e-MOTICON

e-MObility Transnational strategy for an Interoperable COmmunity and Networking in the Alpine Space.

21st March 2018

European Regional Development Fund

SUMMARY

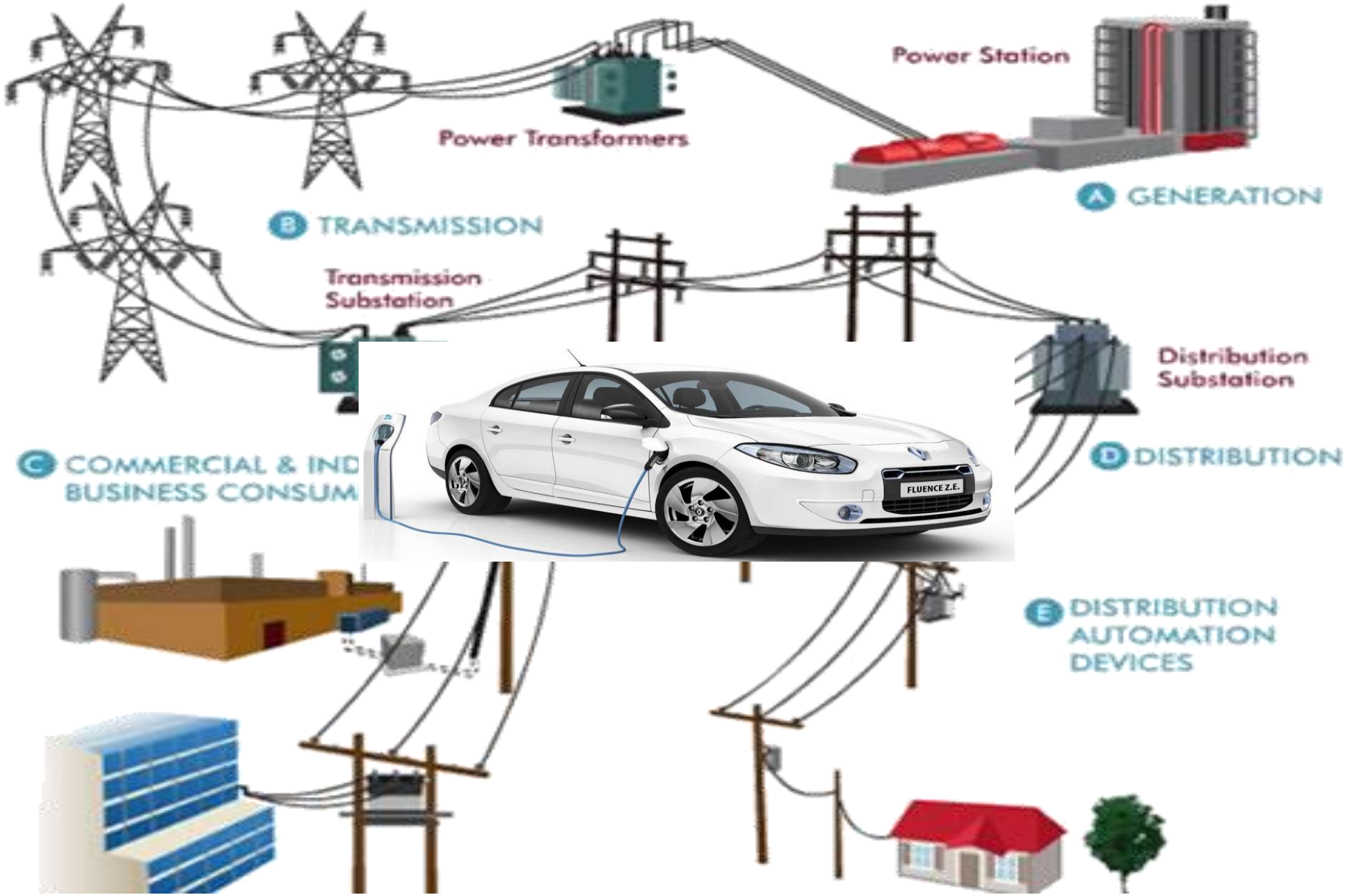
- ✓ e-MOTICON context: energy & transport
- ✓ e-MOTICON coherences
- ✓ Problems to solve & e-MOTICON approach
- ✓ How e-MOTICON wants to help e-mobility deployment
- ✓ e-MOTICON first results

e-MOTICON context: energy & transport

Open question on **the role of e-mobility** on :

- **LOW carbon** transport policy
- e-mob scenario (EV, freight, LPT)
- e- mob charging scenario (EV, freight, LPT)
- **Impact e-mobility on the EE**
- Technical standards (E-CS type)
- Smart grids
- V2H
- V2G

e-mobility and electric sector

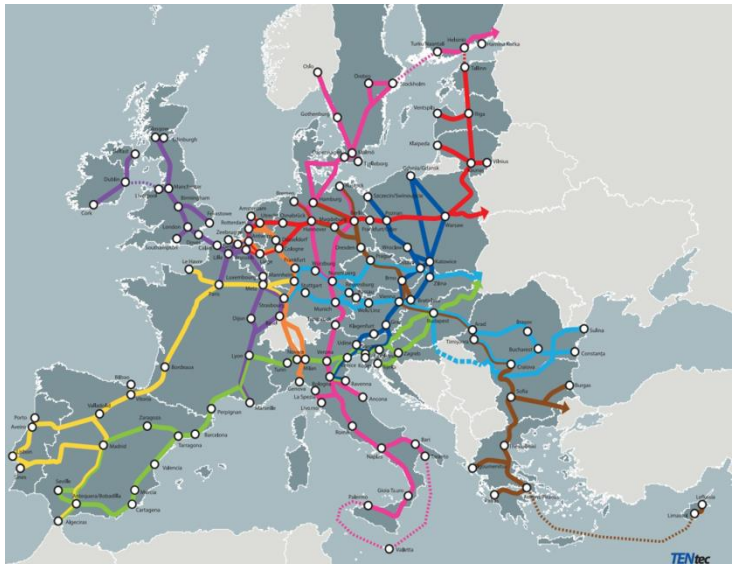


EV and electric grid: opportunities

smart grid

V2G

e-MOTICON coherences with European rules and vision on transport, energy & environment



TEN-T The Core Network Corridors

EUSALP
EU STRATEGY FOR
THE ALPINE REGION

Alpine Convention

Paris agreement - Climate and Energy Package 2030 Effort Sharing, COM(2016) 482 final - European Directive 2009/28/EC - Regulations 510/2011 and 333/2014 on CO2 emissions - World Harmonised Light Vehicle Test Procedure -
White Paper 2011 on Transport -Green Paper on urban mobility, 2007 - 2014/94/UE Directive on Alternative Fuels Infrastructure - "Towards clean and smart mobility" - "European Strategy for Low-Emission Mobility"

e-MOTICON coherences with European rules and vision on transport, energy & environment

EUSALP AG9

Key words

Energy efficiency ,

- **local renewable energy public and private sectors,**
- **reduction** of energy **consumption** in the **housing** , **mobility sector** and **in small and medium enterprises**.

Objectives:

- **Setting up an Alpine energy efficiency cluster** (cohoperation&innovation in housing and **mobility** sectors)
- '**Greening the Alpine infrastructure' (**energy efficiency in the building sector- assessment tools)
- **Alpine renewable energy cluster** (ecological, economical and land use issues)

Actions

- Estimates of **external costs** in mountain areas
- EUSALP Energy **Survey**
- **Grey energy assessment** in construction/ Alpine **construction materials**
- **Greening the Alpine Infrastructure** / **Building** Sector
- Compilation of an **overview of smart grid activities** and projects in the member regions
- Defining the **Remaining Potentials of Renewable** Energies in the Alpine Region
- EUSALP **energy collaboration platform**
- Network for the **Promotion** of local Energy Management Systems (**EMS**)
- Enhance **Energy Efficiency in Alpine Small and Medium-Sized Enterprise**s
- EUSALP energy **observatory**

e-MOTICON

e-MObility Transnational strategy for an Interoperable COmmunity and Networking in the Alpine Space.

2m€

15 partners

41 observers

30 months

http://www.alpine-space.eu/projects/e-moticon/en/home

Project Partners

http://www.alpine-space.eu/projects/e-moticon/en/home

WHY e-MOTICON ?

The problem

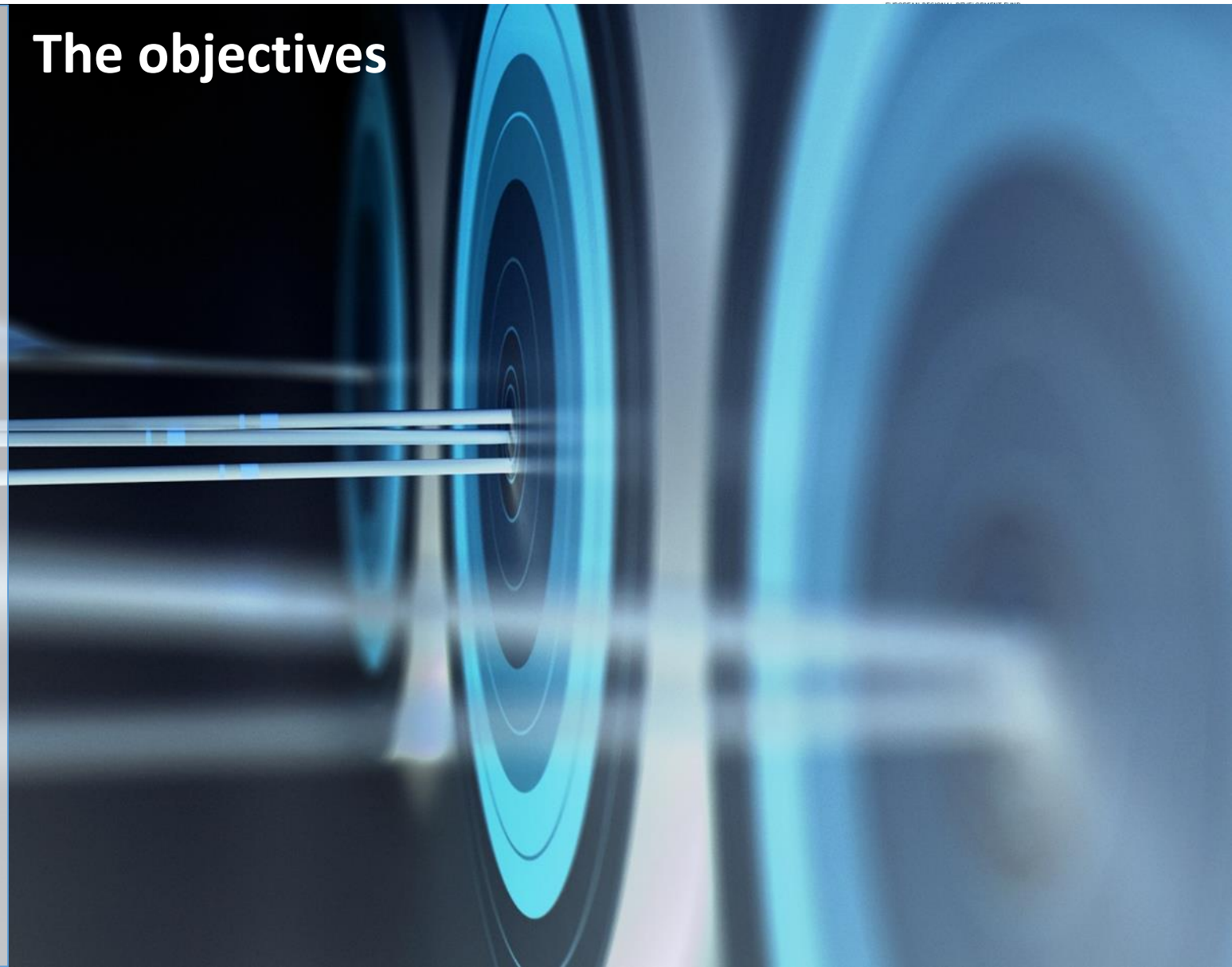
Low and inhomogeneous deployment of electro mobility (e-mobility) characterizes Alpine Space

One reason for the inadequate diffusion is low interoperability of E-CS

THE OBJECTIVES

The objectives

Support Public Administrations in ensuring homogeneous development of **e-mobility,** deploying an innovative transnational strategy of integration among spatial planning, innovative business models and technologies, sustainable mobility patterns, energy efficiency instruments and policies enabling large diffusion of E-CS and wider **interoperability.**



How e-MOTICON wants to help e-mobility deployment?

How e-MOTICON wants to help e-mobility deployment?

Tools (e-MOTICON outputs)

Strategic level

Develop a **STRATEGY**: to build an homogeneous framework linked to EU policy and Strategy for Alpine area (EUSALP AG4/AG9)

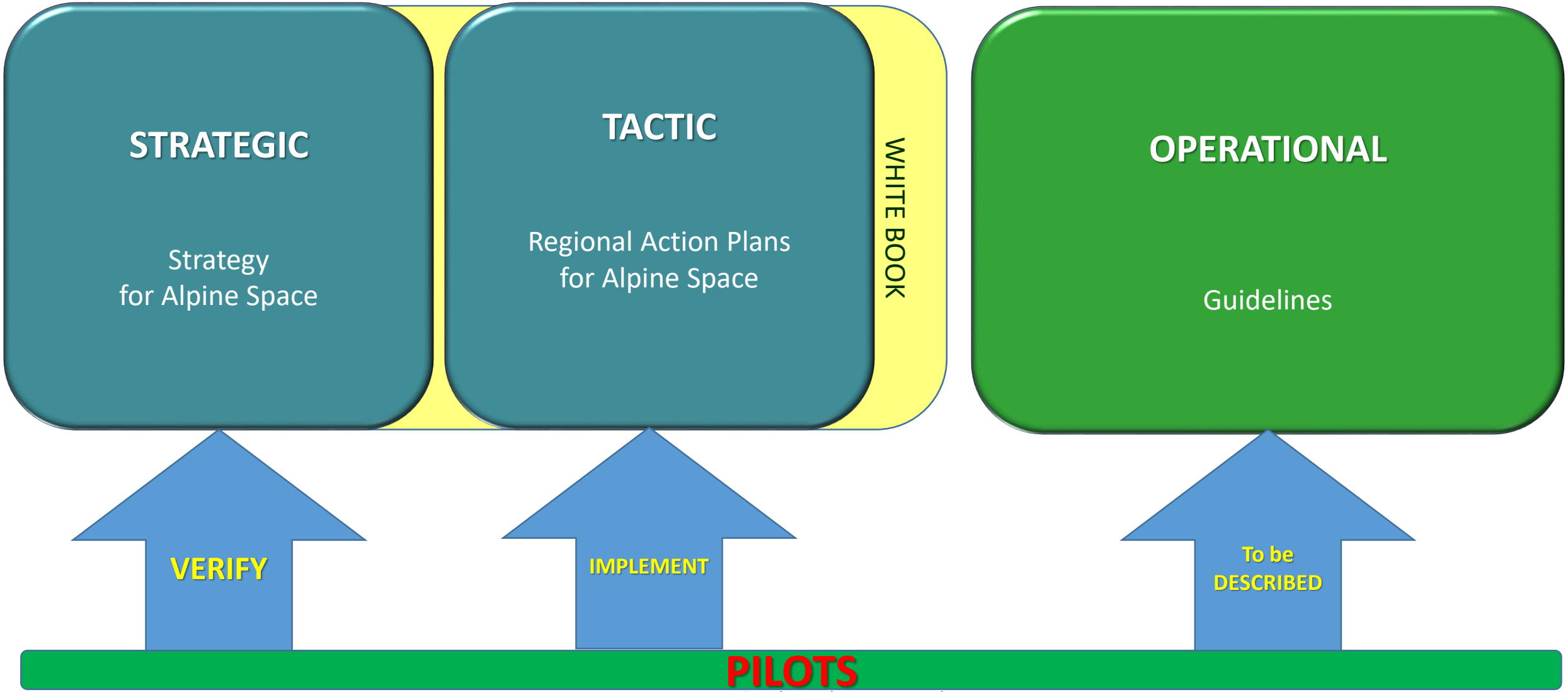
Tactic level

Develop **REGIONAL ACTION PLANS**: to be used by local public administrations to indentify actions linked to their strategic objectives and area of intevention (Priorization – monitoring – evaluation)

Operational (practical) **level**

Develop **GUIDELINES** to guide the implementation of E-CS interoperability in spatial planning policies

How e-MOTICON wants to help e-mobility deployment?



e-MOTICON FIRST RESULTS

STATE OF THE ART

State of the Art

Policies to support e-Mobility

	FR	GER	AUT	SLO	ITA	CH	FL
National funding for EV purchase	X						
Regional / local funding for E purchase							
National funding f E-CS deploymer							
Regional / funding for deployment							
Benefits on taxe							
Vehicles' labelli							
Free access restricted areas							
Free parking (least less pa fees)							
Green F Procurement							
Help desk municipalities							
Public fleets of E							
Information to t public							
Promotion of e-mobility services	X						
Buildings equipped with E-CS (EU	X	X	X	X	X	X	

	FR	GER	AUT	SLO	ITA	CH	FL
KIWHI		X					

	FR	GER	AUT	SLO	ITA	CH	FL
							X
							X

	FR	GER	AUT	SLO	ITA	CH	FL
National government	X	X	X	X	X		X
Regional and local Public Authorities	X	X	X	X	X	X	
Grid operators							
Electricity producers and electricity providers	X	X	X	X	X	X	X
Dedicated firms	X	X	X	X	X	X	
charging							

evelopment Fund

State of the Art

SWOT analysis for the policies

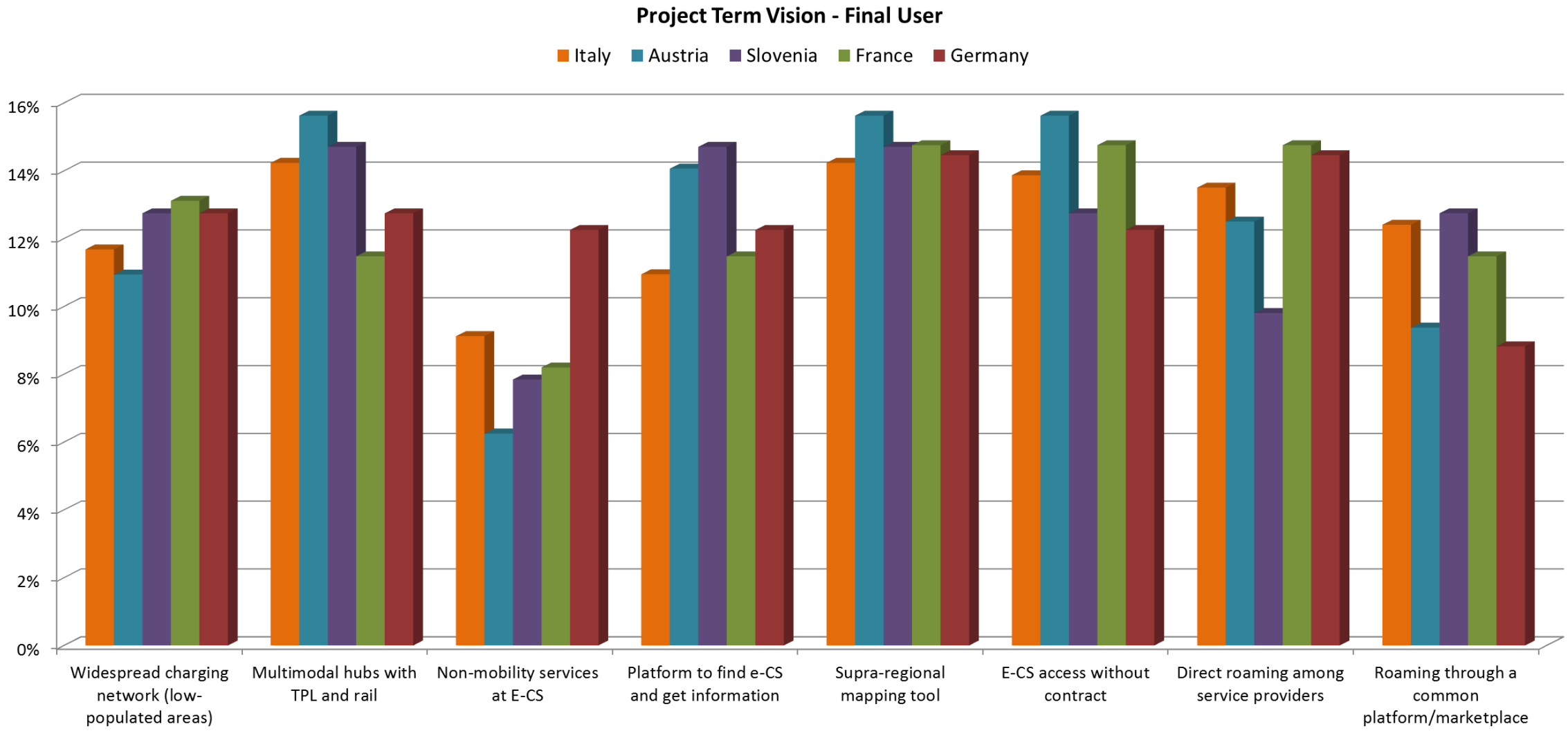
STRENGTHS	WEAKNESSES
- Strong commitment of the national governments and of the regional/local	- The Alpine Space countries do not contribute to the deployment of E-CS and

SWOT analysis for the interoperability and the localization

STRENGTHS	WEAKNESSES
- Number of E-CS already installed and operated - Some of the interoperability platforms are European big players - Overall coverage of the Alpine Space	- A lot of low-charging power E-CS (3kW) - Lower concentration in the rural areas - Several sockets and standards at the moment - National framework for the deployment of E-CS
OPPORTUNITIES	**THREATS**
- Interroaming agreements at the Alpine Space and at the European levels between the interoperability platforms	- Competition between the interoperability platforms in the Alpine Space - Lack of (future) transnational

STRATEGY & REGIONAL ACTION PLANS

The route from SoA weaknesses to a common approach/solution: Survey Results



Strategy

Supra regional (Alpine Space) strategic pillars:

#1 – Define the best possible roles of pas

#2 – Set common minimum rules on infrastructure access

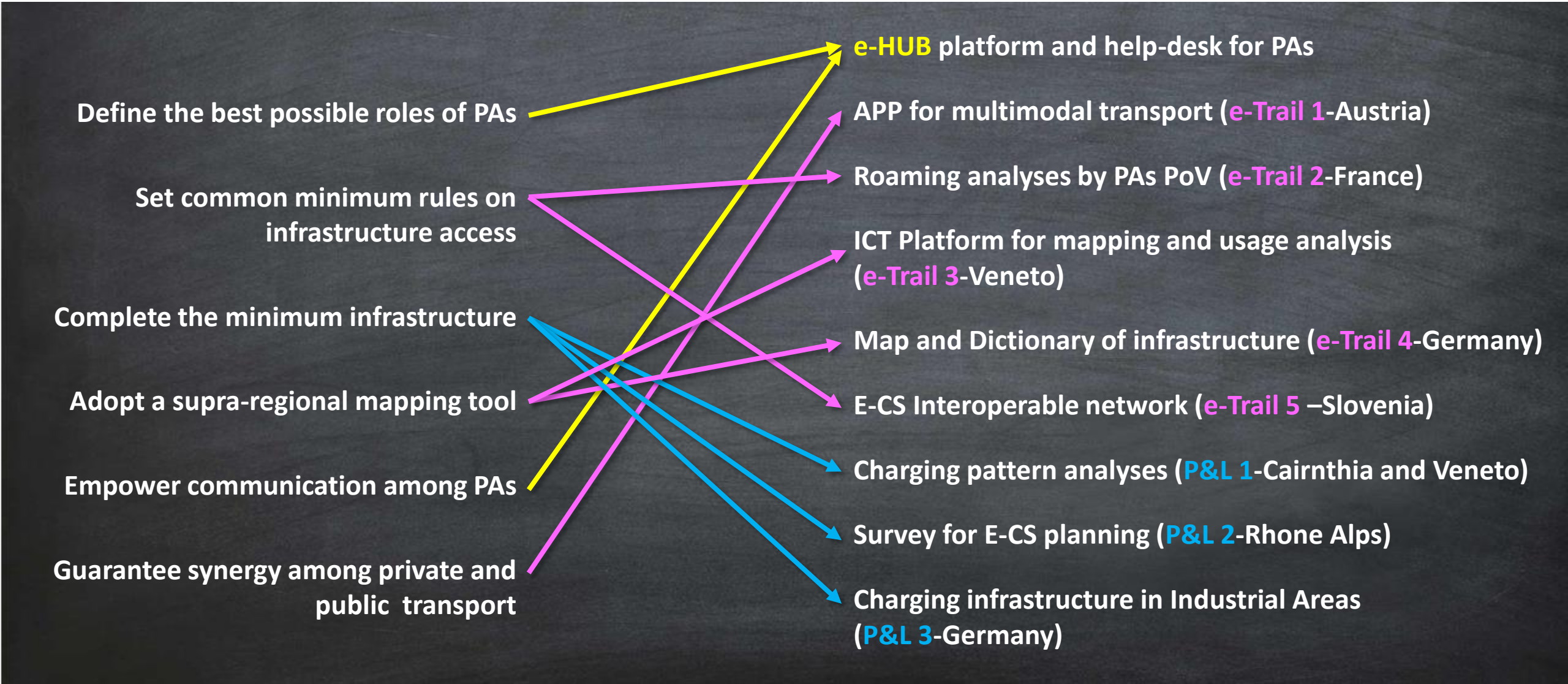
#3 – Complete the minimum infrastructure

#4 – Adopt an integrated, supra-regional mapping tool

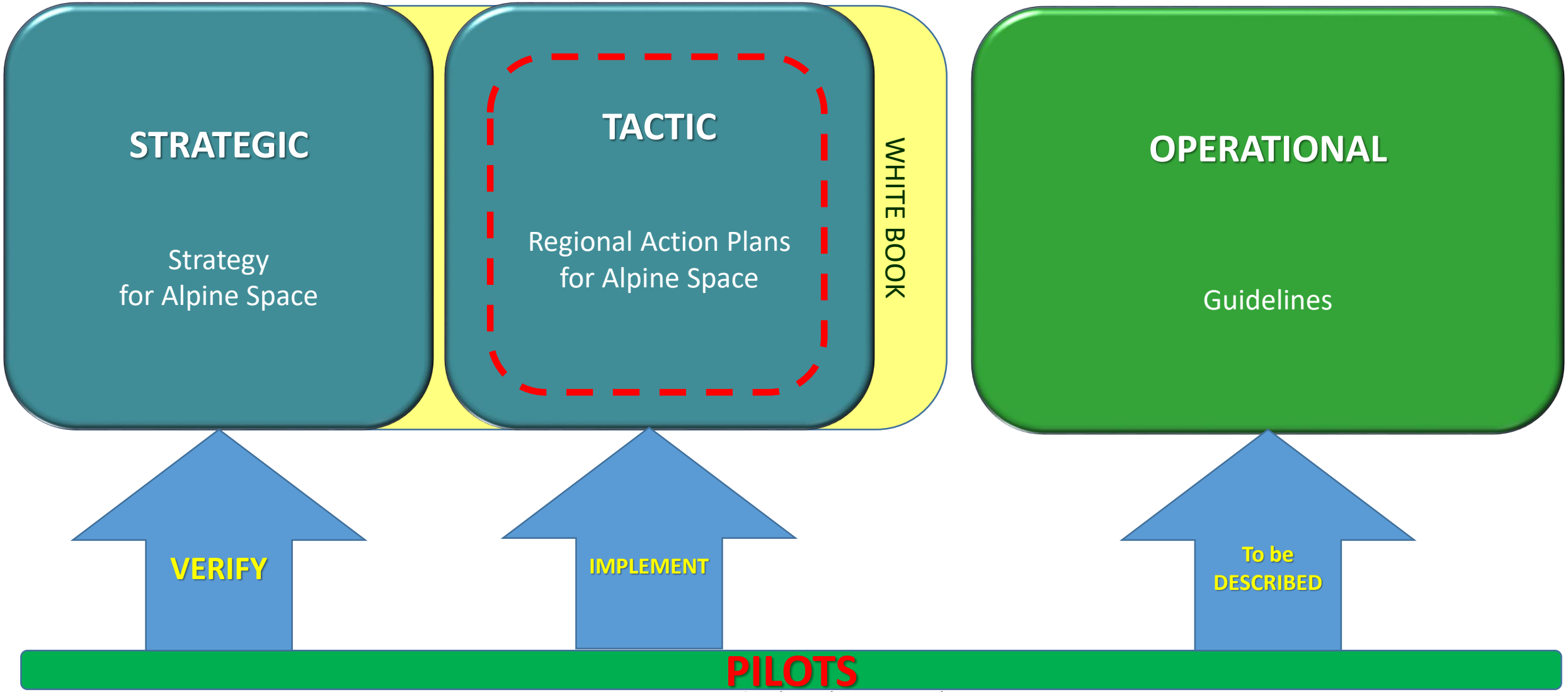
#5 – Empower communication among public authorities

#6 – Guarantee synergy among private and public transport

Strategy & Pilot action



How e-MOTICON wants to help e-mobility deployment?



Regional Action Plan

RAP

Tactic doc (intervention plans) for each region to positively contribute to the achievment of the transnational strategic pillars, by means of a coordinated approach in Alpine Space.

Five Regional Action Plans (one for each country), but:

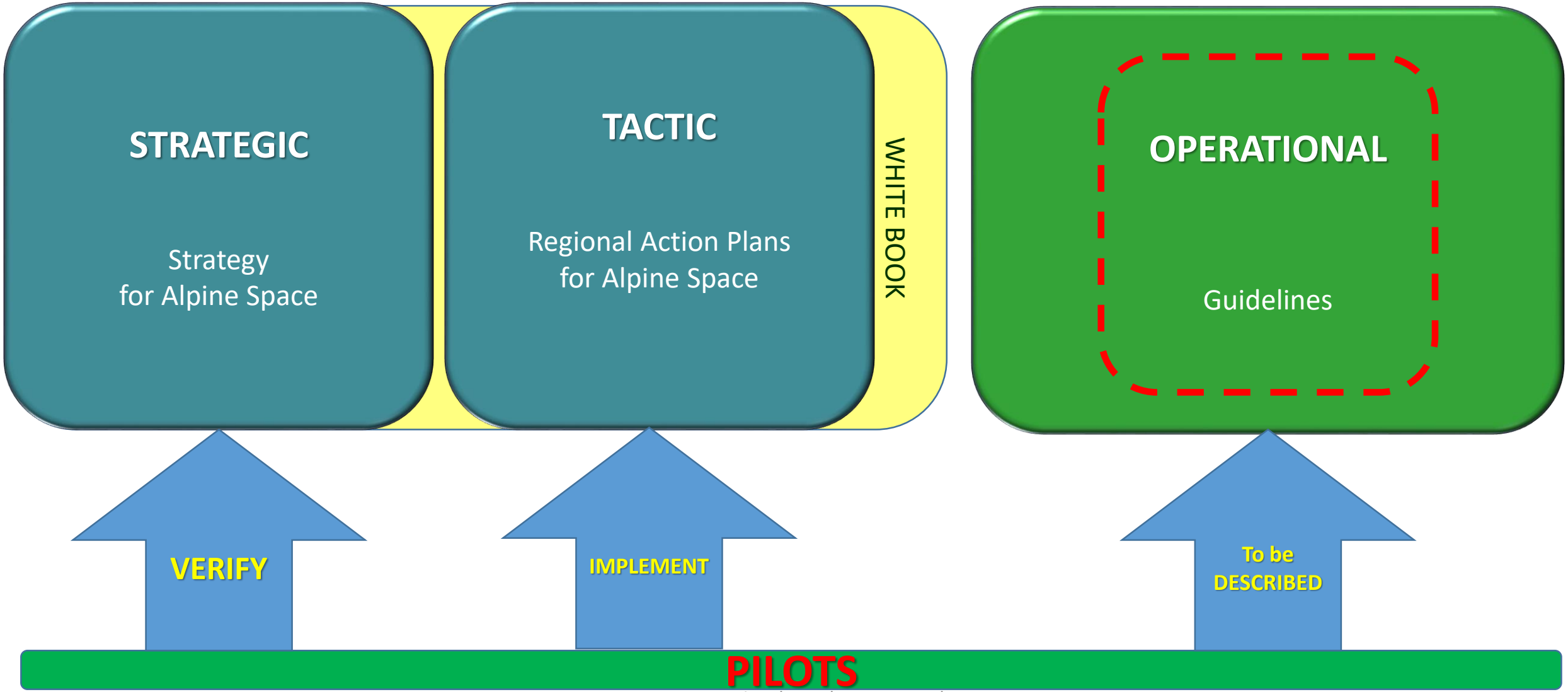
- **Common framework,**
- **Common approach**
- **Link & sinergies**

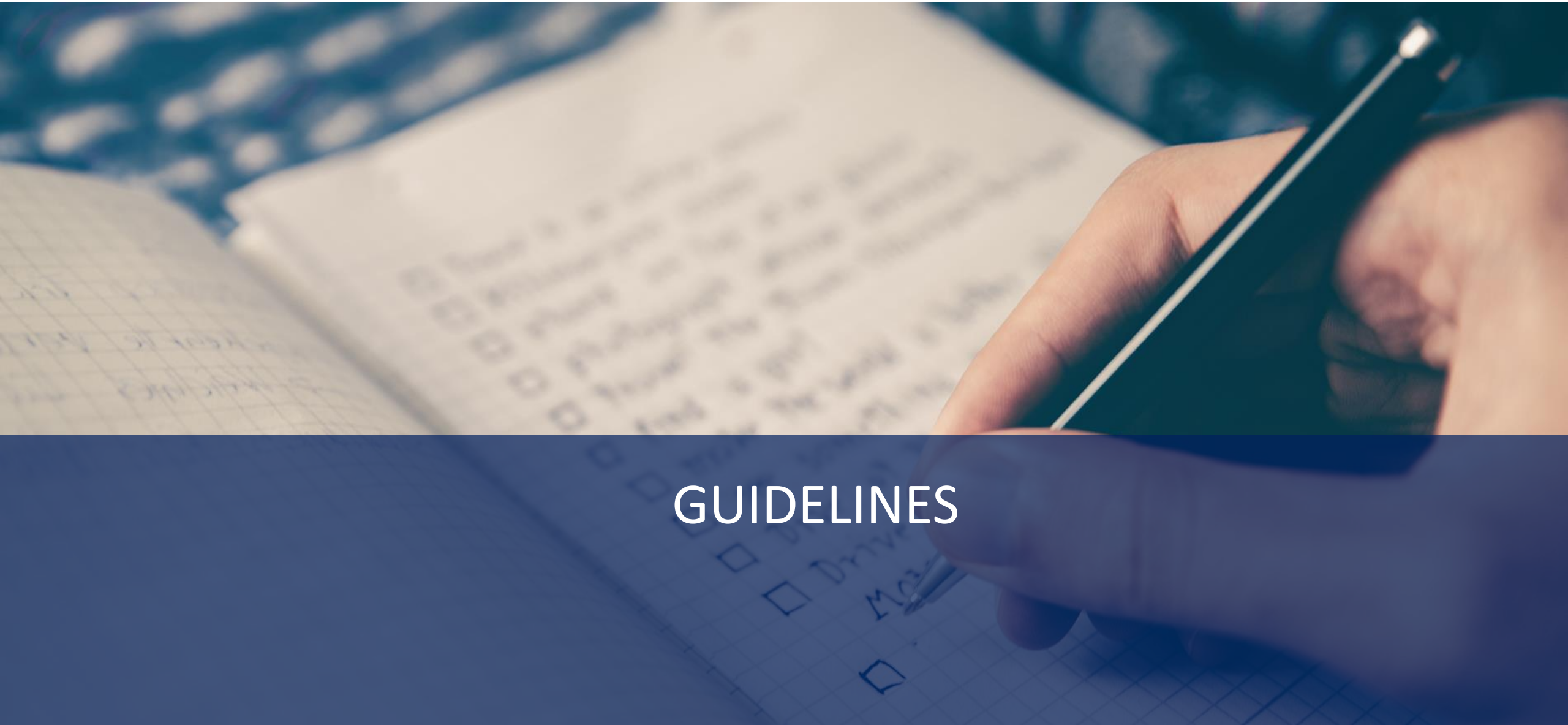
Regional Action Plan

Common approach:

- **Common methodology:**
  - Definition of area of intervention
  - Definition of objectives
  - Identification of actions
- **Action description according a unique scheme**
- **Check of coherence with upper/lower admin., SH and other RAPs**
- **Common methodology for priorization (MCA), monitoring, evaluation**

How e-MOTICON wants to help e-mobility deployment?





GUIDELINES

Guidelines

a “short” guide tailored on PA prospective, containing different tools (recommendations, Lessons learnt, use cases, best practices and format) to foster PA to plan a transnational and interoperable e-CS network

Which tools?

- Checklists
- Planing tools
- Funding hints
- Lists of providers and installation companies (regional)

…

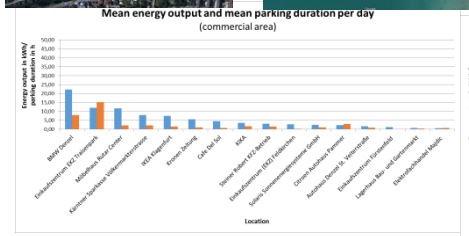
>>>National/regional adaptions/versions needed

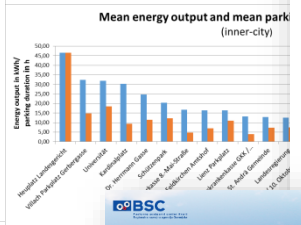
Key Elements

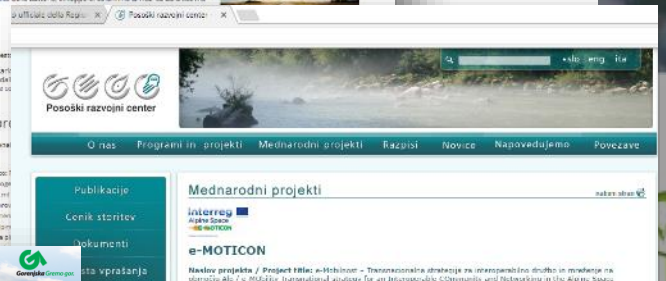
Lessons learnt	> in e-MOTICON Pilot Activities and from outside
Best practice	> in e-MOTICON Pilot Activities and from outside
Tools	> Tool Box

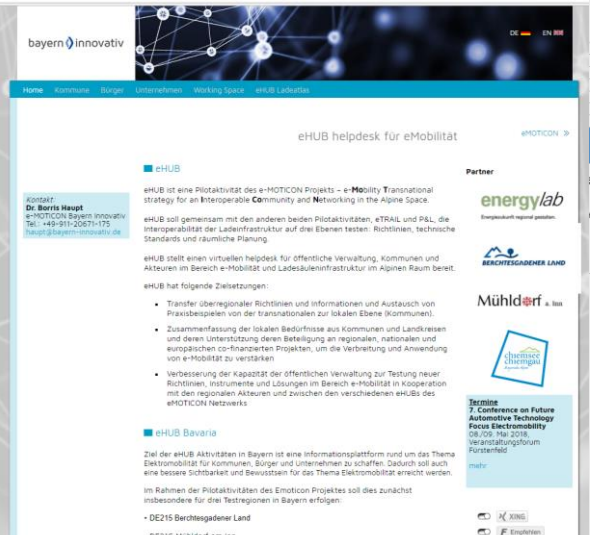
TEST THE STRATEGY

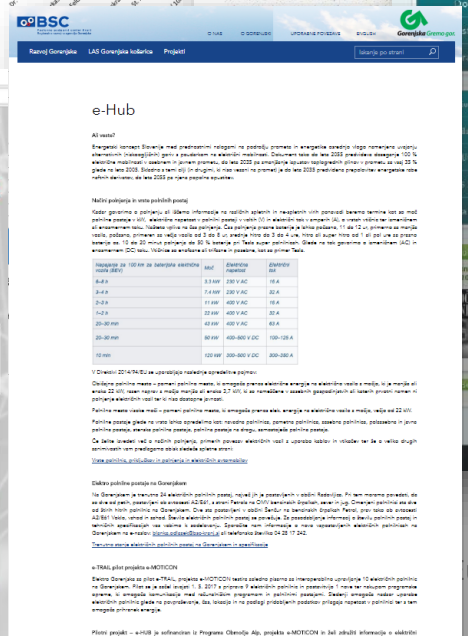
TEST THE STRATEGY











TRASNATIONAL COMMUNITY

WPT4 – TRASNATIONAL COMMUNITY

Networking

Tutorial for Public Administrations

Webinar
Tutoring
Videos
Site Visit
Practical Cases /Best Practice Presentations
Interactive questionnaire / Game
Gaming
Comic strip / Video
Meeting with municipality
Online interactive training course

MEMORANDUM of UNDERSTANDING

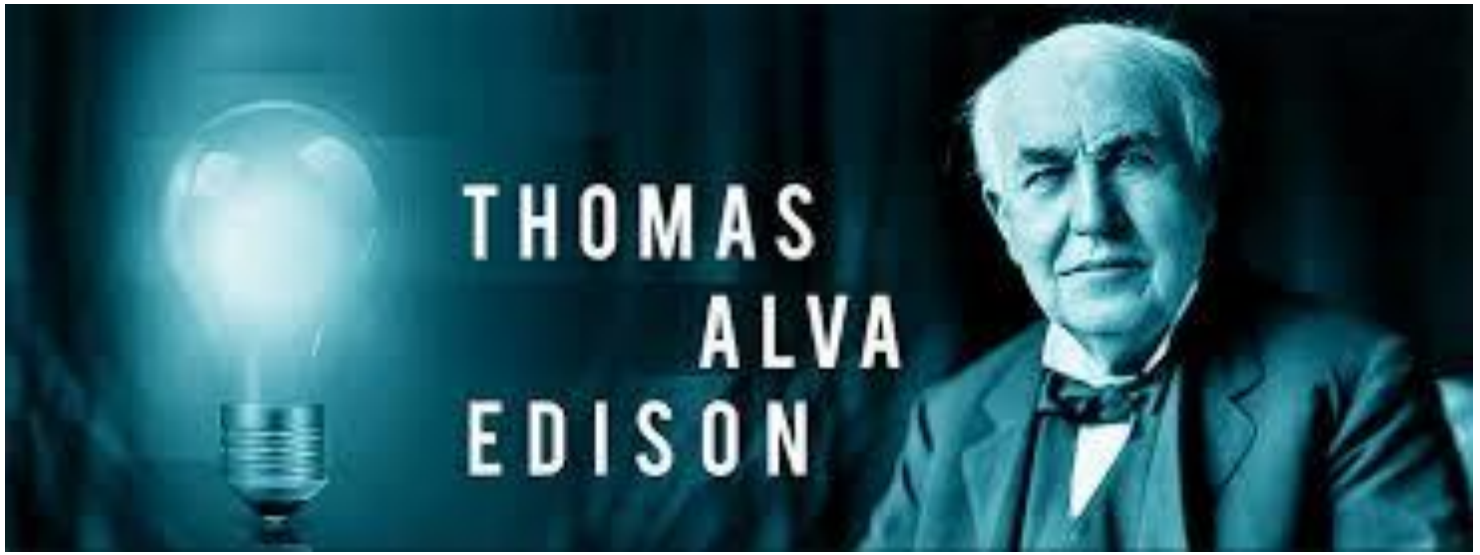
WPT4 – TRASNATIONAL COMMUNITY

…So, please, join our trasnational community!

http://www.e-moticon.eu/

Thanks for your attention

..In 15 years, more electricity will be used for cars than for light….



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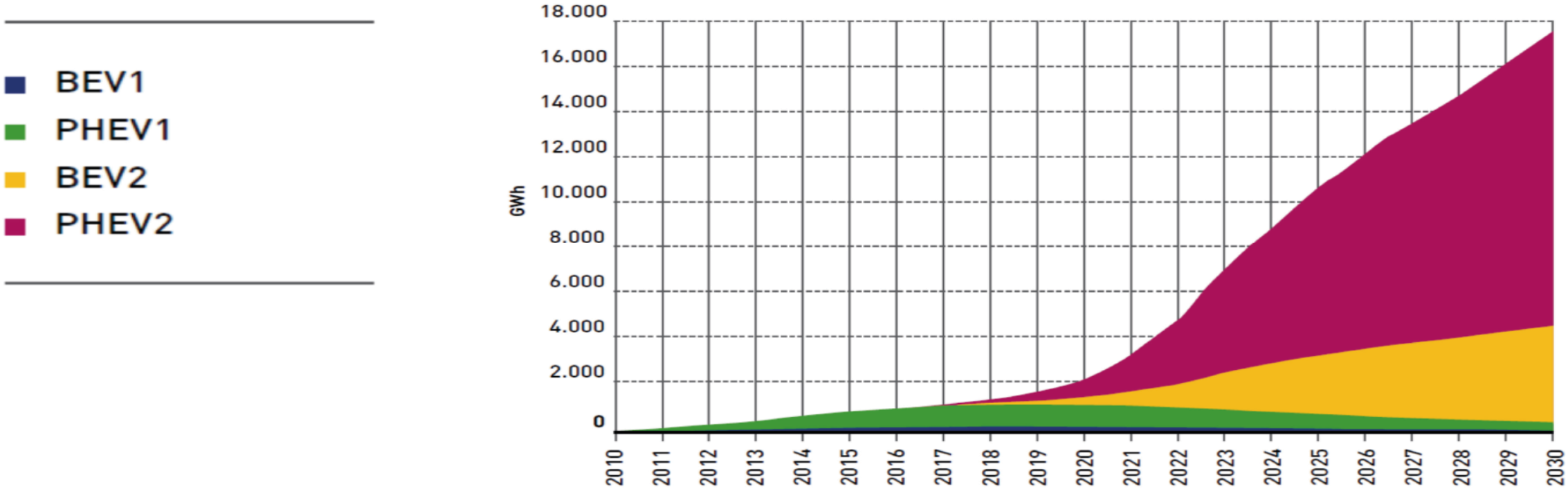
ITALIAN 2030 SCENARIO FOR E-MOBILITY

10 MILION ELECTRIC VEHICLES AT 2030: WHICH IMPACT?

2 milions FULL ELECTRIC VEHICLES (BEV)

8 milions HIBRID PLUG-IN VEHICLES (PHEV)

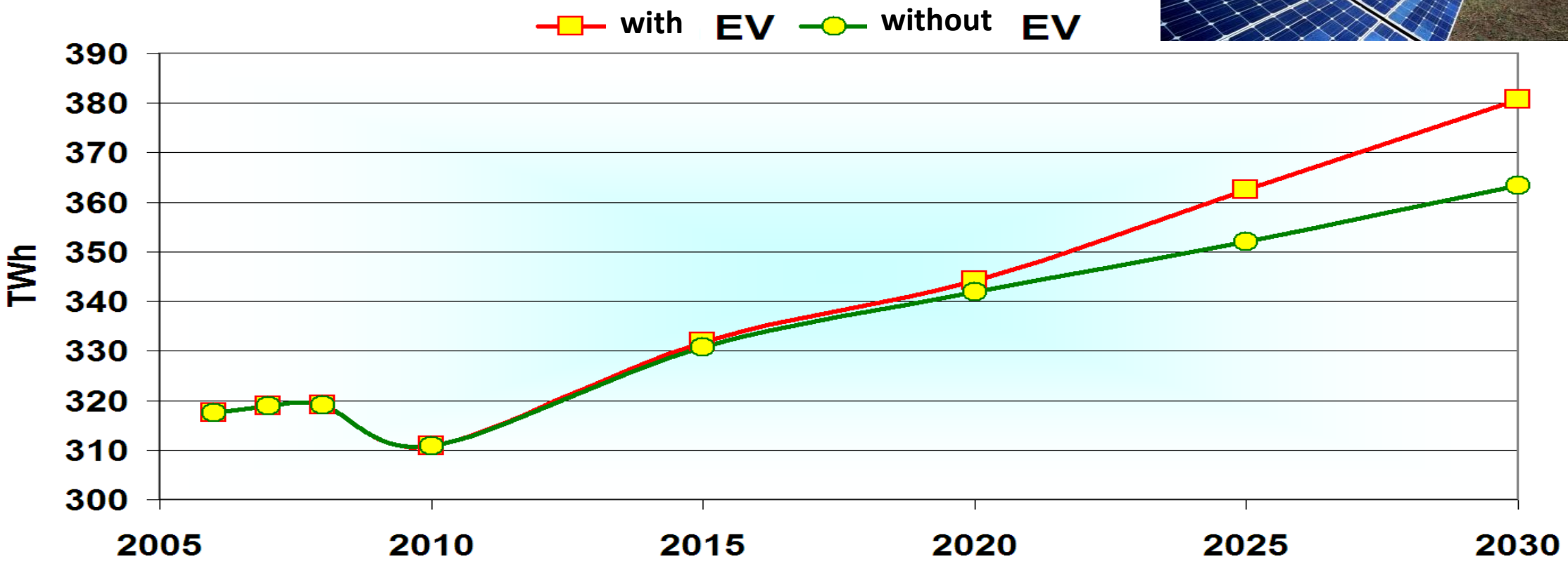


10 MILIONS ELECTRIC VEHICLES AT 2030: WHICH IMPACT?

ADDITIONAL ENERGY REQUEST TO THE GRID:

~19 TWh/y

(<20% of Italian electric demand)



IMPACT ON CO2 EMISSIONS

- An increasing in electricity production needed to feed the new EV at 2030 gives an **increase in CO2 emissions in the electricity sector** of di **8,2 Mt**

- Considering an **average emission rate of internal combustion replaced vehicles** about **95 gCO_2/km**[(1)], their emissions should be about **10,4 Mt**
- The **emissions avoided by electric cars** would therefore be about **2,2 Mt**

(1) EU emission target for new caars at 2021

IMPACT on LT and MT grid

EV **consumptions**?

50 km/day

240 day/y

12.000 km/y

160 Wh/km

1.920 kWh/y

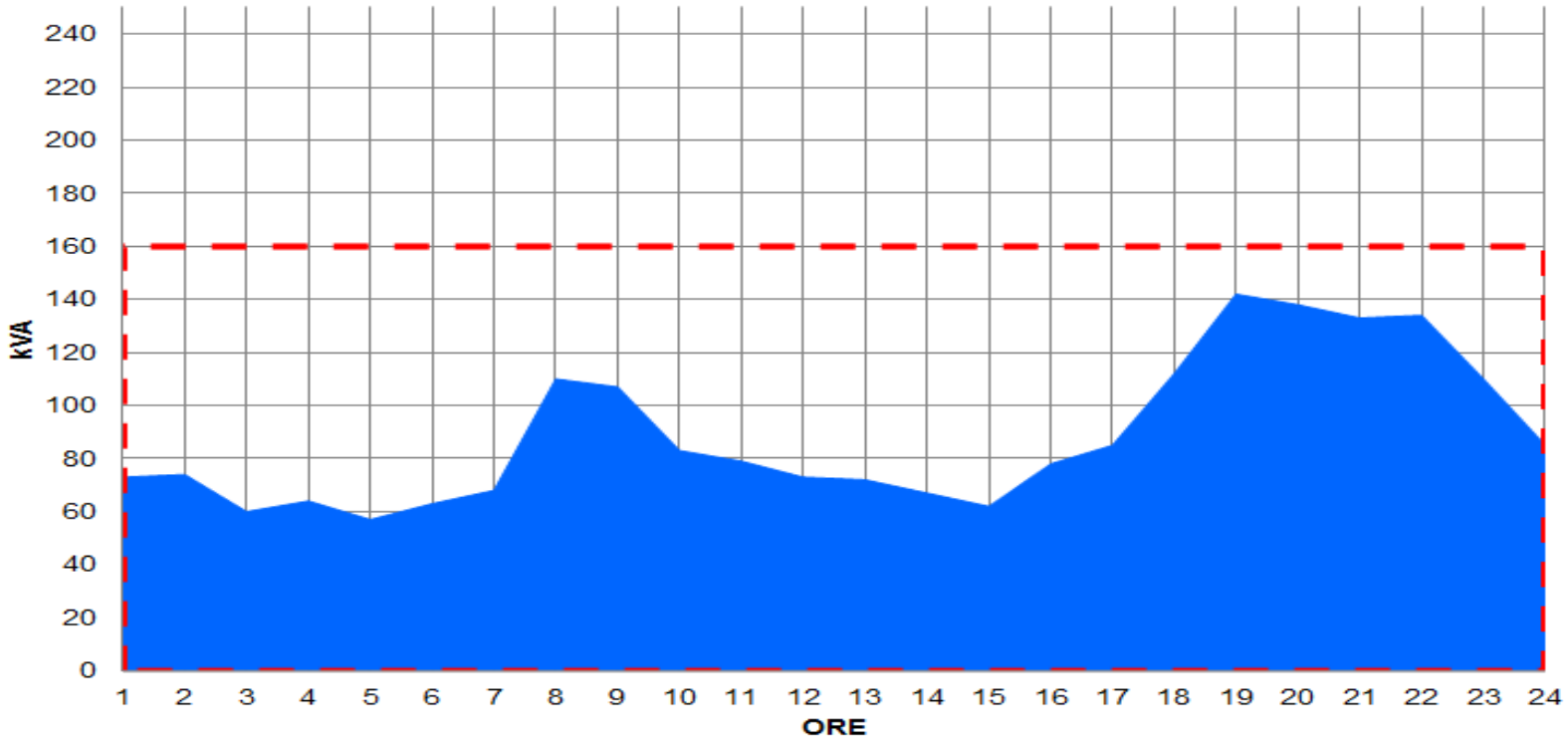
An **electric** car consumes as much as a three people **family**

By charging at home * the energy demand on the LV networks doubles

* We assume that a great percentage of the families can charge vehicles at home (in Italy this rate is about **64 %**)

IMPACT on LT and MT grid

The power grid is sized for demand peaks

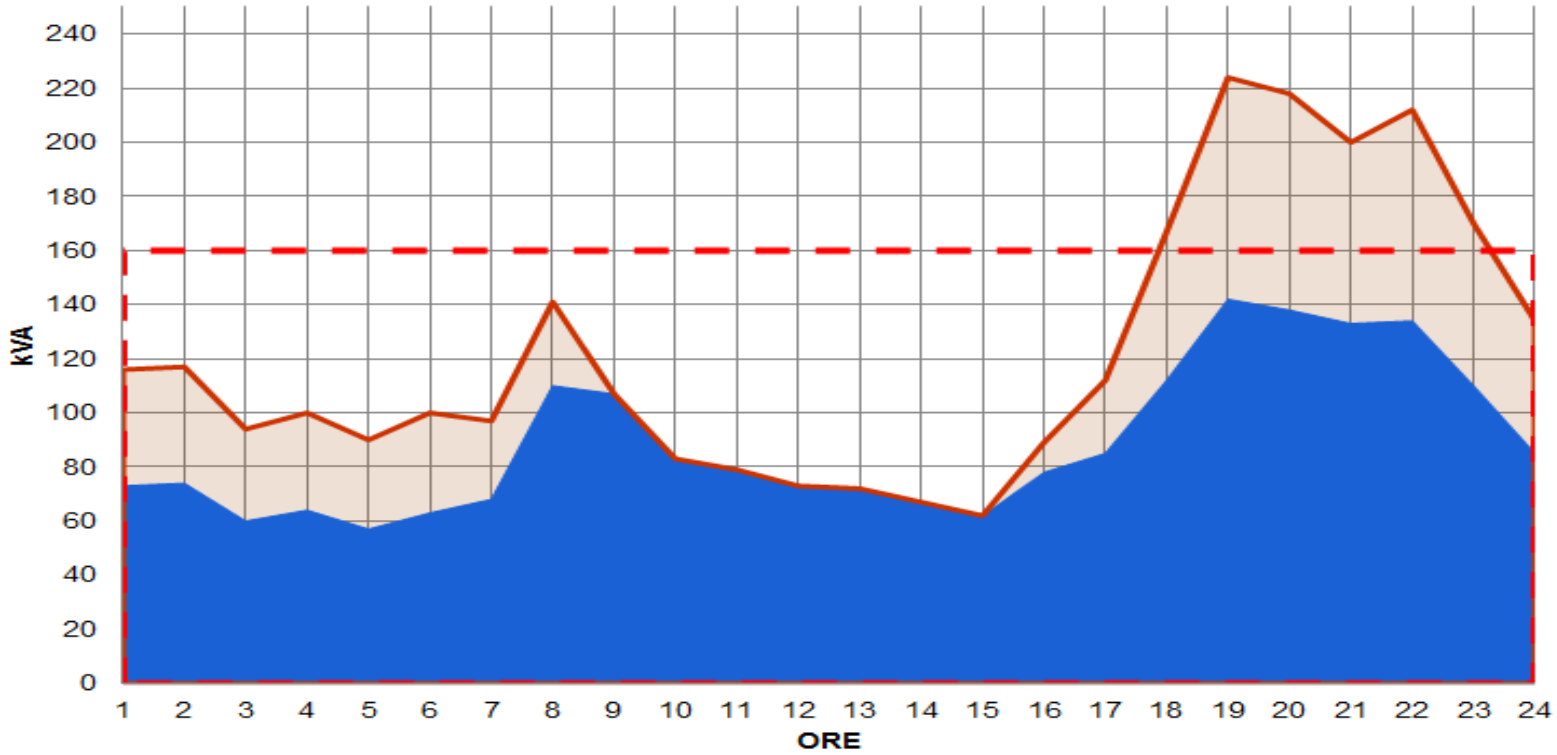


- Curva trasformatore 160 kVA
- Carico senza ricarica

IMPACT on LT and MT grid

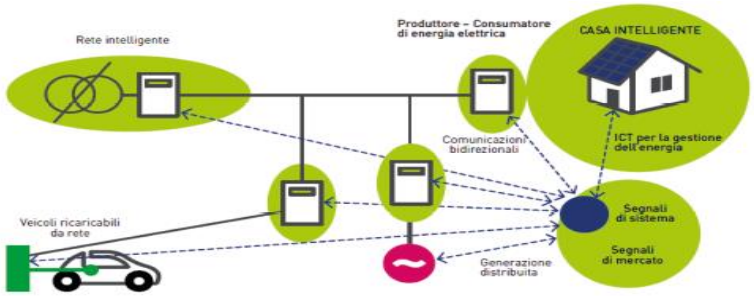
Uncontrolled charging accentuate the peaks

- Carico + ricarica non controllata
- Curva trasformatore 160 kVA
- Carico senza ricarica



IMPACT on LT and MT grid

It is necessary to manage the charging (public and private) through smart grids



- Carico + ricarica controllata
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- Curva trasformatore 160 kVA
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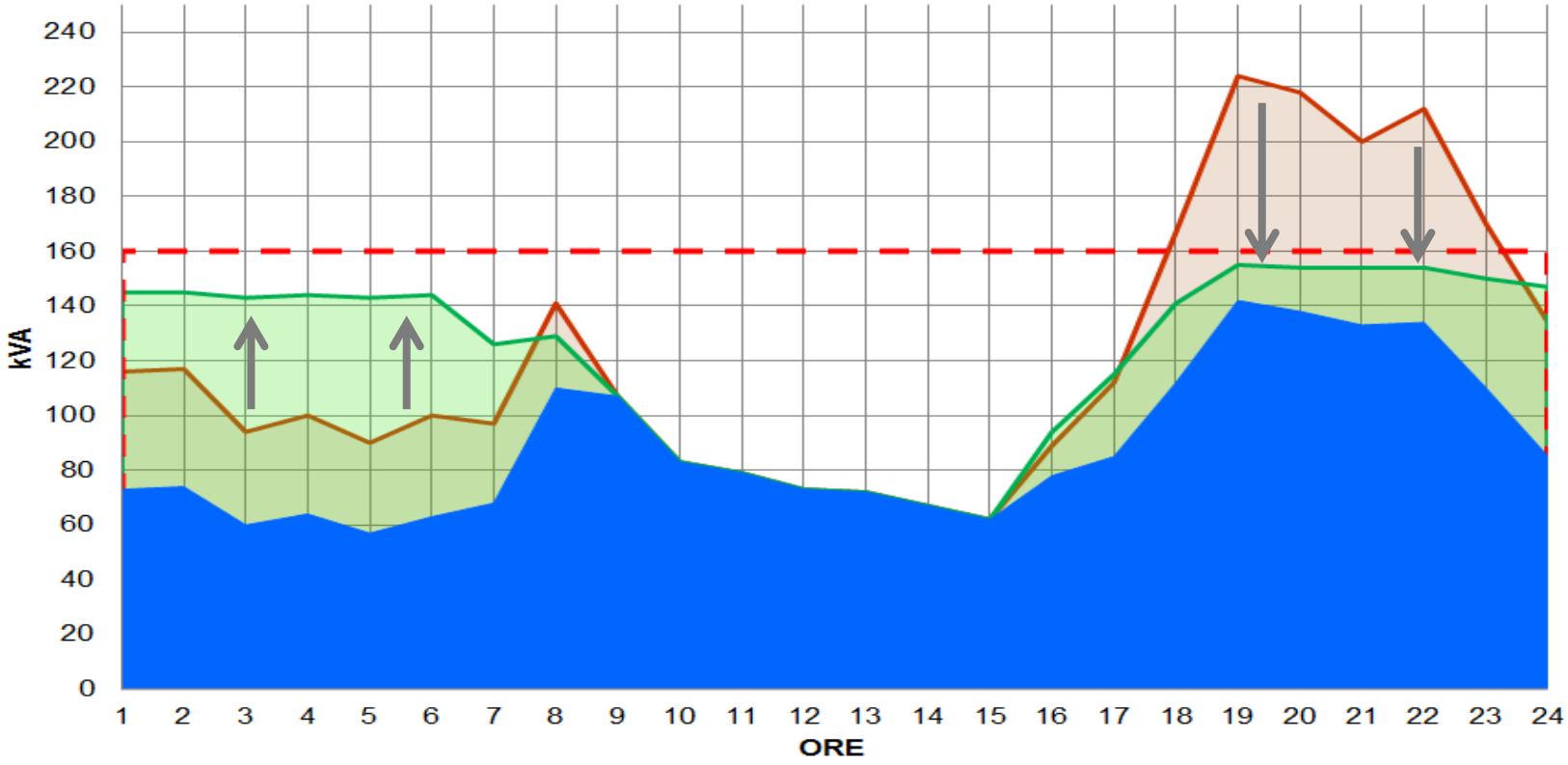
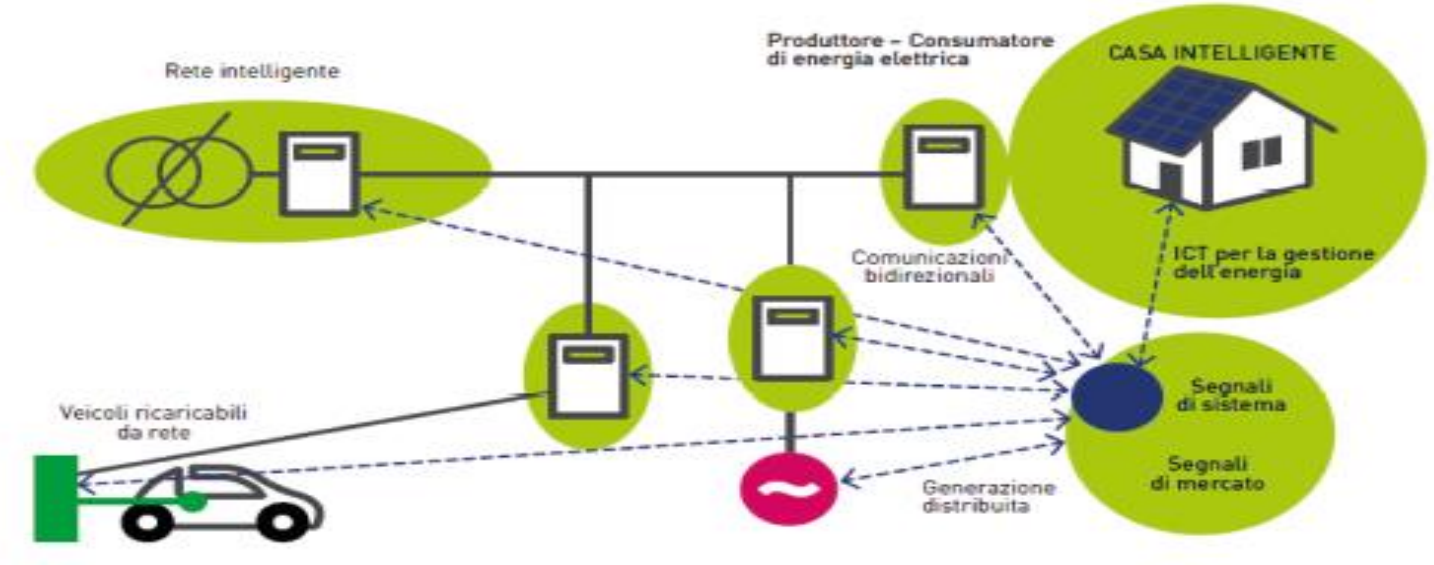


IMPACT on LT and MT grid

Slow recharge on BT electric networks

Benefits by smart grid

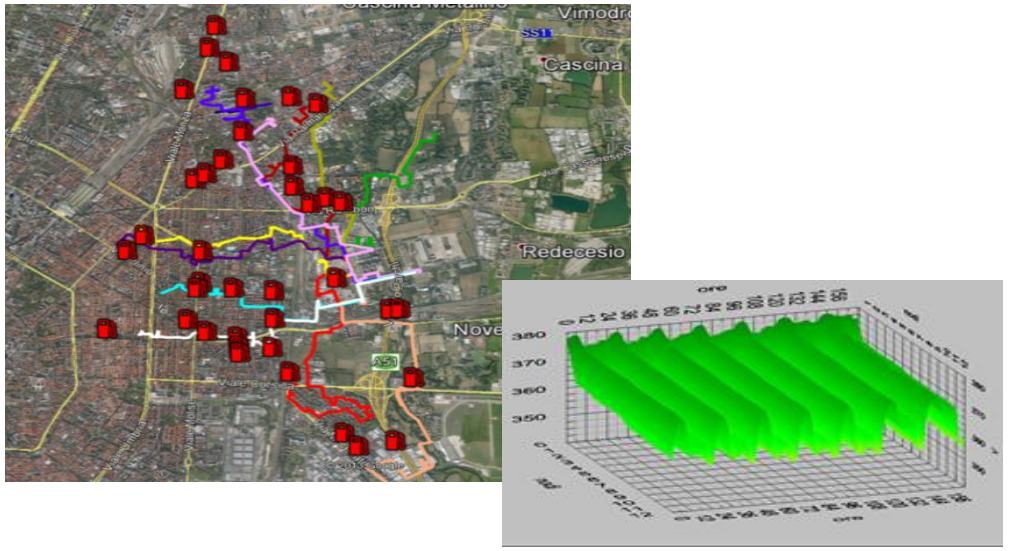
The control system of a Smart Grid can increase at least 10 times the number of EVs that can be recharged in a LT network, without reinforcing the network

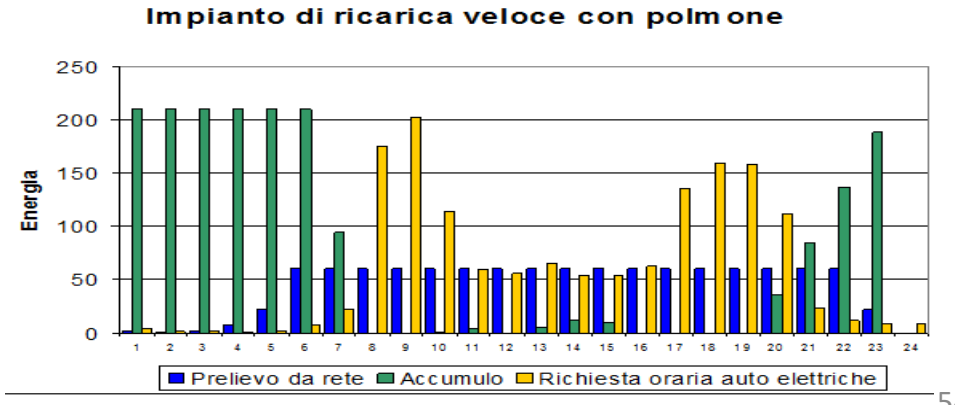


IMPACT on LT and MT grid

Fast charging on the electricity networks of big cities

- energy demand at the "average" service station: 1.2 GWh per day
- direct connection to the city MT networks (power of about 200 kW)
- need of storage systems (about 250kWh) for connection to the LV networks (power required about 60kW)

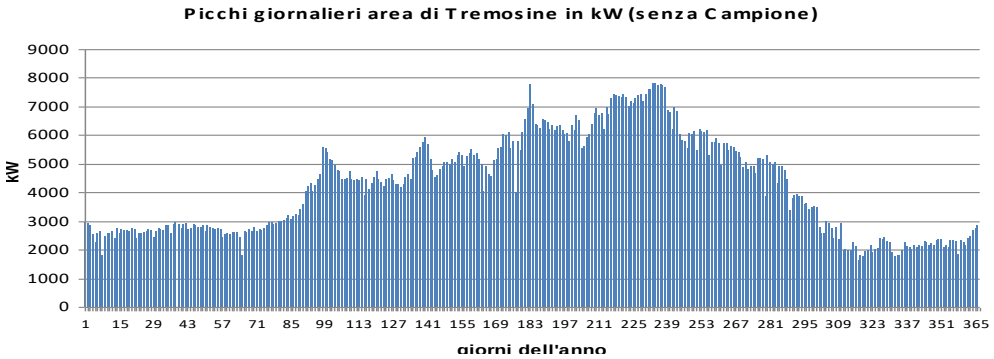


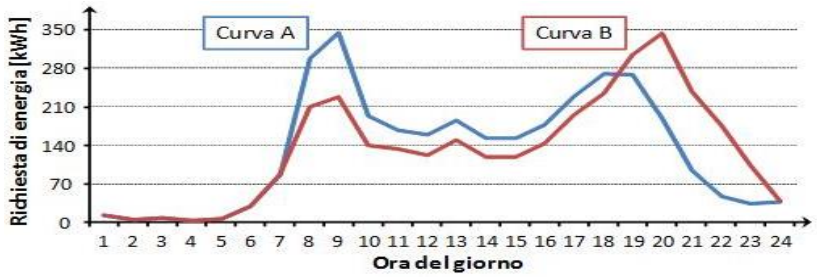


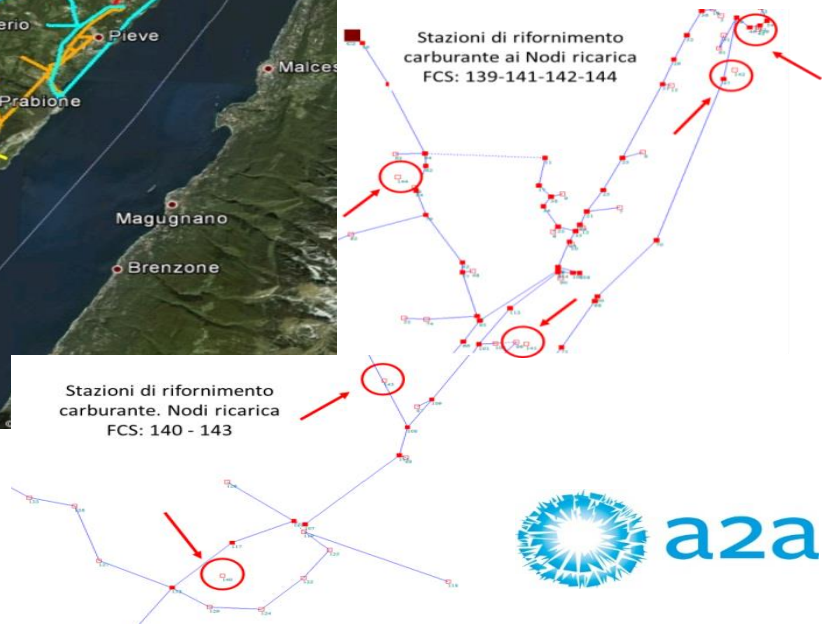
IMPACT on LT and MT grid

Recharge on rural and tourist MT electricity networks

Zones characterized by a marked seasonal fluctuation of energy demand in summer and winter



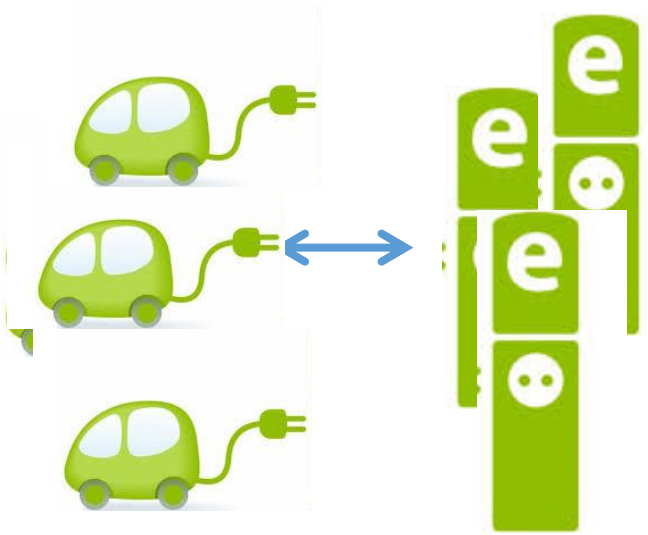




An answer could be

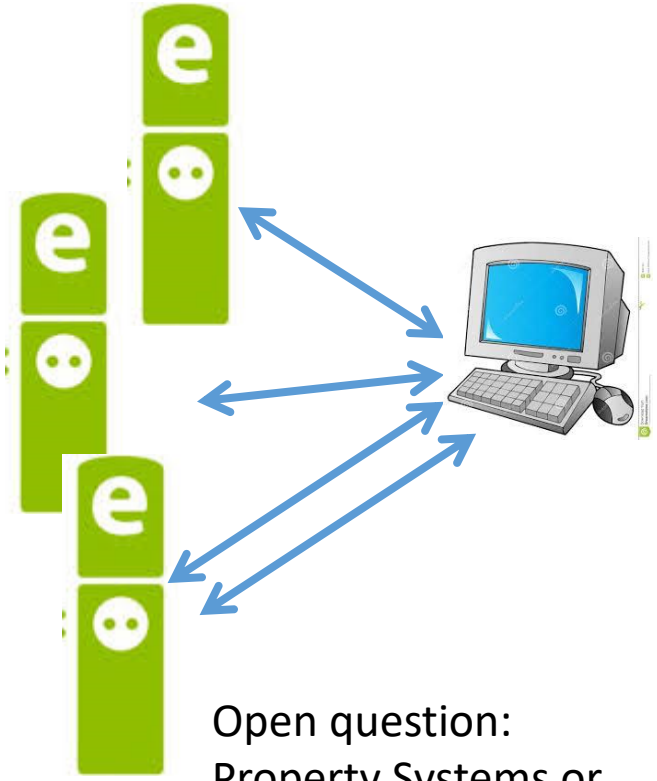
Interoperability

EV- e-CS



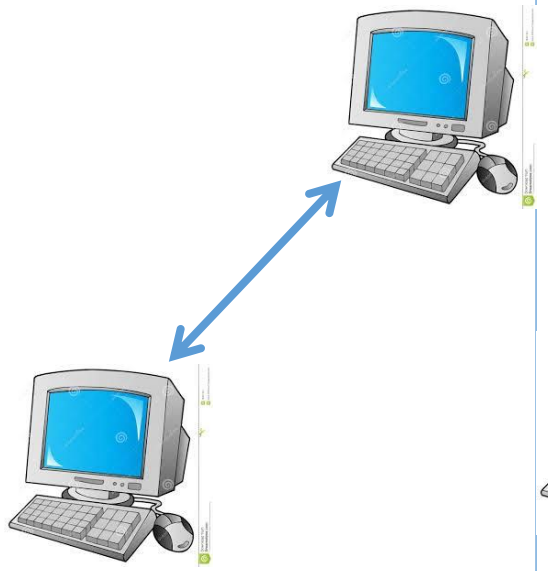
- Plugs ✓
- Identification ✓
- PWM (61851-1 charging managment) ✓

e-CS - Backend



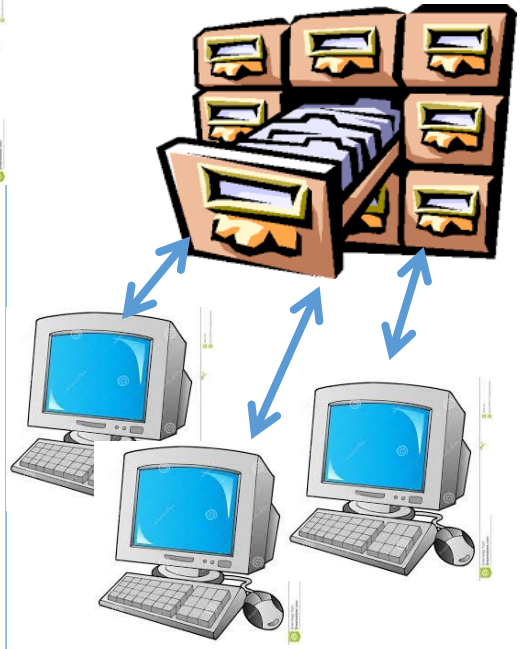
Open question: Property Systems or OCPP??

Backend - Backend



Open question: Roaming??

Backend – National Platform



Open question: all countries??

Interoperability

A specific definition has been given by the e-Mobility ICT Interoperability innovation group (e-MI3) in its report (2015) "Electro-mobility, interoperability challenges" (cf. Appendix): "*Interoperability is the ability to enable various systems to work together*". The e-MI3 association then distinguishes the definition and adapts it to the various stakeholders' situation:

- "***For the e-mobility market,*** *interoperability leads to non-discriminatory e-mobility services, such as charging and navigation, and makes it available through-out a defined territory* [in the case of the e-Moticon project, the Alpine Space] *without limitation and with a coherent service quality level at an optimized price".*
- *"**From customers**' point of view, interoperability is the ability to use the Electric Vehicle Charging Infrastructure wherever it is located, whichever EV the customer uses, whoever operates the charging Point. To meet these customer requirements, the ecosystem has to provide features that can be segmented in four groups:*
  - *Charging points technical features (authentication media, plug and socket compliancy …)*
  - *Charging points functional features (markings, how to use …)*
  - *System (system interconnection, data exchanges …)*
  - *Business & legal features (roaming agreements between operators ...)".*
- *"**From an operator** point of view, interoperability is the ability of an e-mobility service provider to deliver its own services (search and find, charge, book, etc.) to its customers, using the infrastructure of any charging operator under the umbrella of a B2B (business to business) relationship at negotiated prices*".

#2 COMMON MINIMUM RULES ON INFRASTRUCTURE

Main topic: interoperability and roaming

- **There is the need to ensure a "first level of interoperability"** ***(mapping & ad hoc pa.)***
  - set up **National official databases** for publicly accessible EV recharging points.
  - It is mandatory that **electric vehicle users can recharge on an ad hoc basis** without entering into a contract with the electricity supplier

- **Pre-arranged contracts and related roaming functionalities are a "premium" solution for final users**
  - Reservation, flat tariffs, special discounts, fidelity programs, other "Mobility services" (vechicle sharing, vehicle rental, integration with TPL, info-traffic,…), Demand Response or V2G functionalities.

- **It will be interest of e-mobility service providers to look for an agreement on roaming**

Interoperability

Definition given by the e-Moticon project :
"*a characteristic of a product or system, whose interfaces are completely understood, to work with other products or systems, present or future, in either implementation or access, without any restrictions*". The definition deals with two main levels (two "main domains"):

- The "*technical level of interoperability*" focuses on the physical charging infrastructure (connectors and plugs), on the access to the E-CS, such as the authorisation and the payment, and on the access to the E-CS information from the distance.
- The "*systemic level of interoperability*" with the five steps described in Part B – Business models analysis: finding, informing, reservation, payment, and roaming.

EV CHARGING STANDARDIZATION

- CEN-CENELEC eMobility Coordination Group from 2010
- IN 2014 Directive 2014/94/EU concerns “electric recharging points for motor vehicles”, topic which is of particular interest of the eM-CG.
- In March 2015, CEN and CENELEC received a standardization request (M/533 - Commission Implementing Decision C (2015)330) on the implementation of the above directive 2014/94/EU. The coordination of the 'electric supply' part of M/533 has been allocated to the eM-CG.

STATE-OF-THE-ART FOR THE PLUGS AND CONNECTORS

3 basic options for recharging an electric vehicle:

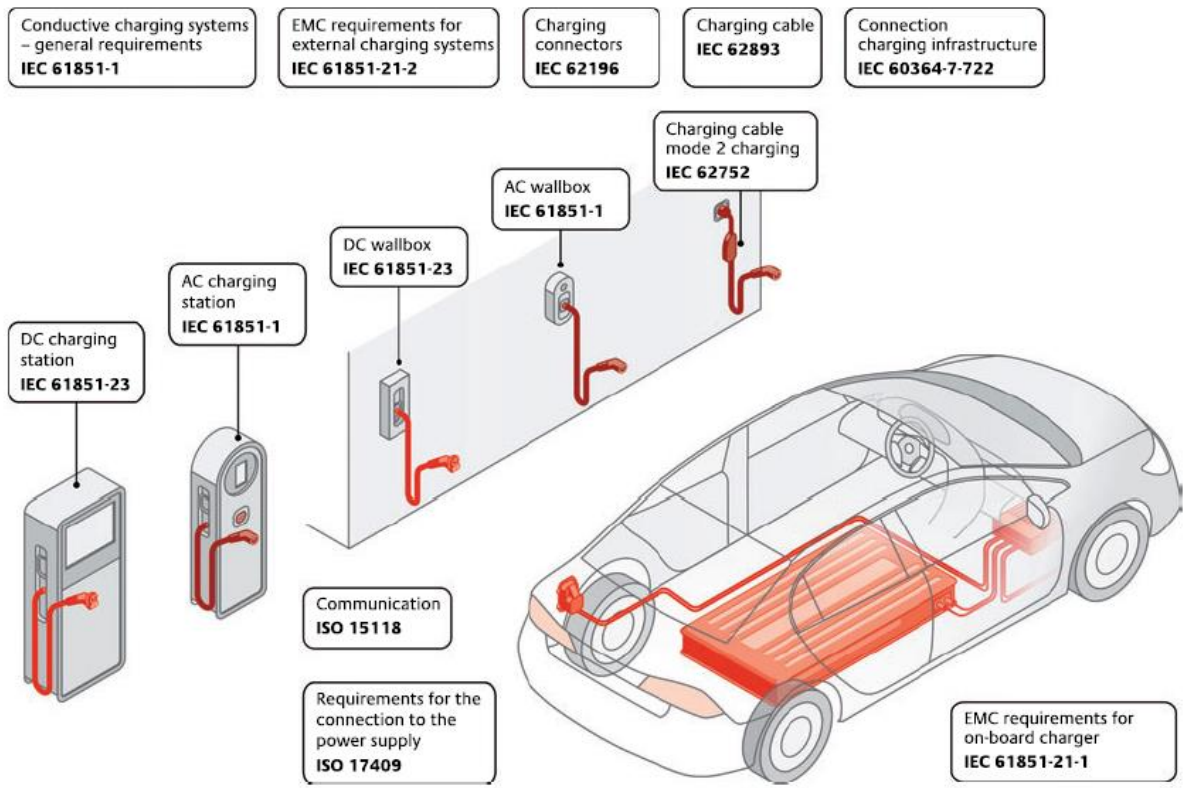
- **wired** →
- wireless by means of induction,
- by swapping its batteries.

For wired charging, two options :

- **AC-Charging** with alternating current (AC) is used for conventional and semi-fast charging at homes and offices, and at the majority of public recharging stations.
- **Direct current** (DC) is used for fast charging

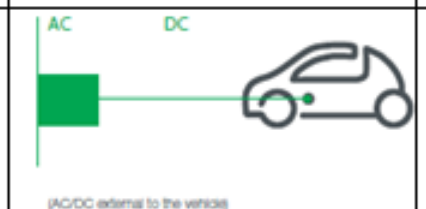
State-of-the-art for the plugs and connectors

Standards for the wired charging of electric vehicles (Nationale Plattform Elektromobilität 2017)



State-of-the-art for the plugs and connectors

Charging modes

Charging Modes		Description
Mode 1		• an AC charging method from household socket/outlets • Supplying circuit shall be provided with an RCD
Mode 2		• 1, 2 or 3 phase charging with AC up to 32 A • Charging cable is equipped with an in-cable control box (IC-CPD) which includes control and safety related functionalities such as restriction of the charging current • IC-CPD provides extended safety functionalities as mode 3
Mode 3		• AC supply from a dedicated EV socket-outlet or connector • 1, 2 or 3 phase charging with AC up to 3x63 A or 1x70 A • Extended safety functionalities ◦ Continuous protective earth conductor continuity checking ◦ No proper connection, no voltage • Extended control possibilities (e.g. controlling the • charging current) • Feeding back electricity from V2G.
Mode 4		• DC charging from an external charger • Fixed charging cable in a charging station • Enables flexible and controllable charging with 50 kW (future developments up to 150 -350 kW).

STATE-OF-THE-ART FOR THE PLUGS AND CONNECTORS

Charging modes & plugs

Charging modes	Plug/connector (standard)	Illustration	Characteristics	
Mode 1	Schuko (IEC 60884)		Non dedicated power socket Power (AC) : Nb of phases: Imax: Vmax: Nb of pins:	 2- 3,7 kW single phase 10A /16A 220 V 2
Mode 2	Schuko (IEC 60884)		Non dedicated power socket Power (AC) : Nb of phases: Imax: Vmax: Nb of pins:	 2- 3,7 kW single phase 10A /16A 220 V 2
Mode 3	Type 1 (IEC 62196-2)		Power (AC) : Nb of phases: Imax: Vmax: Nb of pins:	3 – 7 kW Single phase: 32A 250V AC 5
	Type 2 (IEC 62196-2)		Power (AC) :Nb of phases: Imax: Vmax: Nb of pins:	3,7 – 43 kW Single phase/Three phases up to 70A / 63A 250V AC / 480V AC7
	Type 3A (IEC 62196-2)		Power (AC) : Nb of phases: Imax: Vmax: Nb of pins:	3.7 kW Single phase 16A 250V AC 4
	Type 3C (IEC 62196-2)		Power (AC) : Nb of phases: Imax: Vmax: Nb of pins:	3,7 – 43 kW Single phase/Three phases 16A , 32A, 63A 250V /480V AC 7

Charging modes	Plug/connector (standard)	Illustration	Characteristics	
Mode 4	CCS - Combo 2 (IEC 62196-3)		Power (DC): Imax: Vmax: Communication protocol:	50 kW DC (future system: up to 350 kW) up to 125 A up to 850V DIN 70121
	Chademo (IEC 62196-3)		Power (DC): Imax: Vmax Communication protocol:	50 kW DC (future system: 150 kW) up to 125 A up to 500 V DC CAN

STATE-OF-THE-ART FOR THE PLUGS AND CONNECTORS

Charging times

Charging time for 100 km of BEV range	Power supply	Power	Voltage	Max. current
6–8 hours	Single phase	3.3 kW	230 V AC	16 A
3–4 hours	Single phase	7.4 kW	230 V AC	32 A
2–3 hours	Three phase	11 kW	400 V AC	16 A
1–2 hours	Three phase	22 kW	400 V AC	32 A
20–30 minutes	Three phase	43 kW	400 V AC	63 A
20–30 minutes	Direct current	50 kW	400–500 V DC	100–125 A
10 minutes	Direct current	120 kW	300–500 V DC	300–350 A