



The 27th INTERNATIONAL  
ELECTRIC VEHICLE  
SYMPOSIUM & EXHIBITION  
BARCELONA  
17th-20th November 2013

**ENEVATE**  
European Network of Electric Vehicles and Transferring Expertise



Accelerating E-Mobility

# Accelerated Introduction of Electric Vehicles in North-West Europe

## ENEVATE: Project Lay-Out and Results

Dr. Kord Pannkoke

Matthew Lumsden

Huw Davies

Edwin Bestebreurtje

Harm Weken

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## ENEVATE – Accelerating E-Mobility

### European Network of Electric Vehicles and Transferring Expertise

- Introduction of ENEVATE
- Electric Vehicle Supply Chain Management dr. Kord Pannkoke - Bayern Innovativ
- Sustainable Energy Supply Infrastructure Matthew Lumsden - FTS
- Market Drivers & Mobility Concepts Huw Davies - Cardiff University
- Pilot experiences
- SWOT & Policy Recommendations Edwin Bestebreurtje - FIER Automotive
- What's next: ENEVATE 2.0 Harm Weken - EASN

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## Why a NW-European Networking Project on E-Mobility?

- Most regions spend large public funds on EV & E-Mobility programs, pilots & stimulation → **with no learning effects over the regional borders**
- Europe is scattered in strategy, programs and implementation.
  - ✓ The competition comes from China, Japan and even US
  - ✓ With a much more coherent approach
- Integral approach is absent. On national, regional and city level
- User acceptance is the question mark. Should be driver for mobility concepts and industry development
- The many promising SME companies working on EV, are not to be found by the Vehicle Manufacturers
- Electric energy / infrastructure & automotive are historically isolated from each other



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## ENEVATE aims to

facilitate and support an accelerated and well informed introduction of electric mobility in North-West Europe through **structured trans-national co-operation** between public authorities and business representatives.



And at same time to **boost innovation and competitiveness** of the rapidly developing electric vehicle sector in NW Europe.

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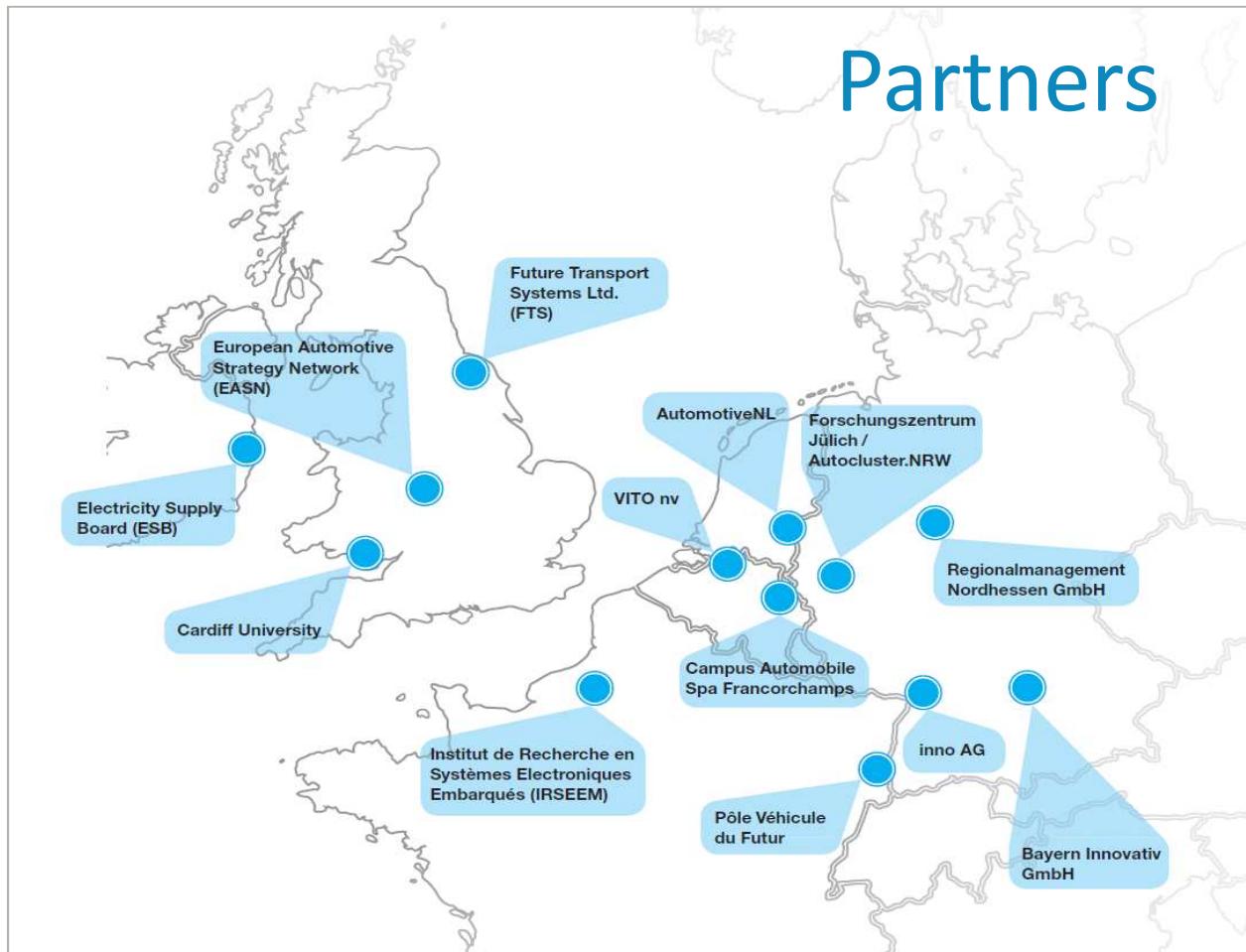
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## Partners



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# Work Packages



## Electric Vehicle Supply Chain Development

Lead: AutoCluster.NRW, GER



## Sustainable Energy supply infrastructure

Lead: Future Transport Systems, UK



## Market drivers and mobility concepts

Lead: Cardiff University, UK



## Pilots

Lead: Automotive NL



## Enabling / Innovation Accelerator

Lead: Bayern Innovativ, Regionalmanagement Nordhessen, GER

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## Work Packages and Results



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## Electric Vehicle Supply Chain Development

WP1



Lead: AutoCluster.NRW, Germany

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## Methodological approach with following steps

WP1.1	Analysis of the conventional supply chain
WP1.2	Technical analysis of electric vehicles
WP1.3	Conception of a supply chain for electric vehicles
WP1.4	Comparison of ICE and BEV supply chain
WP1.5	Validation of findings
WP1.6	Database generation and analysis of the European BEV competencies map
WP1.7	International benchmark to leading regions
<p><b>Analysis report</b></p> <p><b>Online portal</b> for the EV industry and related sectors</p> <p><b>Training sets</b> for target audiences on EV technology and supply chain</p> <p><b>Information packages</b> for target audiences on EV technology and supply chain</p>	

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## Upstream Value Creation Process



**The valued added distribution will change significantly and makes a change in the minds of OEMs and suppliers mandatory:**

- A BEV comes along with ~63 % more value added. Especially suppliers of battery cells and systems profit.
- Around 75 % of the ICE drivetrain production value is falling away.
- The product portfolio of suppliers may be endangered and makes a deeper analysis of the future compliance with the electrified drive trains necessary.



**A make or buy analysis for all BEV components gives an insight on the future task sharing – but multiple strategies will be seen in the next years:**

- OEMs will most likely focus on brand shaping and strategic relevant components.
- Attractive chances for suppliers are shown in interchangeable components and systems.



**Often, xEV & ICE vehicles will be produced on the same flexible production lines.:**

- Therefore the same process structure will be applied, but experience in the supply relations needs to be build up especially within the electronics industry.
- Sophisticated know-how in production technology is therefore a strategic asset for OEMs.

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## The BEV and ICE value chain differ significantly and will change in future...

#### ENEVATE Approach

#### North West Europe (NWE)

- Comp. A / UK
- Comp. B / Ireland
- Comp. C / France
- ...



In whole North West Europe more than 900 companies are active in the automotive industry, but distributed over many locations.

**There are competencies all over Europe as basis for a strong EV supply chain.**



Source: Database - [www.enevate.eu](http://www.enevate.eu)

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#### ENEVATE Approach

##### North West Europe (NWE)

Comp. A / UK
Comp. B / Ireland
Comp. C / France
...



In whole North West Europe more than 900 companies are active in the automotive industry, but distributed over many locations.

##### Systematic Determination

Kompetenz	Fachgebiete						
	Gesamtbauung	Exterior	Komfort	Climate	Motor & Antrieb	Elektrik & Elektronik	Innenraum
Forschung & Entwicklung	X						
Technik und Validierung		X	X				
Kundenentwicklung	X						
Großserienfertigung					XX		
Vertrieb & Marketing					X		
Service & Reparatur					X		
Recycling							

The competencies of all identified companies have been systematically determined for each field (electric motor, suspension ...)

##### Database Analysis

>900 companies

EV supply chain  
database

The EV supply chain database allows a 'white spot analysis' for competencies in each region

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## ENEVATE Approach

## Evaluation

There are competencies all over Europe as basis for a strong EV supply chain.

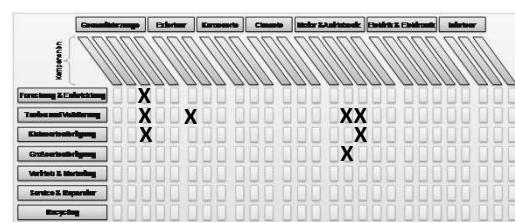
### North West Europe (NWE)

Comp. A / UK
Comp. B / Ireland
Comp. C / France
...



In whole North West Europe more than 900 companies are active in the automotive industry, but distributed over many locations.

### Systematic Determination



The competencies of all identified companies have been systematically determined for each field (electric motor, suspension ...)

### Database Analysis

>900 companies  
**EV supply chain database**

The EV supply chain database allows a 'white spot analysis' for competencies in each region

Each separate region doesn't cover all competencies required to build a BEV. **The white spot analysis shows the lack of competencies and capacities in the regions.**

Research and Development		Fully covered
Testing and validation		Fully covered
Manufacturing (Low / High volume)		Nearly all important BEV components are available within NWE
Reuse & Recycling		Recycling for electric components is a white spot

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## Exemplary recommendations for action:

Policy  
Makers



- Improve networking of industry across all sectors
- Support of know-how transfer from research and development to market ready products

Vehicle  
Manufacturers



- Develop the fitting vehicle for the **current and future customer requirements**:
  - ✓ BEV are especially suitable for **vehicle fleets** driven in inner cities. This includes light commercial vehicles.
  - ✓ PHEV are the fitting technology solutions for customers with an additional demand for **long distance drives**.

Vehicle  
Suppliers



- Orientation towards **the right strategic business partner**, since the supply chain structure will change over the next years with increasing volumes.

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All actors need to set the right course to establish  
a strong electric mobility value chain.

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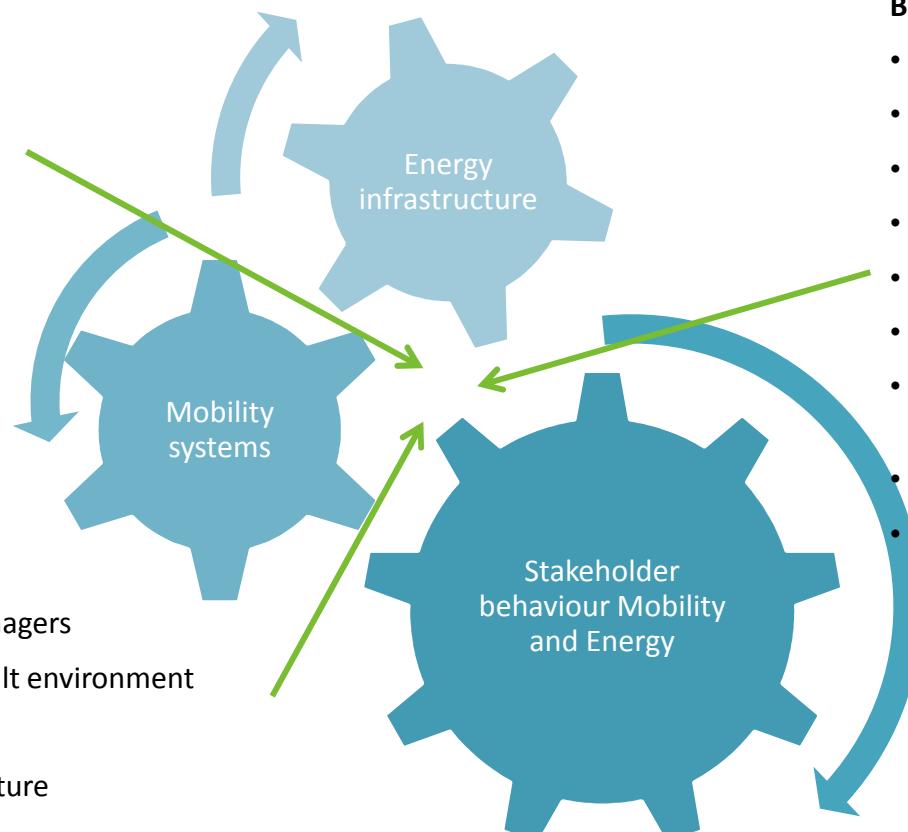
## Future Transport Systems

### Connecting systems

- EV charging
- Vehicle 2 Grid (mobile storage)
- Energy storage (static storage)
- Energy management system integration
- Grid support – micro & macro
- Intelligent, integrated mobility management

### Behavioural influence

- Vehicle purchasers
- Drivers and fleet managers
- Inhabitants of the built environment
- Facilities managers
- The role of infrastructure
- The role of experience
- Interaction, knowledge, communication



### Business models

- Managed charging
- Demand response
- Electricity trading
- Time of Use tariffs
- Local network management
- Multi-stakeholder value streams
- Fleet management – facilities management
- Car clubs
- Multi-modal mobility

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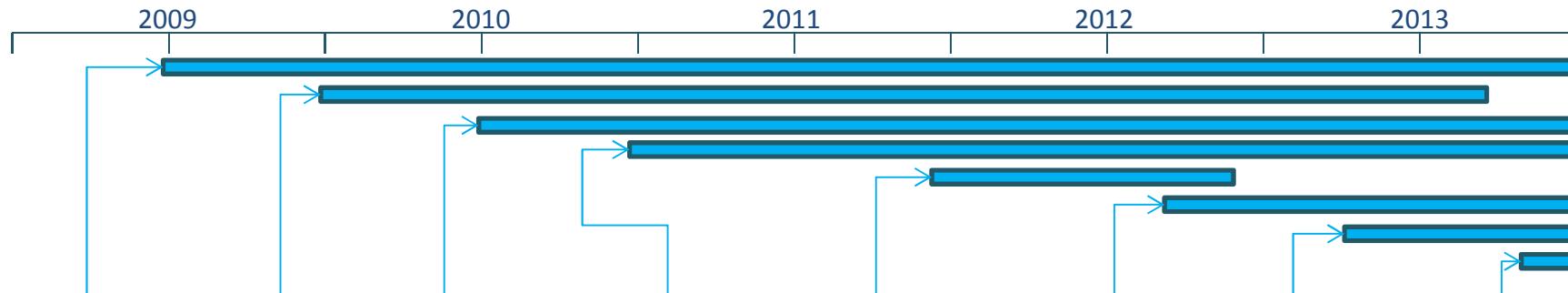


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## Typical projects



Name	Regional strategies	SWITCH EV (TSB)	ENEVATE (EU Interreg)	EVALU8 (OLEV – PiP)	Infras'ture partnership	V2G	Managed Charging	Everest (DECC)
Partners/clients	Various UK regions	Nissan, SEV, Peugeot, Newcastle Uni, AVID	Partners in UK, NL, GR, B, IR, F	Herts Uni	Major Industrial Blue Chip	4 UK Distribution network operators	Major global energy company	Automotive supply chain
Value	£250k	£10m	€5m	£7.5m	£100k	£2.5m	Confidential	£3.6m
Objective	Develop EV charging network & e-mobility strategies	Flagship TSB vehicle trial 43 vehicles, 24 months	Researching EU EV infrastructure landscape, developing tool kit	East of England Plugged in places EV charging network	Commercial partnership to develop and operate EV charging network	Develop V2G conversion feasibility and trial	Create sophisticated managed charging trial within UK, US and Germany	Develop and trial unique energy storage concept

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## Why develop the ENEVATE Tool Kit?

- Many EV infrastructure and e-mobility pilot projects
- Little sharing of knowledge
- E-mobility is still in the R&D phase we need to work together
- A big knowledge differential



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## The development process

- Insights from parties climbing the learning curve
- Borrowed their tools
- Combined their experience
- Created a Tool Kit guidance document
- Passed it on
- Trialled on several projects



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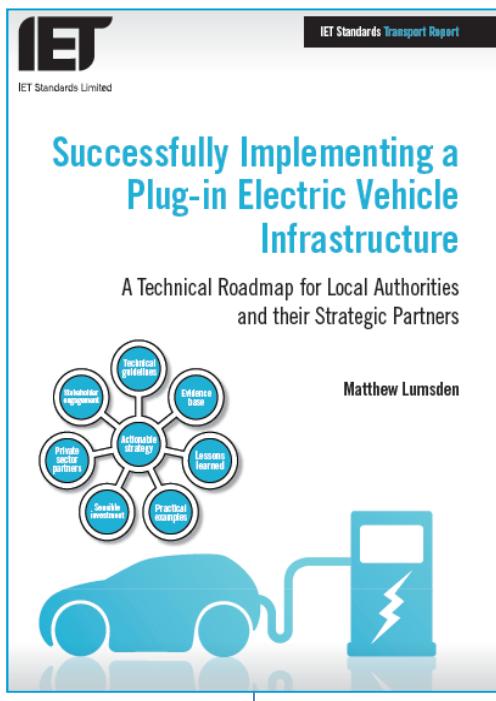
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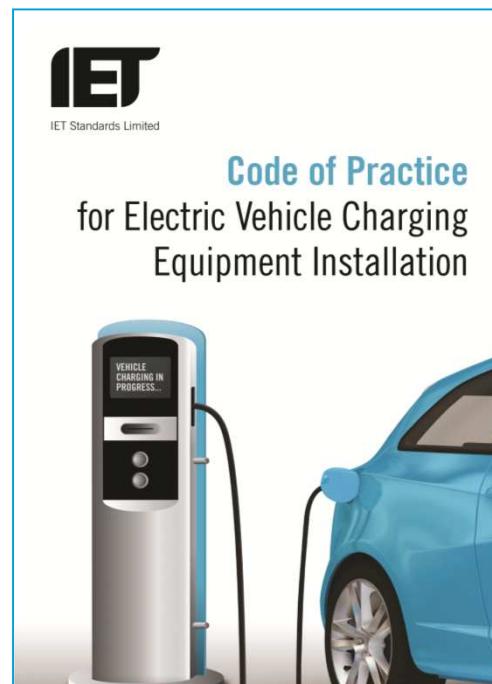


Technical & strategic  
background information

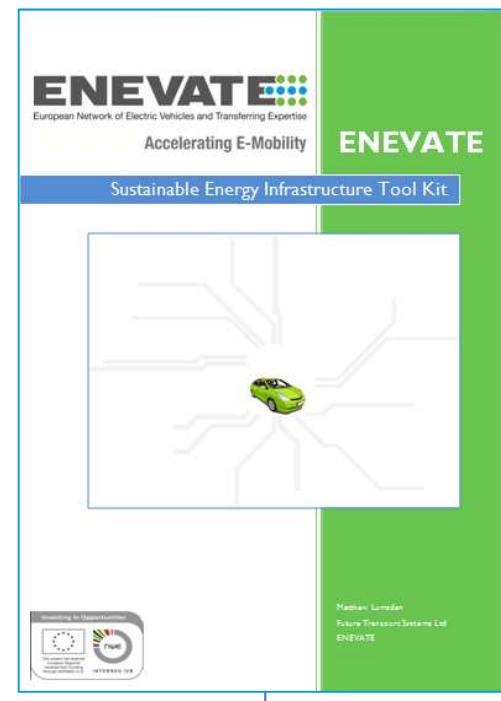


## Part of a set of documents

Detailed technical guidance on  
charge point installation



Key components of the development and  
implementation process



Bespoke workshops

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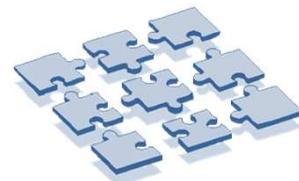


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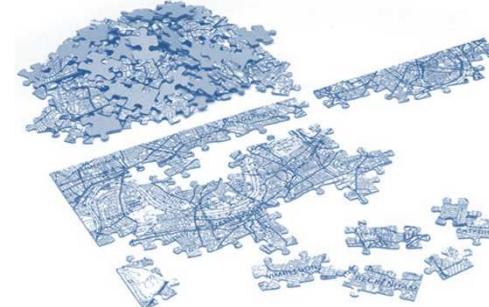
## Structure



Strategy & design



Planning



Implementation



Operation

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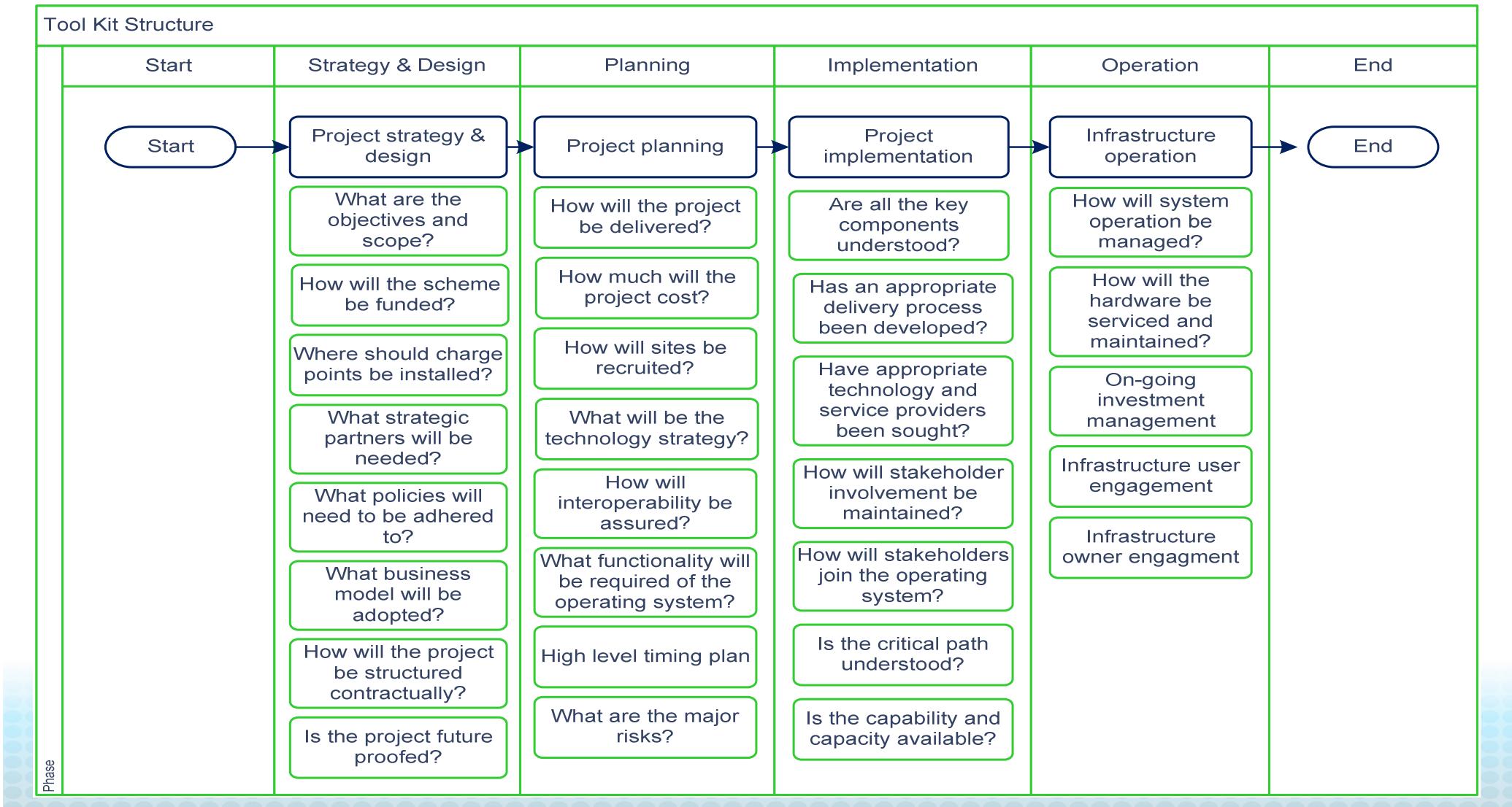
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## Tool Kit Structure



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### Sustainable Energy Infrastructure Tool Kit

Work Package 2 working document

**City centre**

**C123**

**A123**

Other  
Mobile  
Air ducts  
- these  
common  
with a ro-  
adster  
Battery  
Charger  
a large  
increased  
risk of  
conven-  
tional  
high  
induced  
risk to a  
cover of  
mounted  
a compo-  
nent  
and  
systems  
manufactur-

**5.3 Applicable standards**  
A number of standards are applicable or under development for IEC 62196-1/IEC 62199, mentioned here:  
 IEC 62196-1/IEC 62199 – 12.4. plus, socket-outlets, adaptors and connec-  
tors-outlets 12.4. fused duct.  
 IEC 62196-2/IEC 62199 – 12.4. plus, socket-outlets, adaptors and connec-  
tors-outlets.  
 IEC 62197-2006 – Requirements for electrical installations. IEC 62196-  
2007 – Plus, socket-outlets and couplers for Indi-  
cators. IEC 62029-1-2007 – Plus, socket-outlets and couplers for Indi-  
cators, with or without indicator.  
 IEC 62029-2-2007 – Plus, socket-outlets and couplers for Indi-  
cators, with or without indicator.  
 IEC 61231-1-2001 – Electric vehicle conductive charging system.  
 IEC 61231-2-2002 – Electric vehicle conductive charging system con-  
ductive connection to an AC/DC supply.  
 IEC 61231-20-2002 – Electric vehicle conductive charging system.  
 IEC 62196-1-2007 – Plus, socket-outlets, vehicle couplers and elec-  
tric vehicles – Charging of electric vehicles up to 250 A, Ap. 1

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Matthew Lonsdale  
Future Transport Systems Ltd  
ENEVATE

Work Package 2 working document – UK version | ENEVATE

• main conductor (duct) is not verified and should a damaged cable or connector be used, an earth fault in a vehicle can not be detected which could cause fault of power to the user connection or contact with the vehicle bodywork. Thus, it is extremely important that users of this document ensure that the conductors are protected and insulated so the user connection and the cables are properly insulated and insulated

• a main advantage of this approach is its inherent simplicity, low cost and the ability to use existing infrastructure.

• main disadvantages are the potential for undetected faults with damaged cables etc, the increased risk of dust and soot that can be caused by using unisolated a vehicle when active charging and risk of fire due to overheating of insulation cables.

• **Mode 2 charging** (see 5 in Figure 1 above)

• protection of the electric vehicle to the AC supply network, branch lighting associated a positive-cables, self-shield or three-phase, and lighting shield, cables, and protective earth conductors together with a main earth conductor between the electric vehicle and the user on-site control box. The intermediate earth box is usually located close to the standard outlet due to constraints the length of undetected cable.

• a main advantage of this mode over mode 4 is that the intermediate box has an RCD unit in branch and also connects with the vehicle as well as the insert of the protective conductor and also with the vehicle • maximum current can drive. A number of vehicle manufacturers have limited the maximum current to 16A. In recognition of the fact that one could a 32A 16A plug and socket at its rated current for long periods can lead to overheating issues in some circumstances.

• disadvantages of this mode of charging is that there is still risk to prevent users from isolating the outlet due to a conventional extension cable. Also the reduced power outlet will result in longer charge times.

• **Mode 2 interface (see 8 & 9 in Figure 1 above)**

• protection of the AC supply cable to the vehicle, supply cables, supply equipment, control, lighting, dedicated electric vehicle, power supply, and vehicle. In this case, there is a dedicated power wire over which communications are made between the EVSE and the vehicle can be established. In this mode, the current of the conductors that connect to the EVSE can be up to 20A per phase.

• a main advantage of this mode is that the insert of the protective conductor is monitored. • communications with the vehicle must be established before an power will be delivered from the EVSE, the safety of the insert connection cable can be verified and the amount of power limited to ensure that the existing equipment is not overloaded during connection.

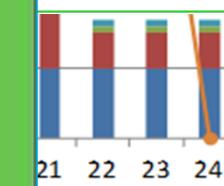
• main disadvantages is the increased complexity and cost.

• **Mode 4 interface**

• direct connection of the electric vehicle to the AC supply network. Instead, a branch line or off-board charger is the control and conductor equipment connected to the AC supply.

• this mode is applicable only applicable to DC Quick chargers and in the UK these are currently all **mode 4** compliant units for Nissan, Nissan Leaf and Ford vehicles. Mode 4 development within the UK and such developments will need to take advantage of the commercialisation of the American particularity of the American connectors, Ford and GM, who appear to be adopting a different approach.

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## Use of the Tool Kit



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