#H2020RTR21

INCIT-EV

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Overall Project Introduction

INCIT-EV is a European project led by CIRCE in which electric vehicle charging technologies will be developed and validated in five European countries, thus improving the user's perception of electric mobility.

REFERENCE CITIES IN EUROPE

INCIT-EV PROJECT

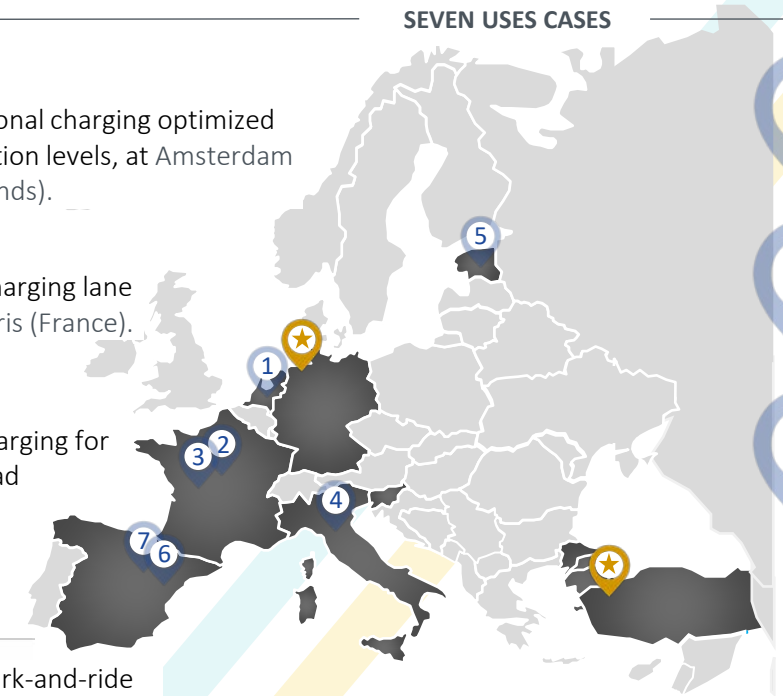
SEVEN USES CASES

UC1 Smart and bi-directional charging optimized at different aggregation levels, at Amsterdam & Utrecht (Netherlands).

UC2 Dynamic wireless charging lane in urban area, at Paris (France).

UC3 Dynamic wireless charging for long distance – e-road prototype, at Satory (Versailles, France).

UC4 Charging hub in a park-and-ride facility, at Turin periphery (Italy).



UC5 Superfast charging systems for European corridors, at Tallinn periphery (Estonia).

UC6 Low power DC bidirectional charging infrastructure for EV, including two-wheelers, at Saragossa (Spain).

UC7 Opportunity wireless charging for taxi queue lanes in airports/central stations, at Saragossa (Spain).

TWO FOLLOWER LOCATIONS

- Bursa (Turkey)
- Norderney (Germany)

INCIT-EV in figures

18,6M€ budget
15M€ funded by the European Commission
33 partners are directy involved in the project
48 months long. January 2020 - January 2024
More than 7 innovative solutions

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Project Objectives

INCIT-EV aims to demonstrate, at seven demonstration environments, an innovative set of **charging infrastructures**, **technologies and its associated business models**, ready to improve **the EV users experience** with the ultimate goal of **fostering the EV market share** in the EU.

EV users preferences and expectations

3,475 EV drivers engaged

V2G ready
30 kW modules

Up to 130 km/h

Wireless Charging 120 kW Static and Dynamic

Wireless Interoperability In all demos

Low cost scalable V2G DC chargers up to 200 kW

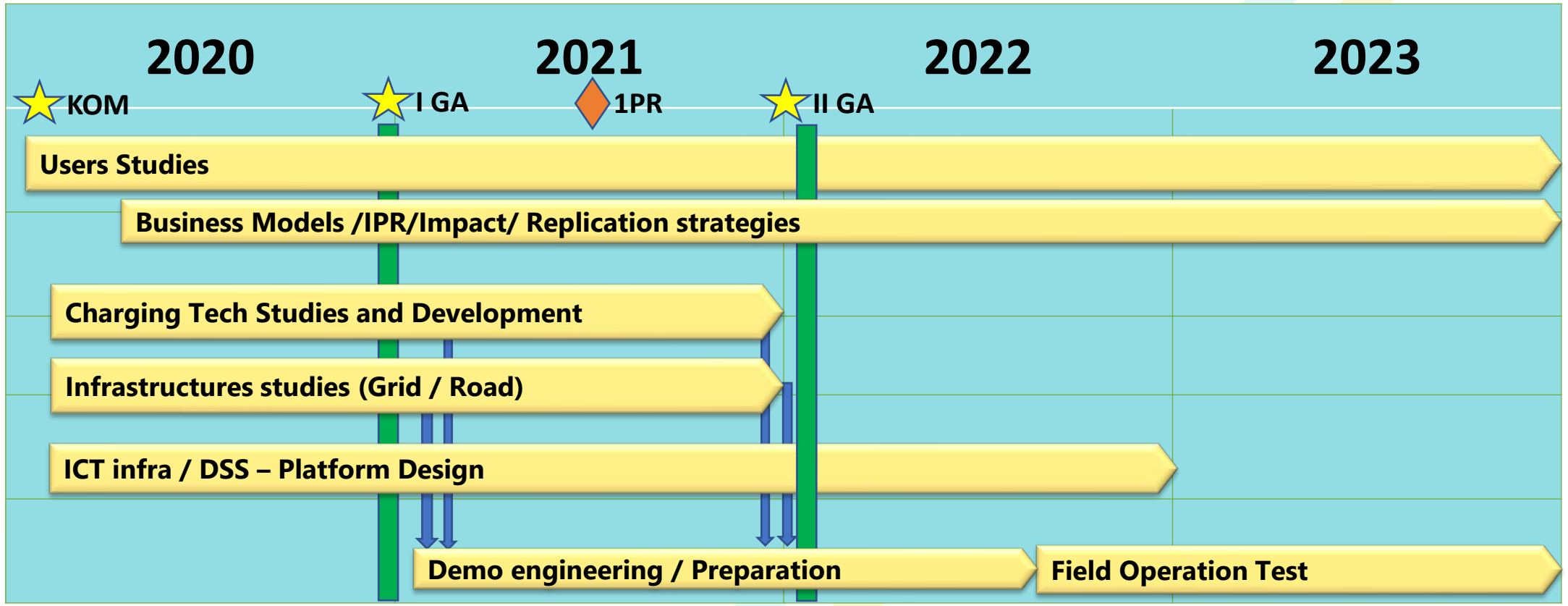
Decision Support System for mobility planners

Grid Congestion
Smart Energy / Charging
Interoperable payment

Promote investment in charging infr **Attractive Business Models**

8.87 M€ investment on the Use Cases
Regulation and standards
Based on Project devep

General Introduction
2021 Achievements



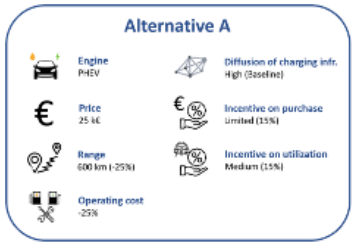
TODAY [M27]

- WP3/4 Charging and infrastructure studies finished
- Demos on enginering phase, preparation for comissioning → Ready for demonstration phase by Q4 2022
- User Studies on place, some delays in activities
- ICT Infrastructure and DSS activities on place
- First IPR analysis done. Exploitation of results pending to be defined.

1 – User perception about charging infrastructure

Surveys

Face to face interviews



Discrete choice experiments

Focus groups

Combination of qualitative and quantitative methodologies:

- **Surveys:** Declarative data about socio-demographics, user needs and habits,...
- **Discrete choice experiments**: Stated preference questions to recover decision making factors (buy car & recharge)
- **Face2Face interviews:** to deepen in the expectations, fears and personal experiences
- **Focus group**: Technology and future trends from professionals and experts

2 – Needs of users and adaptation of electric vehicles

EV USERS

GRID OPERATORS

- **Pains and gains of the users**

PRELIMINARY

  - Seamless and reliable charging
  - Fast and interoperable charging for travels
  - Integration of EV battery in smart grids
    - EV batteries for solar charging
    - EV batteries as energy back-up
  - EVs as storage for RESs
  - V2G / Smart charging for ancillary services
    - Frequency, voltage and reactive regulation
    - Smart charging – Power optimization
    - Load balancing

- **New generation of more connected and compatible electric vehicles**

In INCIT-EV, three international manufacturers of electric vehicles, **Renault**, **Stellantis** and **IVECO**, will be the enablers of the innovations of the Use Cases. Some of them are:

- Vehicles integrating secondary induction charging systems working at high frequency working with misalignment
- Battery management system for dynamic inductive charging.
- Adaptation of vehicles to be able to charge with V2G protocols.
- In-vehicle electronics compatible with bidirectional fast conductive charging up to **200 kW**.

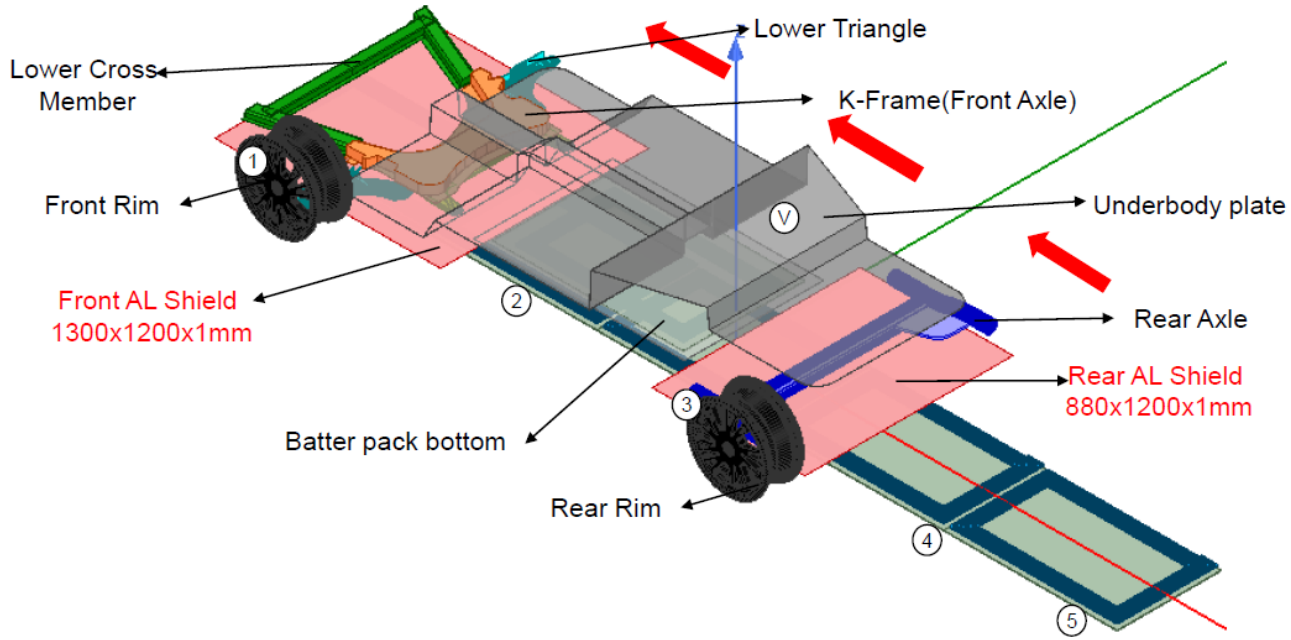
GROUPE RENAULT

STELLANTIS

IVECO

3 – Wireless Innovative Solutions

- **3 dynamic and static wireless charging system interoperable**

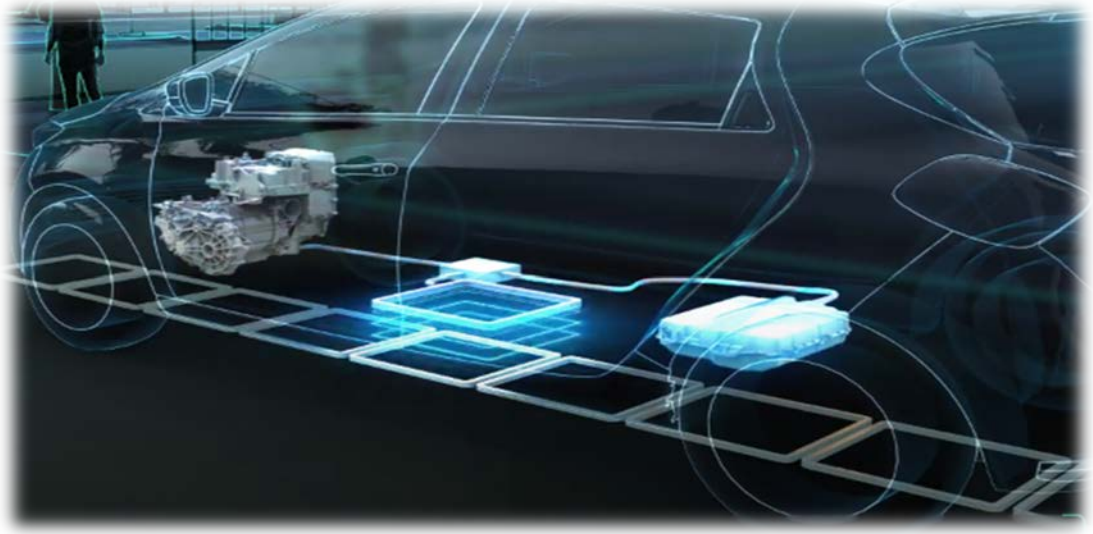


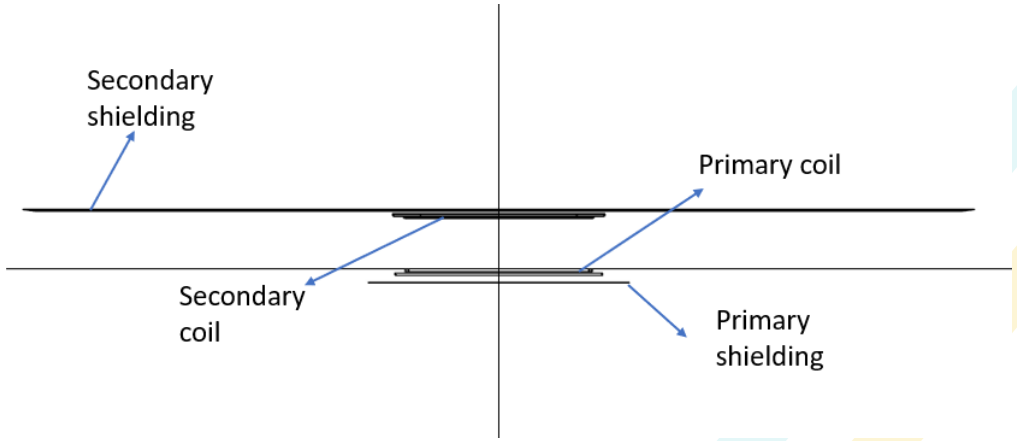
- Vehicle shielding for safe electromagnetic field emissions
- Control strategies for safe operation and fast switching
- Wireless bidirectional ready

- Optimal design of coil and shielding for all cases
- Misalignment sensibility and stability of the systems
- **Modular 30 kW** secondary coil for all vehicles

- 3 different Use Cases and pavement integration
- 4 retrofitted vehicles to test up to 90 kW wireless charging in e-roads

3.1 – Static 50 kW Wireless Charging in Zaragoza



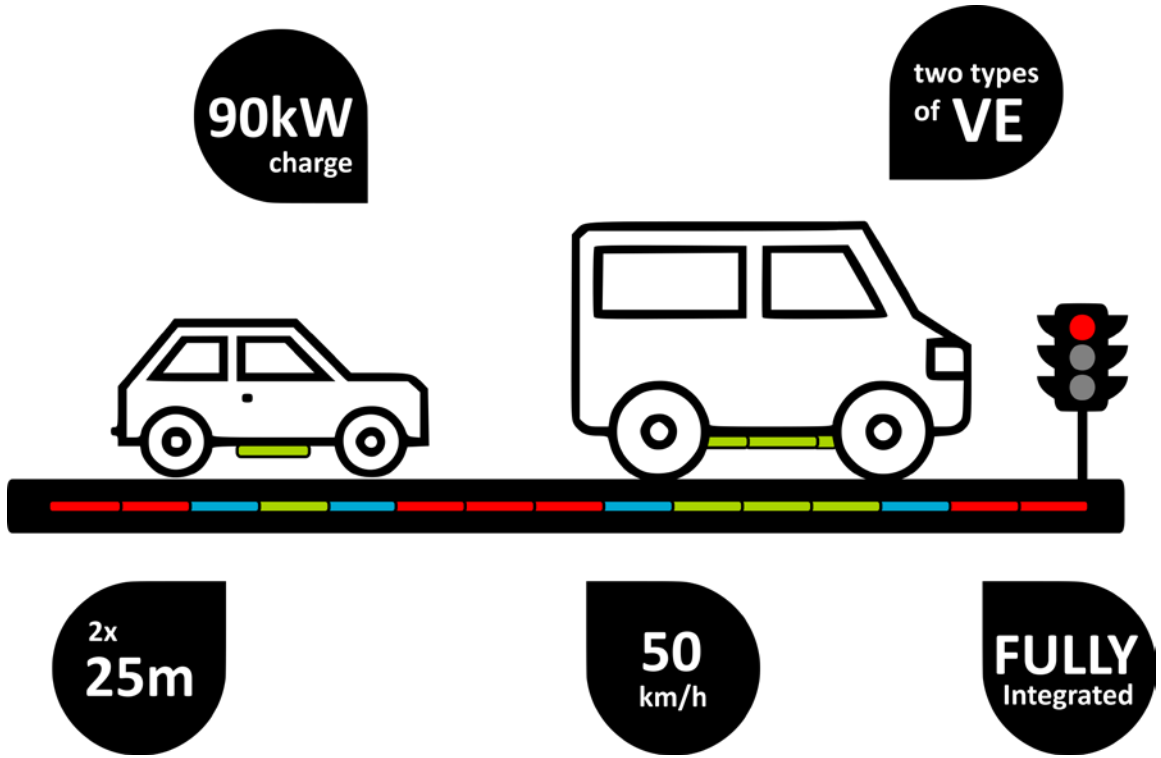


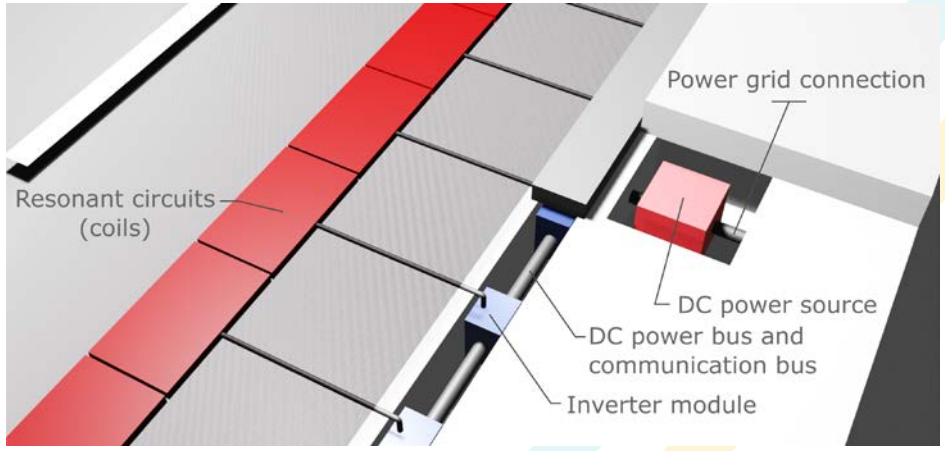
- **Opportunity wireless charging system:**
  - A highly replicable model
  - Designed for static wireless 50 kW
  - Pavement integration
  - Refrigeration needs for continuous operation
  - **95% charge efficiency** vs conductive charging
  - Misalignment accepted **up to 25%**
  - Vehicle detection, communication and energy billing
  - Exceptional user charging experience

  - UC designed for Taxi Queue
  - 50 km charged every 10 min

  - Lower power can be used for premium charging experience at home

3.2 – Dynamic 90 kW Wireless Charging in Paris

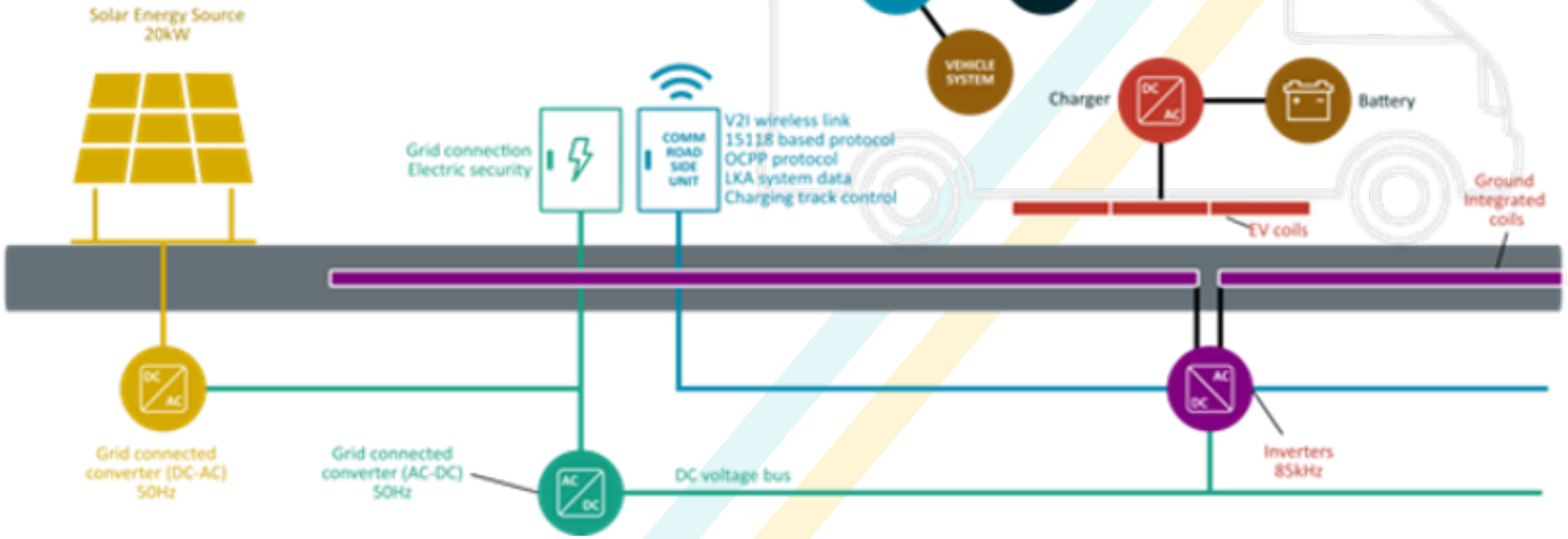




- **Urban dynamic wireless charging system:**
  - A highly replicable model
  - Urban scenario and specifications
  - Two charging power – 30kW or 90kW
  - Two kinds of VE – van and conventional
  - Traffic lights zones to improve the charge
  - Ground integration of the system – coils and inverters
  - Communication system – V2I

3.3 – Dynamic 90 kW Wireless Charging in Versailles

- Communication system based on ISO 15118 standard
- Renault-VEDECOM wireless dynamic charging technology
- VEDECOM's lane keeping assistant
- Grid facilities partners involved
- CIRCE wireless dynamic charging technology - extra-urban



Up to 90kW charge

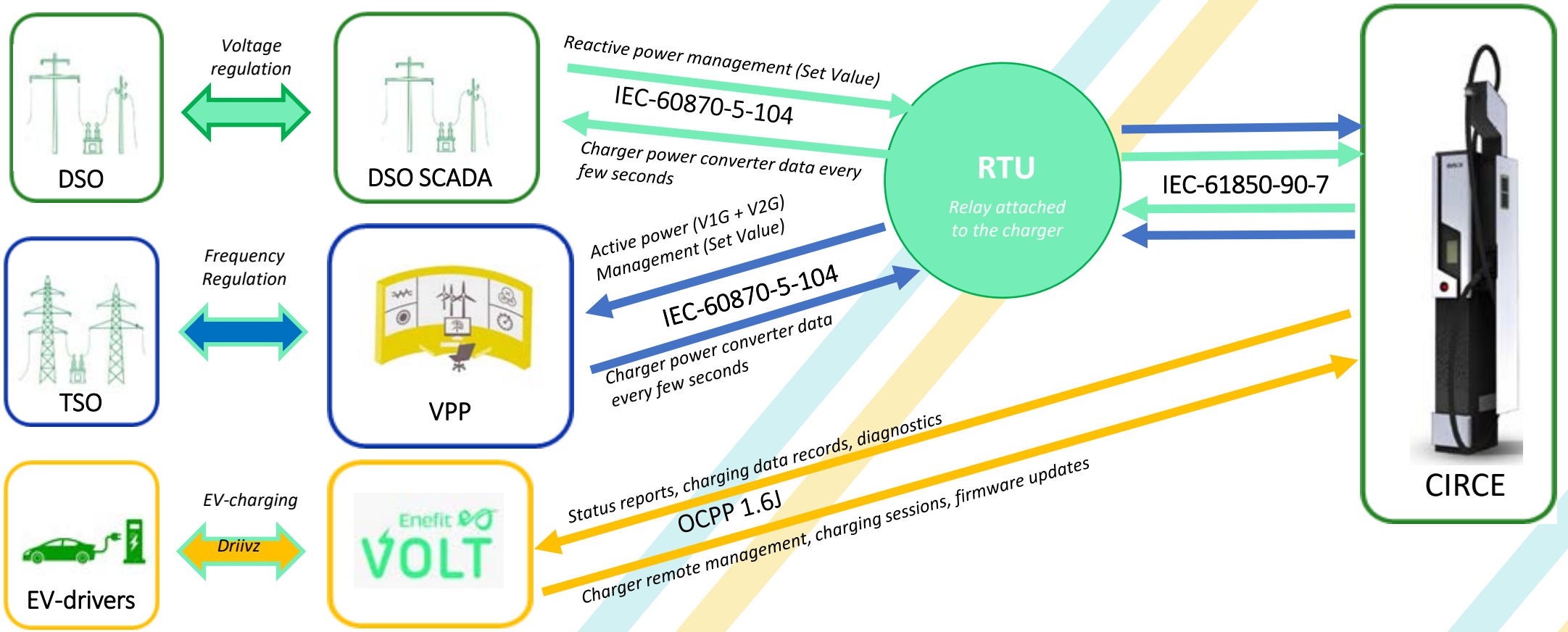
two types of VE

130 km/h

FULLY Integrated

4 – Ultra Fast 200 kW Charging in Tallin

UC5 - Super Fast Charger 200 kW – Ancilary services for DSO and TSO



End clients	Service	Service management platforms	Simplified communication scheme	200 kW EV-charger

4 – Low Power V2G Chargers in Zaragoza and Torino

circe

1 **CCS2+ 1 CHAdeMO** bidirectional conductive charging points (25 kW)

WE DRIVE SOLAR

2 x **Type 2 AC** AC bidirectional conductive charging points (11 kW)

Politecnico di Torino

Prima Electro
electronics and laser technologies

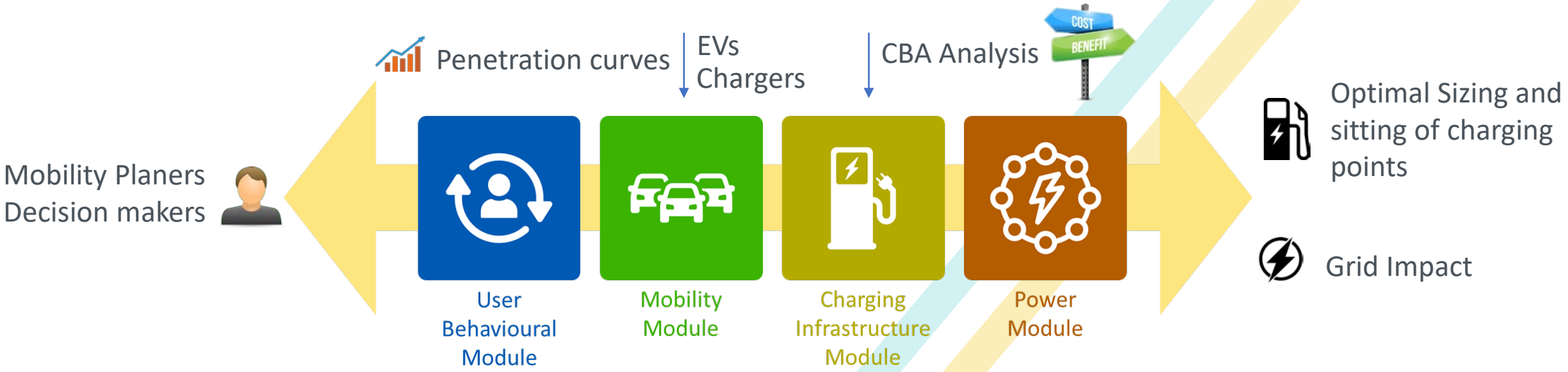
10 **CCS2** bidirectional conductive charging points (3,6 kW)

1 Common Storage (only simulated)

1 **CCS2** ultrafast conductive charging point (150 kW)

Smart charging system with AI algorithm

5 – INCIT-EV Decision Support System (DSS)



4 DSS modules:

- **User Behaviour**: outline and describe users' mobility habits and behaviour.
- **Mobility**: support the decision making of DSS users providing insights related to the impact of user behaviour and habits to the city mobility.
- **Charging Infrastructure**: provide the information related to the expected usage of the charging stations, their type and quantity in different city zones.
- **Power**: estimate how the additional charging infrastructure would affect the existing power system.

6 – Contribution to future regulation and standards

- INCIT-EV is paving the standards

INDUCTIVE

- Interoperability of all cars and tracks
- Up to 3 coils per vehicle
- High frequency operation for high power
- V2I communications
- Lane Keeping Assistant

CONDUCTIVE

- V2G pilots in CHAdeMO and CCS
- V2G AC Tests
- Ancillary services provided by EV charging
  - Frequency, voltage and reactive regulation
  - Smart charging – Power optimization
  - Load balancing
  - DSO/TSO Direct Communication

ISO 19363:2020 - Electrically propelled road vehicles -- Magnetic field wireless power transfer -- Safety and interoperability requirements

ISO 15118 Road vehicles -- Vehicle to grid communication interface

IEC TS 61980-2:2019 - Electric vehicle wireless power transfer (WPT) systems - Part 2: Specific requirements for communication between electric road vehicle (EV) and infrastructure

IEC TS 61980-3:2019 - Electric vehicle wireless power transfer (WPT) systems - Part 3: Specific requirements for the magnetic field wireless power transfer systems.

SAE J2954 - Wireless Power Transfer for Light-Duty Plug-in/Electric Vehicles and Alignment Methodology

Synergy Club: Collaboration with sister projects

- 19 projects were identified with INCIT-EV synergies
  - In 2021 we create the Synergy Club: between “the sister projects” of the same H2020 call: INCIT-EV, USER-CHI, eC4D, and E-smart.
  - regular exchange on results (2 times a year)
  - Work on common recommendations

EU 2030 Objectives

- INCIT-EV will contribute towards EU 2030 Objectives

At least 32.5% improvement in energy efficiency

At least 40% cuts in greenhouse gas emissions (from 1990 levels)

At least 32% share for renewable energy

- New and improved charging technologies for EVs
- Lower costs for EV chargers and new services: Foster investors
- V2G services to integrate REE and VE at any level – High level management DSO/TSO
- Increase users perceived value of EVs: wide user acceptance
- Improve interoperability of all kinds of EV charging

Improved grid quality and resilience

Energy independence from fossil fuels

Improved air quality and noise polution

At least 30 million zero-emission cars will be in operation on European roads

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Thanks for your attention

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