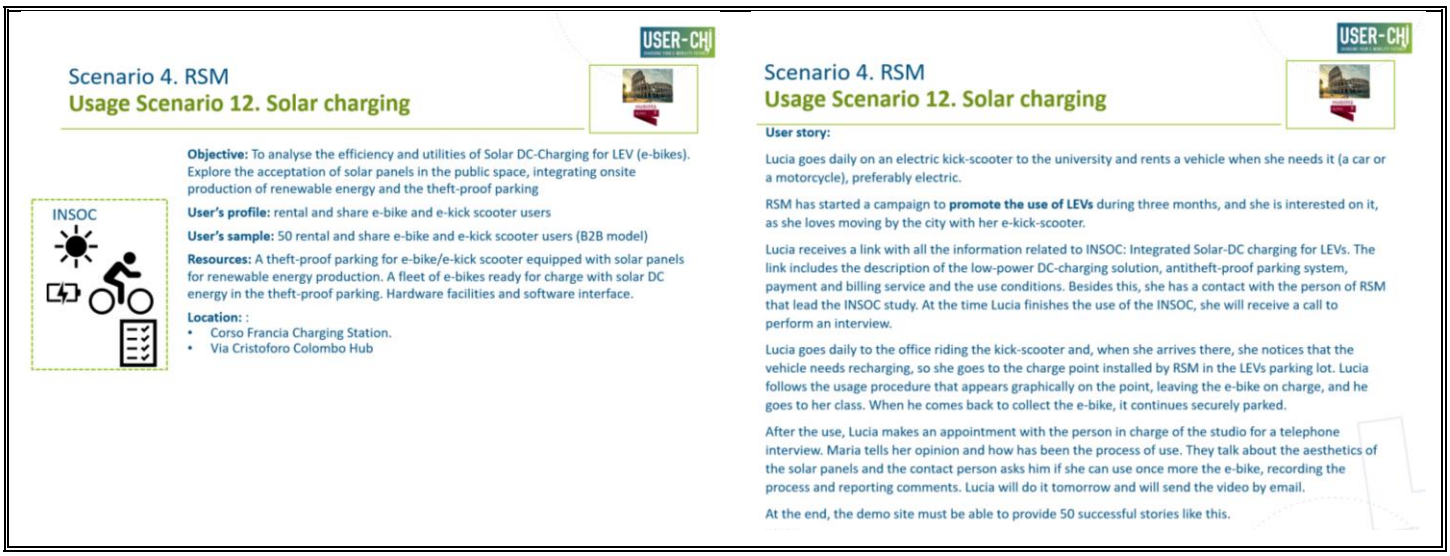


Table 39: Usage Scenario 13. SMAC demonstration in RSM

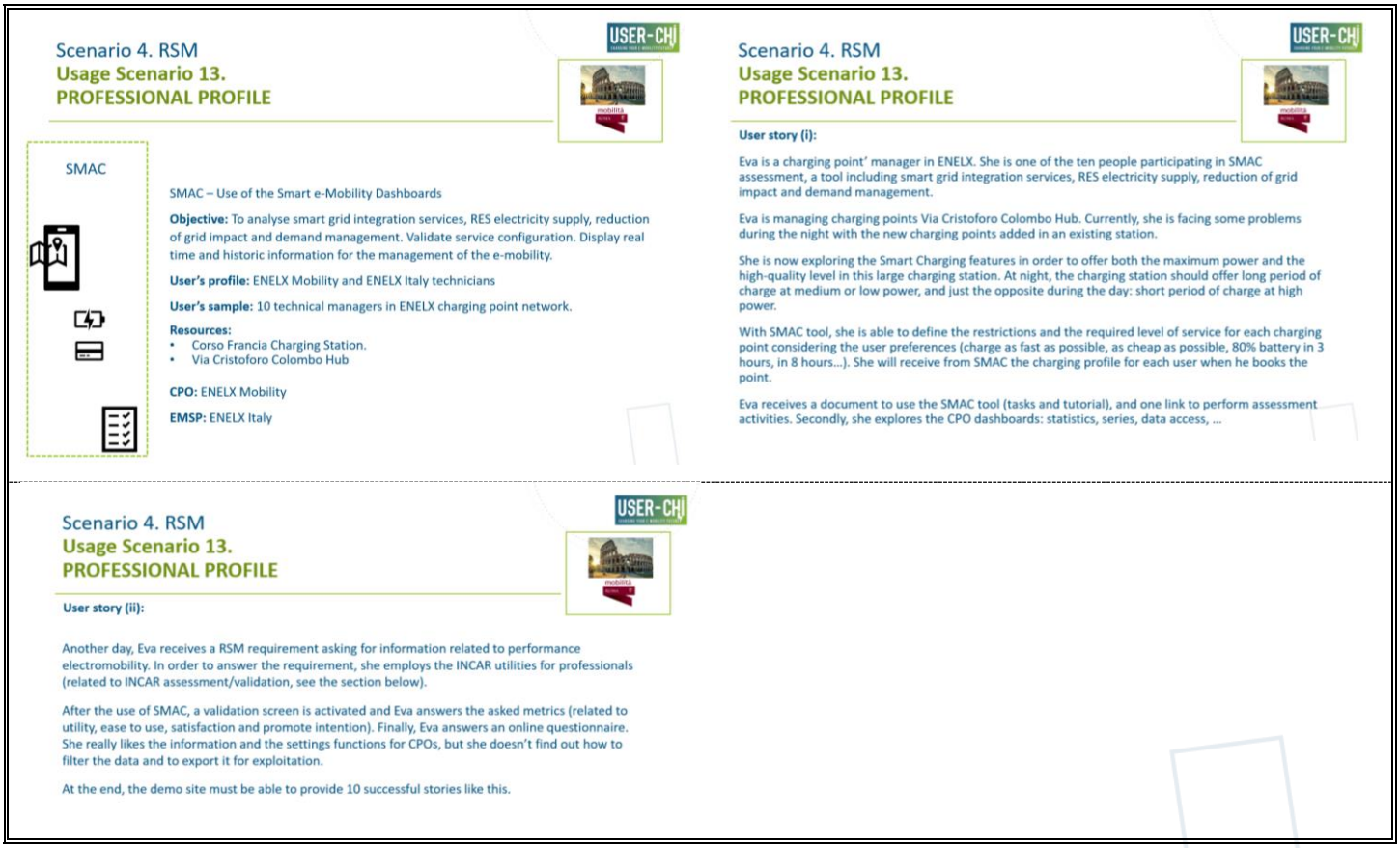


Table 40: Usage Scenario 14. INCAR demonstration in RSM

Scenario 4. RSM
Usage Scenario 14
END USER without an EMSP contract

User story C (ii):

As an additional activity, Gina explores different charging points in Roma area using the filter function. Gina selects the menu option to display (map/list) charging stations near to her.

Another day, Gina selects the pole which is closer to her location, but when the whole information of the charging point is displayed, she observes that it is occupied. She comes back to the previous menu, but in this case she sets searching parameters in order to show available charging points and the application displays different options, related to INCAR assessment/validation (see the section below).

The last day, Gina performs a telephone interview and an online questionnaire. It's a bit long but the collaboration ends here. She just hopes to see improvements in the charging network.

At the end, the demo site must be able to provide 25 successful stories like that demonstrating the interoperability in Roma area.

Scenario 4. RSM
Usage Scenario 14
INTERMEDIATE USER PROFILE: CPO

User story D:

Eva is charging point's manager in Rome charging network. She is one of the three professionals' participants who are going to use and assess the Interoperability Platform (INCAR).

Eva receives a document for use the platform (tasks and tutorial), and a personalised link to the web frontend of the platform.

She accesses the INCAR platform by filling the registration form.

A couple of days later, Eva enters into the app and notices that has five new charges from different users in the charging poles network. In the Dashboard she reviews the energy and cost of these charges. She have specified that wants to receive payments at the end of each month, and that has been specified in a Smart Contract.

At the end of the month Eva checks her account in the INCAR platform and the bank all prove that the payments of that month has been made effective automatically.

Rome charging network has a node in the Blockchain network of INCAR, therefore Eva can verify all the transactions in every moment.

After all the checks, Eva evaluates the INCAR platform and its functionalities.

Scenario 4. RSM
Usage Scenario 14

INCAR

Objective: To analyze the interoperability between CPOs. Explore the utilities according to user group. Validate service customization. Improve availability of CPOs.

User's profile: e-drivers

User's sample: 6 e-drivers in RSM area, selected from the AMB data base as ESMP.

Resources: fast charging points (AC/DC) in RSM area, INCAR platform and INCAR app.

CPO: ENELX Mobility

EMSP: ENELX Italia and AMB

Scenario 4. RSM
Usage Scenario 14
PROFESSIONAL PROFILE

User story E:

Jordi is an EV owner living in Barcelona, that employs his car for daily displacements. He is subscribed to AMB, so he can charge his car in different charging poles all around the city. He is planning one week holidays with his family in Rome, a fancy small village in Giuliano-Dalmata, close to Barcelona.

He is thinking in renting a car for going from the Fiumicino Rome airport to his apartment in Q. XXXI, and for visiting Rome during the week. He would like to rent an EV, but difficulties with accessing to the charging network makes him doubt. So when he receives the invitation from AMB to participate in INCAR validation, that includes the possibility of charging in Rome chargers with his AMB subscription, his doubts disappears.

Jordi downloads the INCAR app, available in Google Play , signs up with an user and password and starts using the app. The first day he explores all functionalities of the app. Jordi compares the INCAR navigator with the one he usually employs.

The second day, Jordi creates his user profile and explores different charging points using the filter function. When the profile is created, Jordi is invited to fulfil a new questionnaire.

A day during his holidays, he plans a trip to Rome. He explores the fast charging points in the area, books one point, accesses and charges in this location. That recharge is paid through the USER-CHI app when he unplugs the car.

This day, after the use of INCAR, a validation screen is activated and Jordi answers some questions (a questionnaire related to utility, ease to use, satisfaction and use promotion).

The last day, Jordi performs a telephone interview and an online questionnaire. It's a bit long but the collaboration ends here. He just hopes to see improvements in the charging network to EU level.

4.5 BUD's *Usage Scenarios* (15-18)

In the following tables, the updated *Usage Scenarios* from 15 to 18, to be deployed in the city of Budapest (BUD), are presented. The *Usage Scenarios* are characterized by a basic description, and the user stories of the different participants' profiles.

Table 41: Usage Scenario 15. CLICK demonstration in BUD

Table 42: Usage Scenario 16. INSOC demonstration in BUD

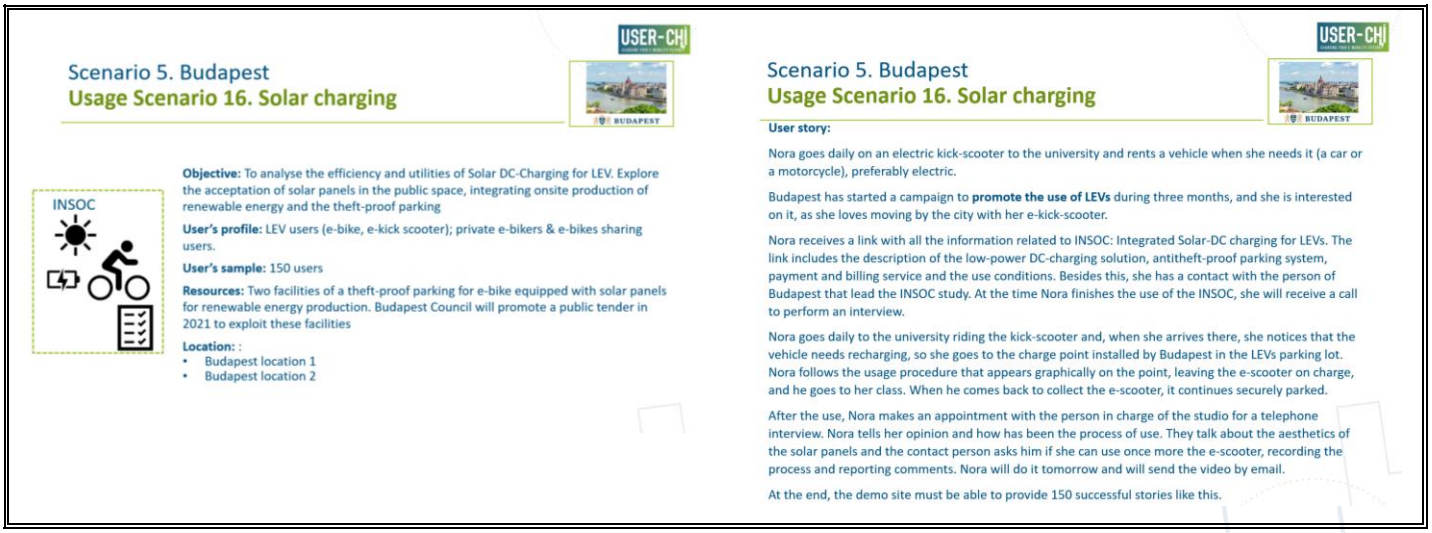


Table 43: Usage Scenario 17. SMAC demonstration in BUD

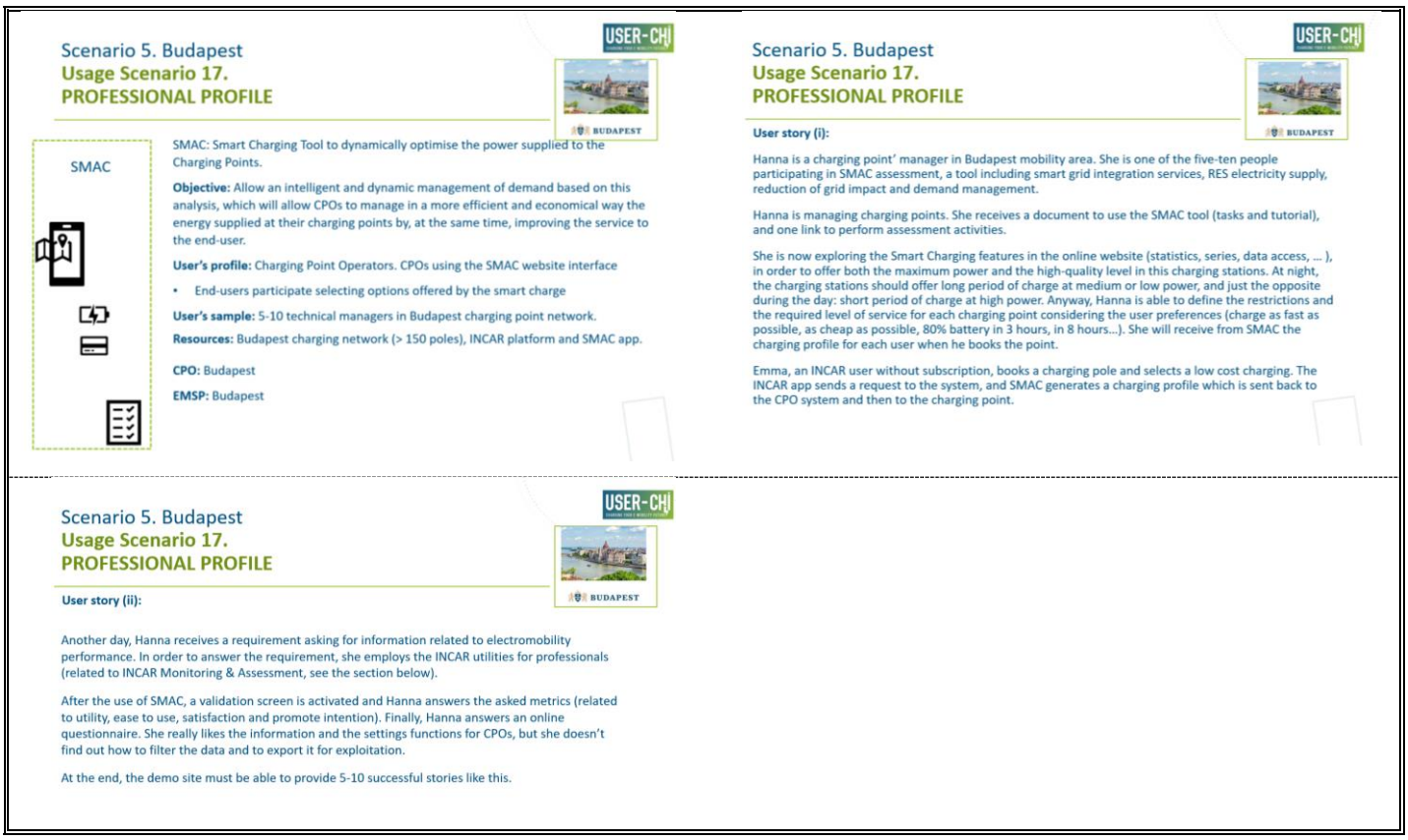
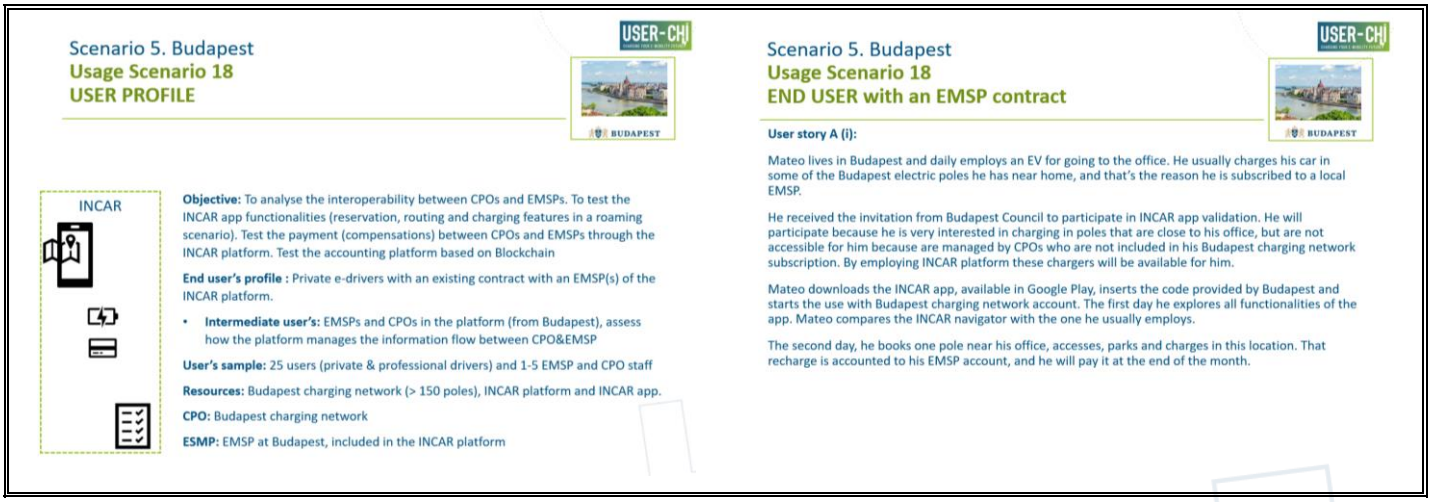


Table 44: Usage Scenario 18. INCAR demonstration in BUD



Scenario 5. Budapest
Usage Scenario 18
END USER with an EMSP contract

User story A (ii):

This day, after the use of INCAR app, a validation screen is activated and Mateo answers some questions (a questionnaire related to utility, ease to use, satisfaction and use promotion).

The third day, Mateo creates his user profile. When the profile is created, Mateo is invited to fulfil a new questionnaire.

As an additional activity, Mateo explores different charging points around his office using the filter function. Mateo selects the menu option to display (map/list) charging stations close to this location.

The last day, Mateo performs a telephone interview and an online questionnaire. It's a bit long but the collaboration ends here. He just hopes to see improvements in the charging network.

At the end, the demo site must be able to provide 25 successful stories like that demonstrating the interoperability in Budapest area.

Scenario 5. Budapest
Usage Scenario 18
INTERMEDIATE USER PROFILE: CPO

User story B:

Hanna is the a charging point's manager in Budapest area and Gábor is the responsible of the eMobility Service Provider of a local company in Budapest.

They are two of the five professionals' participants who are going to use and assess the Interoperability Platform (INCAR).

Hanna and Gábor receive a document for use the platform (tasks and tutorial), and a personalised link to the web frontend of the platform. They access the INCAR platform by filling the registration form.

In a first step, Gábor notices that one of their users charged its EV in a pole managed by Budapest charging network. He checks the amount of energy supplied and the cost in the Smart Dashboard. After that, he also checks if any other user has used another charging point of the USER-CHI network.

Likewise, Hanna also notices that has a new charge from a user from a local EMSP, she checks in the Dashboard also the energy and cost of this charge.

Budapest charging network and Budapest EMSP have specified that want to pay and receive payments at the end of each month, and that has been specified in a Smart Contract.

At the end of the month Hanna and Gábor check their account in the INCAR platform and the bank all prove that the payments of that month has been made effective automatically.

After all the checks, Hanna and Gábor evaluate the INCAR platform and its functionalities.

Scenario 5. Budapest
Usage Scenario 18
END USER without an EMSP contract (ad-hoc charging)

INCAR

Objective: To test the INCAR app functionalities (registration, reservation, routing, charging features) and the possibility to charge in any of the demo site. Test the direct payment through the app. CPO to test the payment process through the INCAR platform. Test the accounting platform based on Blockchain

End user's profile : Private e-drivers without any contract with an EMSP(s) of the INCAR platform.

- **Intermediate user's:** CPOs in the platform (Budapest charging network) assess how the platform manages the payments to its companies

User's sample: 25 private e-drivers (selected from the Municipality database) and 1-3 CPOs staff.

Resources: Budapest charging network (> 150 poles), INCAR platform and INCAR app.

CPO: Budapest charging network

ESMP: ---

Scenario 5. Budapest
Usage Scenario 18
END USER without an EMSP contract

User story C (i):

Emma lives in Budapest and she drives an EV for going to the office. She usually charges at home and if she needs to charge outside, she knows some free chargers that she can employ. For this reason, she is not subscribed to any company supplying electromobility services in her city.

She receives the invitation from Budapest to participate in INCAR app validation. She will participate employing INCAR app to charge in some of the 150 poles of Budapest charging network. She accepted because the idea of accessing to charging points without subscription is very attractive for her.

Emma downloads the INCAR app, available in Google Play, signs up with an user and password and starts using the app. The first day she explores all functionalities of the app. Emma compares the INCAR navigator with the one she usually employs.

The second day, she books one pole close to her office, accesses, parks and charges in this location That recharge is paid through the USER-CHI app when he unplugs the car.

This day, after the use of INCAR app, a validation screen is activated and Emma answers some questions (a questionnaire related to utility, ease to use, satisfaction and use promotion).

The third day, Emma creates her user profile. When the profile is created, Emma is invited to fulfil a new questionnaire.

Scenario 5. Budapest
Usage Scenario 18
END USER without an EMSP contract

User story C (ii):

As an additional activity, Emma explores different charging points in Budapest area using the filter function. Emma selects the menu option to display (map/list) charging stations near to her.

Another day, Emma selects the pole which is closer to her location, but when the whole information of the charging point is displayed, she observes that it is occupied. She comes back to the previous menu, but in this case she sets searching parameters in order to show available charging points and the application displays different options, related to INCAR Monitoring&Assessment (see the section below).

The last day, Emma performs a telephone interview and an online questionnaire. It's a bit long but the collaboration ends here. She just hopes to see improvements in the charging network.

At the end, the demo site must be able to provide 25 successful stories like that demonstrating the interoperability in Budapest area.

Scenario 5. Budapest
Usage Scenario 18
INTERMEDIATE USER PROFILE: CPO

User story D:

Hanna is charging point's manager in Budapest charging network. She is one of the three professionals' participants who are going to use and assess the Interoperability Platform (INCAR).

Hanna receives a document for use the platform (tasks and tutorial), and a personalised link to the web frontend of the platform.

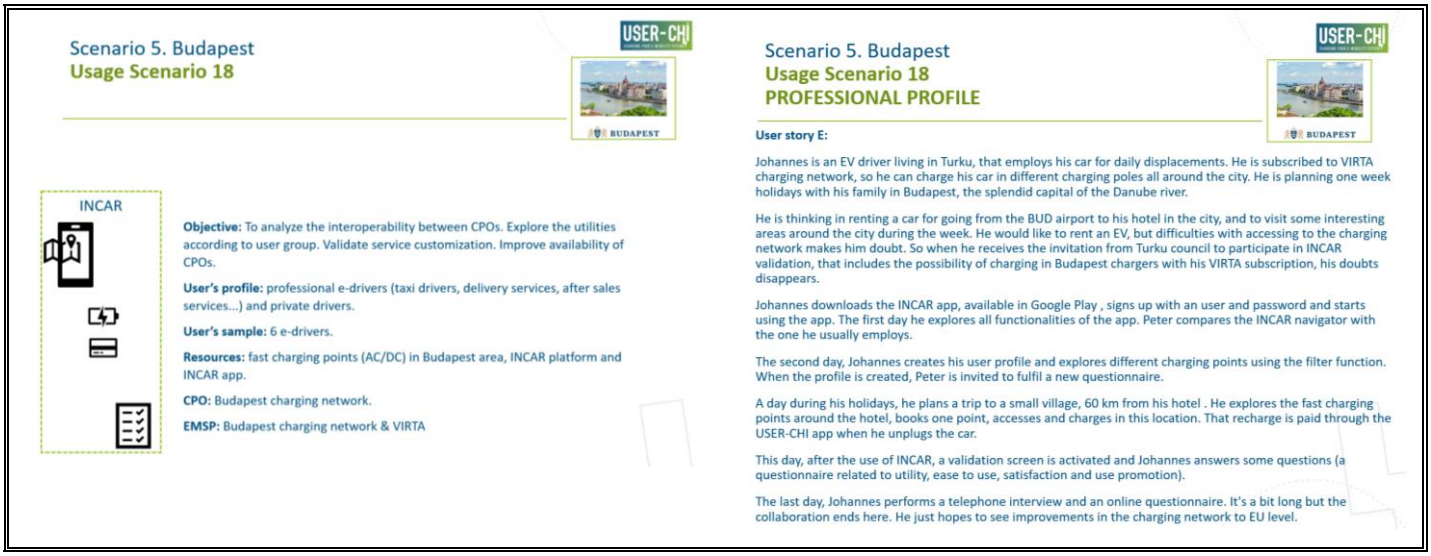
She accesses the INCAR platform by filling the registration form.

A couple of days later, Hanna enters into the app and notices that has five new charges from different users in the charging poles network. In the Dashboard she reviews the energy and cost of these charges. She have specified that wants to receive payments at the end of each month, and that has been specified in a Smart Contract.

At the end of the month Hanna checks her account in the INCAR platform and the bank all prove that the payments of that month has been made effective automatically.

Budapest charging network has a node in the Blockchain network of INCAR, therefore Hanna can verify all the transactions in every moment.

After all the checks, Hanna evaluates the INCAR platform and its functionalities.



Scenario 5. Budapest
Usage Scenario 18

INCAR

Objective: To analyze the interoperability between CPOs. Explore the utilities according to user group. Validate service customization. Improve availability of CPOs.

User's profile: professional e-drivers (taxi drivers, delivery services, after sales services...) and private drivers.

User's sample: 6 e-drivers.

Resources: fast charging points (AC/DC) in Budapest area, INCAR platform and INCAR app.

CPO: Budapest charging network.

EMSP: Budapest charging network & VIRTA

Scenario 5. Budapest
Usage Scenario 18
PROFESSIONAL PROFILE

User story E:

Johannes is an EV driver living in Turku, that employs his car for daily displacements. He is subscribed to VIRTA charging network, so he can charge his car in different charging poles all around the city. He is planning one week holidays with his family in Budapest, the splendid capital of the Danube river.

He is thinking in renting a car for going from the BUD airport to his hotel in the city, and to visit some interesting areas around the city during the week. He would like to rent an EV, but difficulties with accessing to the charging network makes him doubt. So when he receives the invitation from Turku council to participate in INCAR validation, that includes the possibility of charging in Budapest chargers with his VIRTA subscription, his doubts disappears.

Johannes downloads the INCAR app, available in Google Play , signs up with an user and password and starts using the app. The first day he explores all functionalities of the app. Peter compares the INCAR navigator with the one he usually employs.

The second day, Johannes creates his user profile and explores different charging points using the filter function. When the profile is created, Peter is invited to fulfil a new questionnaire.

A day during his holidays, he plans a trip to a small village, 60 km from his hotel . He explores the fast charging points around the hotel, books one point, accesses and charges in this location. That recharge is paid through the USER-CHI app when he unplugs the car.

This day, after the use of INCAR, a validation screen is activated and Johannes answers some questions (a questionnaire related to utility, ease to use, satisfaction and use promotion).

The last day, Johannes performs a telephone interview and an online questionnaire. It's a bit long but the collaboration ends here. He just hopes to see improvements in the charging network to EU level.

5. Conclusions

From the information presented in the precedent sections, we derive the following conclusions:

- *Usage Scenarios* to demonstrate USER-CHI products have been created, according to product leaders' requirements to clearly show the innovations related to project products (product cards), and interests, expectations, capabilities and facilities of the cities that take part in the project demonstration.
- Eighteen (18) *Usage Scenarios* have been defined (*Table 27* to *Table 44*), covering the project products that have to be demonstrated with end users and intermediate users' participation (CLICK-INSOC-INDUCAR-INCAR&SMAC), and the five cities (Barcelona, Budapest, Berlin, Rome, Turku) where demonstration will be performed.
- The *Usage Scenarios*' description includes the objective to achieve in the demonstration tests, the profile of the participants, the main city resources to mobilize and the CPOs and EMSPs that participate. In addition, the *Usage Scenarios* also include user stories describing the main actions to be performed by the participants in order to demonstrate the products.
- The demonstration of INSOC and INDUCAR require the purchase and installation of new facilities by the city councils. CLICK's demonstration will be performed with available facilities, while INCAR&SMAC will be demonstrated by some cities with available facilities, and others will combine available facilities with new ones.
- The number of participants in the different *Usage Scenario* must be adjusted from now to the starting up of demonstration execution (July 2022, M30 of the project planning), in order to achieve the quantity of users taking part in the demonstration tests, stated in the DoA document.
- The *Usage Scenarios* presented from *Table 27* to *Table 44* must be considered as a starting point to design the USER-CHI demonstration tests. These scenarios will change as products to demonstrate advance in its definition and development, new entities are enrolled in the demonstration tests, or relevant aspects to be considered in the demonstration arise. Anyway, we consider that the most critical elements to conform the scenario to test the products are included in the *Usage Scenarios* presented in section 4 of this report.

Acronyms

Acronym	Meaning
AMB	Barcelona Metropolitan Area (Spain), demonstration site of USER-CHI project
BER	City of Berlin (Germany), demonstration site of USER-CHI project
BMS	Battery Management System
BUD	City of Budapest (Hungary), demonstration site of USER-CHI project
CLICK	Charging infrastructure Locatlon and HolistiC Planning Kit (product of the project)
CPO	Charging Point Operator
DoA	Description of the Action
EMC	Electro Magnetic Compatibility
EMSP	Electro Mobility Service Provider
EV	Electric Vehicle
ETRA	ETRA I+D (project partner)
FOD	Foreign Object Detection
GA	Grant Agreement
ICT	Information and Communication Technology
LEV	Light Electric Vehicle
MOD	Metal Object Detection
RSM	City of Rome (Italy), demonstration site of USER-CHI project
TUR	City of Turku (Finland), demonstration site of USER-CHI project
USER-CHI	Project Title: innovative solution for USER centric CHarging Infrastructure
VCU	Vehicle Control Unit
VMZ	VMZ Berlin Betreibergesellschaft mbH (project partner)

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