Standards for Electrical Vehicle

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because anticipation matters

Pierre Malaterre

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A few facts on Electrical Vehicle

- In the future we must overcome the problems of petroleum disappearance and greenhouse gas creation
  - Road vehicles create 11% of greenhouse gas
- Nevertheless Electric Vehicle (EV) will be a solution for both problems
- Urban vehicles seem to be the first target
  - they can help to solve problems of: pollution, traffic jam, parking …

Electrical Vehicle power needs

- Usual vehicle 1200 Kg S 2m²Cx 0,3
  Fr 8,5 daN/tonne

Needed power in kW:

Vehicle speed km/h	30 km/h	50 km/h	90 km/h	130 km/h
Rolling power	0,8 kW	1,4	2,5	3,6
Aerodynamics power	0,2	1	5,6	17
horizontal	1	2,4	8,1	21
5% Climb	4,9	8,2	15	21
Total	6	11	23	42 kW

Power and Energy comparisons

- Engine power 10 to 40 kW
- Energy 60 to 300 Wh/km
- Range about 100km
  - 5 liters of fuel
  - 50 kWh
- 5 liters in a tank in 1min is same as loading a battery with a power 3 MW
  - or 5kW in 10 hours
- Forgetting battery technology : we have a problem with power network

Specifics problems for Electrical Vehicle

- Type : Probably urban
  - personal car , rental car , fleet,multi user/self service…
- Medium range 100 – 150 km
- Battery load 30mn to 15 H
- Charging Station :Where?
  - At home
  - In the street
  - In parking

Why do we need standards for EV?

- Economic : substantial cost savings by using the same components and systems
- Interoperability: it seems mandatory above all in Europe ➔ Every EV must be able to charge the battery everywhere even in an other country
- Framework : Regulations probably will use standards as technical constraints
- Security issues

What kind of standards ??

- Same set as thermal engine vehicle
- Electromagnetic compability EMC
- Batteries : Load, size, recycling
- Security for high voltage
- Charging station (and smart Grid!!)
- Communication between vehicle and outside
  - Service, payment, electronic charger control, security of transactions …
- *EV lack of specialized standards ???*

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Organisms involved

- TC69 TC57 TC69/WG4
- TC22/SC3 and TC21
- JWG V2G CI

ISO+IEC

- EU Mandat
  - Will use ISO IEC works

European Committee for Standardization
Comité Européen de Normalisation
Europäisches Komitee für Normung

CENELEC

ETSI World Class Standards

- USA
  - few recommended practice ready

SAE International

- Japan (JISC), China (SGCC)

International Telecommunication Union

Working groups involved

ISO TC22/SC21
Standard ISO 12405,

IEC TC69/WG4

IEC 62196-1
IEC 62196-2
SAE J1772
IEC 61851

ISO TC22 SC3 WG1 et **TC 204 JWG ISO/IEC V2G-CI**
Norme ISO 15118

ISO TC 204

ISO TC 22/SC3/WG1

General purpose standard-1

- Automotive side :
  - Brake, power, Energy consumption, Frontal impact, Side impact, recyclability,Functional security ….
  - A few hundred of well known standard developed in ISO TC22
- Charging system and smart Grid
  - Industrial Connectors
  - Safety risk and EMC (see EU directive 2006/95EC and 2004/108/EC)
  - Fusing and Switching devices

➔ Mostly developed in IEC TC64 and TC 57

General purpose standard-2

- Communication EV-Charging station – Smart Grid
  - Customer identification, payment, services, charging system control,
- A lot of standards developed into ISO, IEC, ITU and also standardization EU and national bodies CEN CENELEC ETSI
- Problems to solve (view by final customer)
  - Same system for everybody
  - Simple and low cost
  - Support all services

General purpose standard-3
Special view on EMC

- Electric motor and charging system mostly use DC switching technology
- High power switch generates EMC (Electromagnetic compatibility) perturbation
- Exists several standards usable
  - IEC/EN 61000 family Electromagnetic compatibility
  - CISPR EN 55011 Industrial EMC
  - ISO 10605 Test method
  - ISO 11451 Vehicle test method (family)
  - ISO 11452 Components test method
  - IEC 61204 Power suplly EMC
  - …….all that is necessary is already existing

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Standards for charging station

- ISO and IEC are working since 2 years
- SAE has published a recommended practice in January 2010
- And also
  - Japanese Industrial Standard JISC
  - Smart Grid Corporation China SGCC
  - Defacto standards from Chademo,EV Plug alliance …
- EU Mandates (M/468) CEN CENELEC and ETSI to propose standards for Charging station-EV

Charging station standard

- IEC 61851defines the specifications
- 4 modes (power)of charge
- Output versus vehicle mono tri phases AC or DC
- Data link between vehicle and station
- The levels presently considered in Europe are:
  - 16A 230V = up to 3,7 kW depending on connector ratings (see later)
  - 32 A 230 V = up to 7,4 kW
  - 16 A 400V 3 Phase = up to 11 kW
  - 32 A 400V 3 Phase = up to 22 kW
  - 63 A 400V 3 Phase = up to 43 kW
  - DC charge = up to 86 kW (all intermediate values are also possible according to the 61851-1)

Station Connectors

- IEC 62196 define a set of 3 connectors and theirs use cases. The work is quite finished
- The SAE J1772 connector is defined since one year. Its usage is mandatory in some US State. One of the IEC62196 is close to SAE definition

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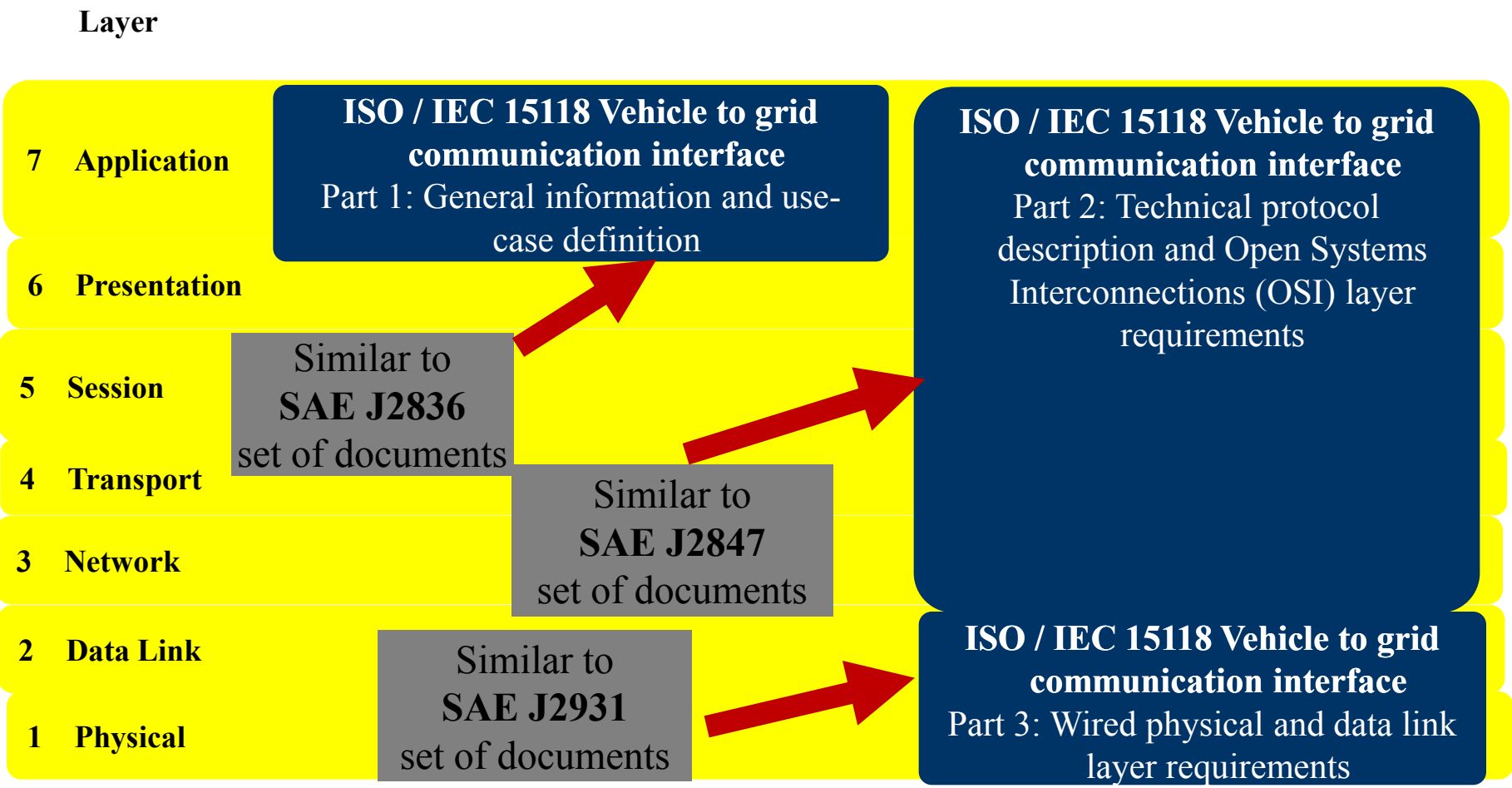
Communications

- ISO IEC work in a JWG V2G CI on ISO 15118
- SAE works on SAE J2847
- Telecom industry has its own idea and competition is hard,this subject is the key
- All the work is late

Communication V2G ISO/IEC — SAE



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VE and Charging station in Europe

- CEN CENELEC ETSI are in charge
- First decision use IEC 61851, IEC 62196 et ISO15118
- Report to commission Mars 2011
- focus group responsability
  - PT1: terminology
  - PT2: connectors
  - PT3: batteries
  - PT4: communication and liaison with smart grid
  - PT5: charging modes and associated safety conditions
  - PT 6: regulations and standards
- Interoperability concerns the following points:
  - connector footprints (PT2)
  - charging modes used in public or private locations (PT5)
  - basic electric signals required to initiate or control the charging (PT5)
  - vehicle communication, payment systems and compatibility with the smart grid (PT4)

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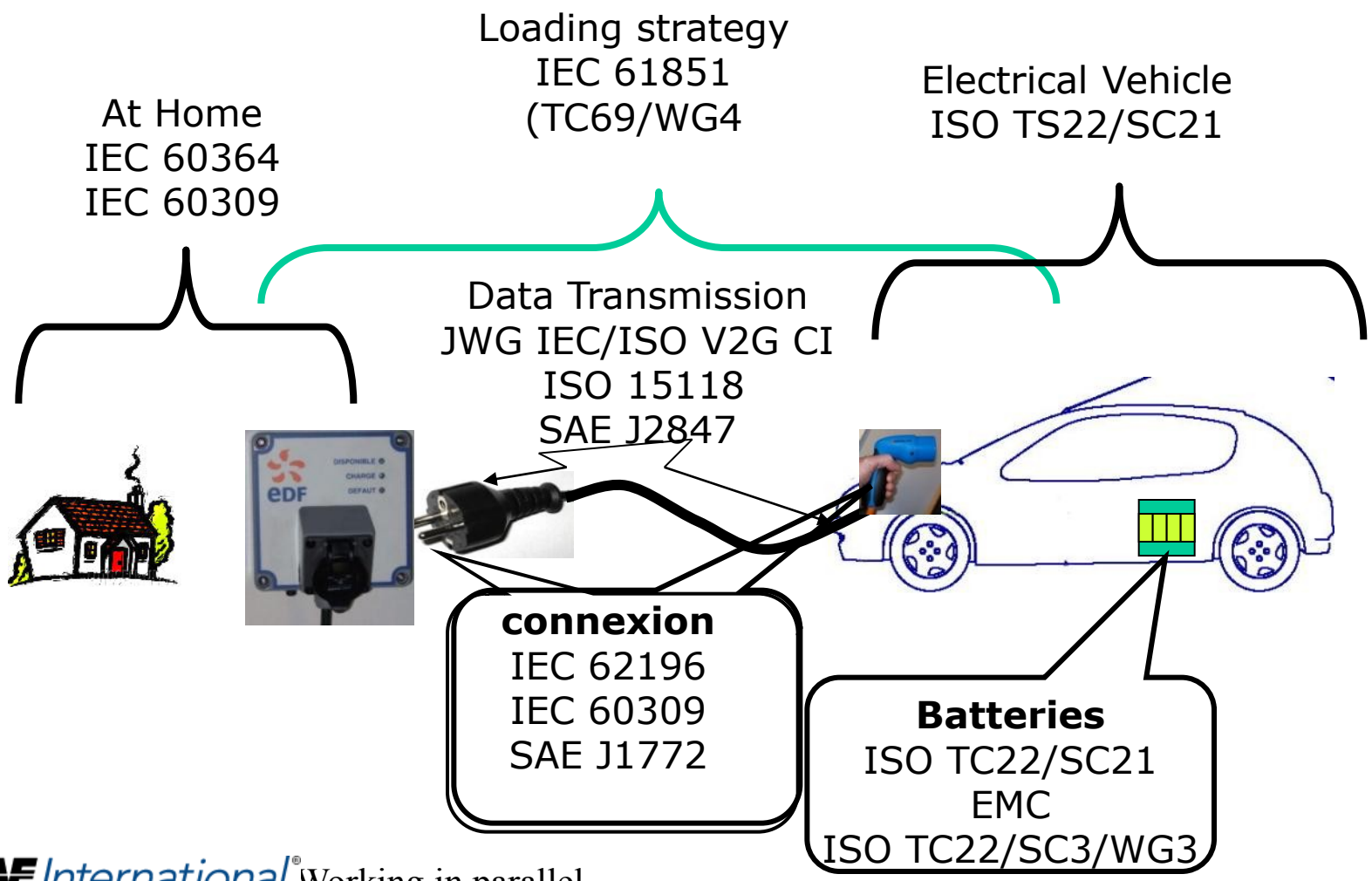
Summary Charging station –VE standards



SAE International® Working in parallel

Thank you for Attention

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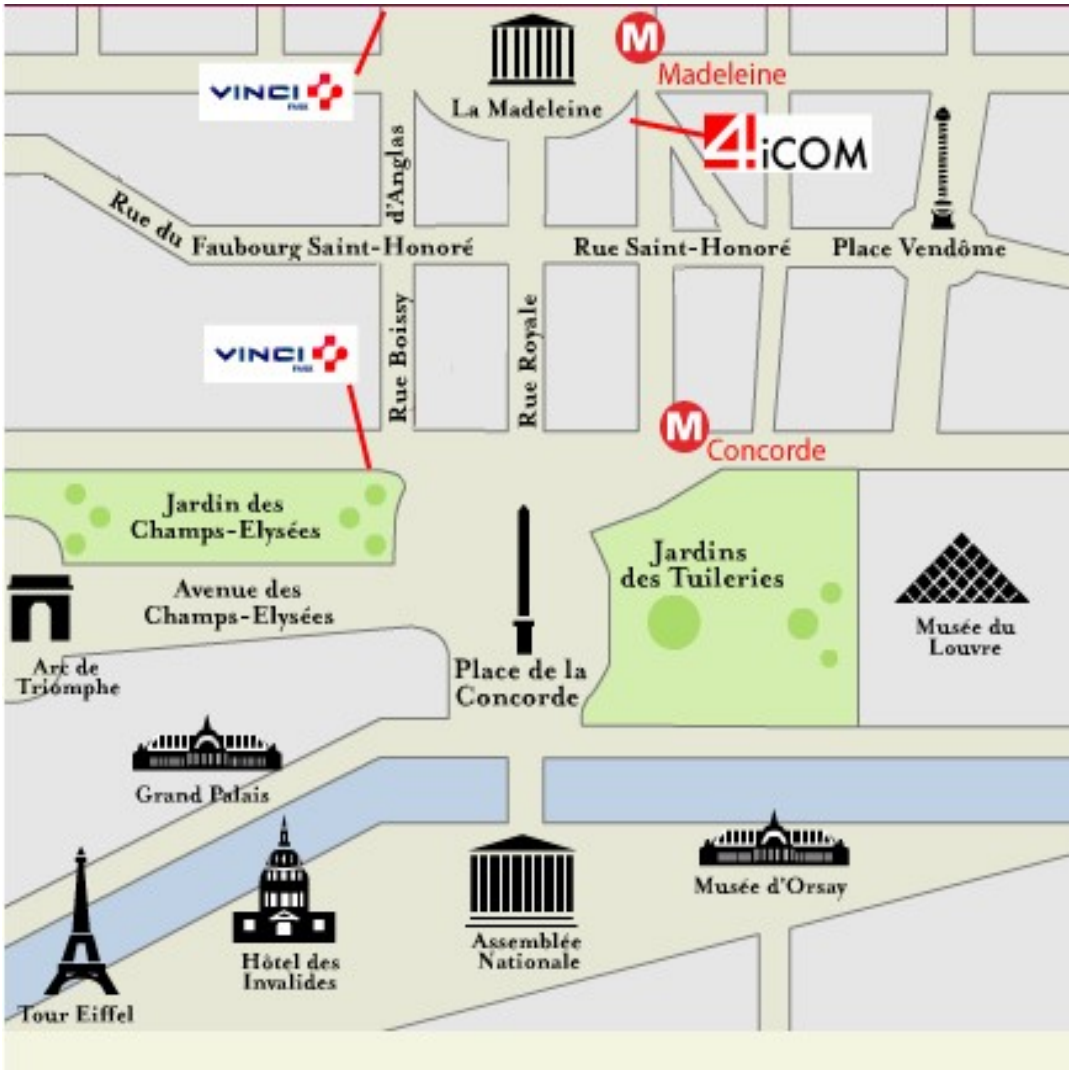

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"BACKUP SLIDES"

For interested people people-1
a few standards

- Batteries Safety
  - EN1175, EN 50272,J2464
- Batteries Test
  - ISO 12405,ISO6469,IEC61982,J1495
- Charging Station
  - **IEC61851**, EN50275
    - Safety IEC62040
    - Connector **IEC 62196, J1772**,IEC 60309,
    - Earth residual current IEC 62335

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For interested people people-2
a few standards

- Communication
  - **ISO/IEC 15118**, ISO/IEC 74198,
  - ISO/IEC 121391,ISO 15764
  - J2293, J2487,J2836
- Safety/worker Protection
  - EN 1987, ISO 6469, IEC 60073
  - IEC 62040, J2344, UL2231
- Functional Safety
  - ISO 26262

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For interested people people-3
a few standards

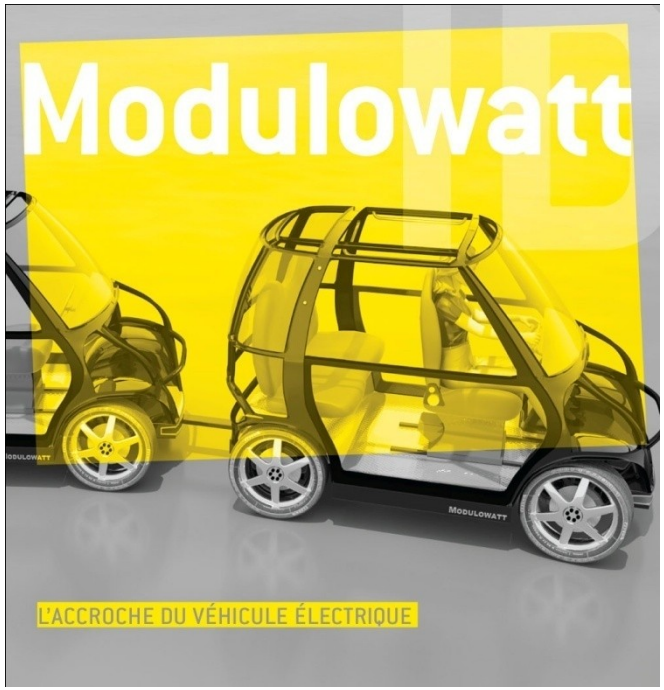
- EMC
  - ISO 7637, ISO 10605, ISO 11451,
  - ISO 11452, IEC 61000, J1113
- Environmental conditions
  - ISO 16750, IEC 60811
- Vehicle performance
  - ISO 8715,ISO 23274,J2841,ISO 12405

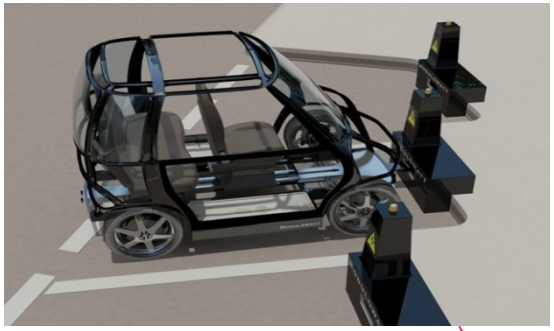
Introduction of 4icom's activities

- Our business: Innovation
- Three main activities :
  - Strategic analysis, prospective, technology monitoring
  - Project management
  - Business Development
- Main fields : Mobility, Urban mobility, road charging, automotive, IT, electronics, monetics, electric vehicle, Digital mobility (mobile content, mobile banking, mobile payment, geolocalisation, NFC, etc),
- Paris, Beijing, Bangalore
- Set up in 2000, independent company

Introduction of 4icom's activities

- AMARE project - www.modulowatt.org





Partners : PSA Peugeot Citroën, Aixam, DBT, Valeo, Inria and **4icom.**

4icom is the PMO project and standardisation leader

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