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Programme Area: Light Duty Vehicles

Project: Electricity Distribution and Intelligent Infrastructure

Title: Completion Report - Systems Integration and Architecture Development – Appendix D2

Abstract:

This project was undertaken and delivered prior to 2012, the results of this project were correct at the time of publication and may contain, or be based on, information or assumptions which have subsequently changed. The purpose of this deliverable was to develop an open architecture (ie, system design requirements) for recharging infrastructure to enable the system to be operated and managed effectively while also enabling compatibility between different business models. This is Appendix D2, providing a gap assessment on the required standards for specific interfaces within the ecosystem against those currently existing or in development.

Context:

This project looked at the potential impact of electric vehicles on the UK electricity distribution grid.

ETI EV Work Package 2.4

SP2/IBM/25 ETI EV Intelligent Infrastructure Design Standards Gap Assessment Report

Version: 2.0

SP2/IBM/25 Header Page

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Deliverable Title	ETI EV Work Package 2.4 Intelligent Infrastructure Design Standards Gap Assessment Report
Deliverable Reference	SP2/IBM/25 version 2.0

Interim or Final	Final Report

Original Due Date	17/12/10
Initial Submission Date	22/12/10

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Version	History
v.1.0	22/12/2010
v2.0	09/02/2011 Updated following ETI Review

IP Ownership	As defined in the ETI Technology Contract

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EV Intelligent Infrastructure

SP2/IBM/25
Executive Summary

Executive Summary – Intelligent Infrastructure Standards - Key Risk

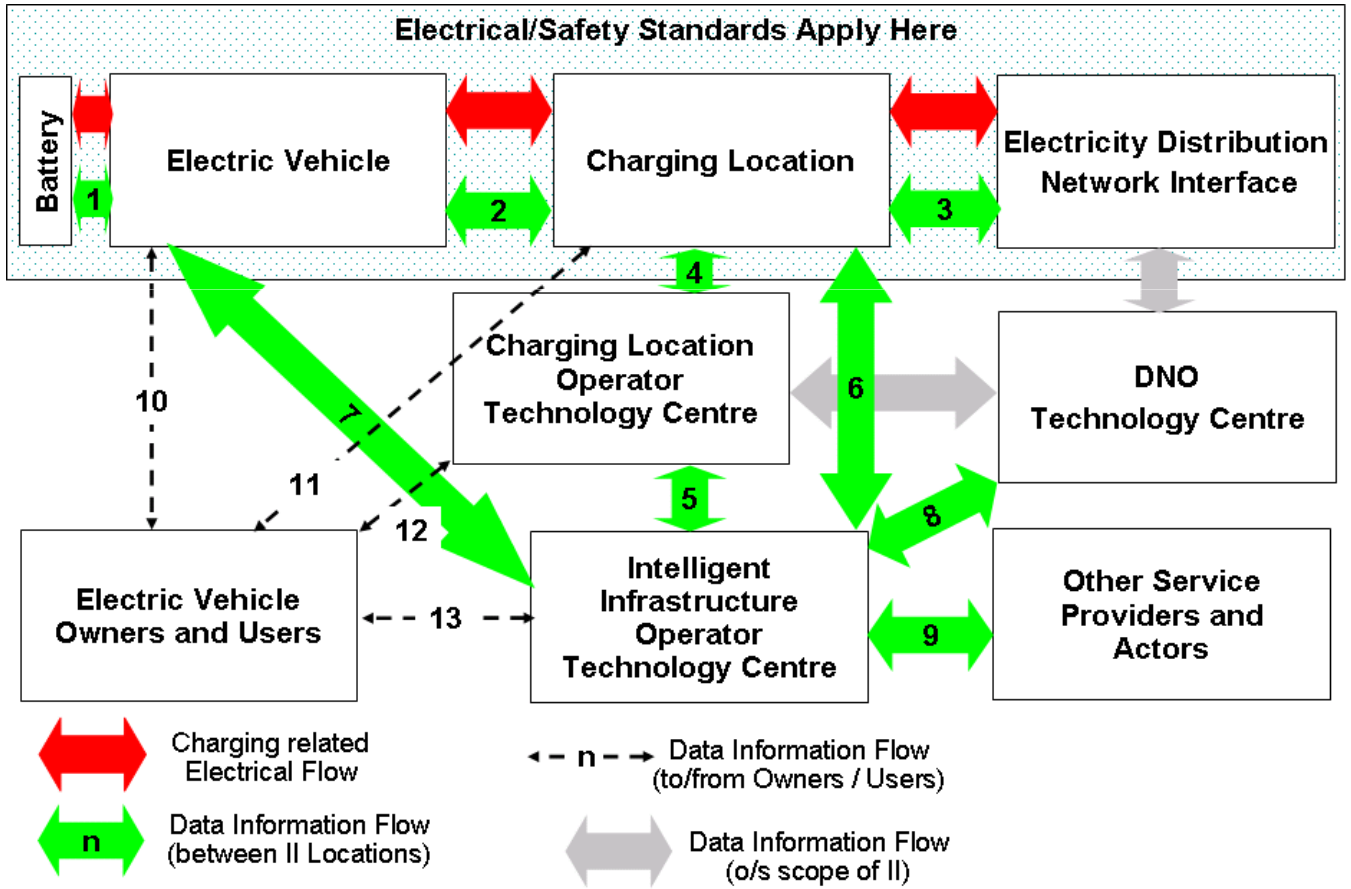
- A critical risk to the realization of the Intelligent Infrastructure, (highlighted in SP2/IBM/28), is:-

  - The failure to develop and promote standards for the Intelligent Infrastructure in an appropriate timeframe. The slow establishment of standards for the exchange of data and information between components of the Intelligent Infrastructure can delay market growth. This risk can be mitigated by using existing standards organisations, and by establishment of industry groups, coalitions or a central body.

- There is a secondary risk in this area to do with international compatibility and of the UK heading down a standards path different to that followed by others. The mitigation here is engaging internationally with relevant bodies, both political and industrial

Executive Summary – Intelligent Infrastructure Standards Key Messages (1/3)

- This deliverable underlines the need for standards in the areas of interfaces, data and information exchange and provides an initial analysis (see below). The numbered arrows in the diagram highlight where standards are required between actors /locations /components.



Executive Summary – Intelligent Infrastructure Standards Key Messages (2/3)

- Areas which are identified as a priority for requiring standards are :-

  - **EV User to/from Charge Point** (esp. Access Token, Electronic Purse, Payment Card) – to ensure universal access to Public Charging Infrastructure.

  - **Charge Point to/from the Charging Location Operator Technical Centre** (e.g. standards for reporting Charging Activity from the CP to the CLO) – to ensure interoperability of Charge Posts and Location Operators

  - **Charging Location Operator Tech' Centre to Intelligent Infrastructure Tech' Centre *and* Externally** (esp. standards relating to Settlement Activities) – to ensure availability of universal services within a country / region /international, and ease of use - 'roaming'

Executive Summary – Intelligent Infrastructure Standards Key Messages (3/3)

- Failure to develop and deploy standards for interfaces, data and information exchange, risks:-
  - incompatibility between Intelligent Infrastructure actors and locations - vehicles, charge posts, DNOs - resulting in basic system failures e.g. failure to charge or failure to bill
  - additional costs in the market which ultimately flow through to the end user and detract from the enablement of a mass market,
  - actors locked into proprietary standards and technologies, restricting universal availability of services and competition,
  - some functionalities of the Intelligent Infrastructure become impractical to provide, for example settlement and clearance and market wide availability of data and information
- Some of the standards advocated in this report are ideally needed at a Global or European Level, in particular:-
  - standards relating to interfaces between the EV and the Charge Point
  - standards relating to interfaces between the Intelligent Infrastructure Operator and External Services/other Infrastructure Operators
- ….whilst some standards can remain as UK-only standards, for example those related to interfaces to/from Electricity Distribution Network Operators.
- Electrical and Safety Standards are being considered in other sub-project work streams, principally Work Package 2.2, and have an interdependency with Interface, Data and Information Exchange Standards in terms of underlying infrastructure, but the dependency is not critical
- A multi-disciplinary body representative of Intelligent Infrastructure actors is required to start work in this area at the earliest opportunity - the Intelligent Architecture Steering Group created by the ETI – which comprises auto-makers, charging infrastructure makers, service providers and DNOs - could provide a good basis.

ETI EV Work Package 2.4

SP2/IBM/25 ETI EV Intelligent Infrastructure Design Standards Gap Assessment Report

Section 2 - Introduction

ETI EV Intelligent Infrastructure Design Standards Gap Assessment Report – Original Purpose and Objective - and Rationale for Changing

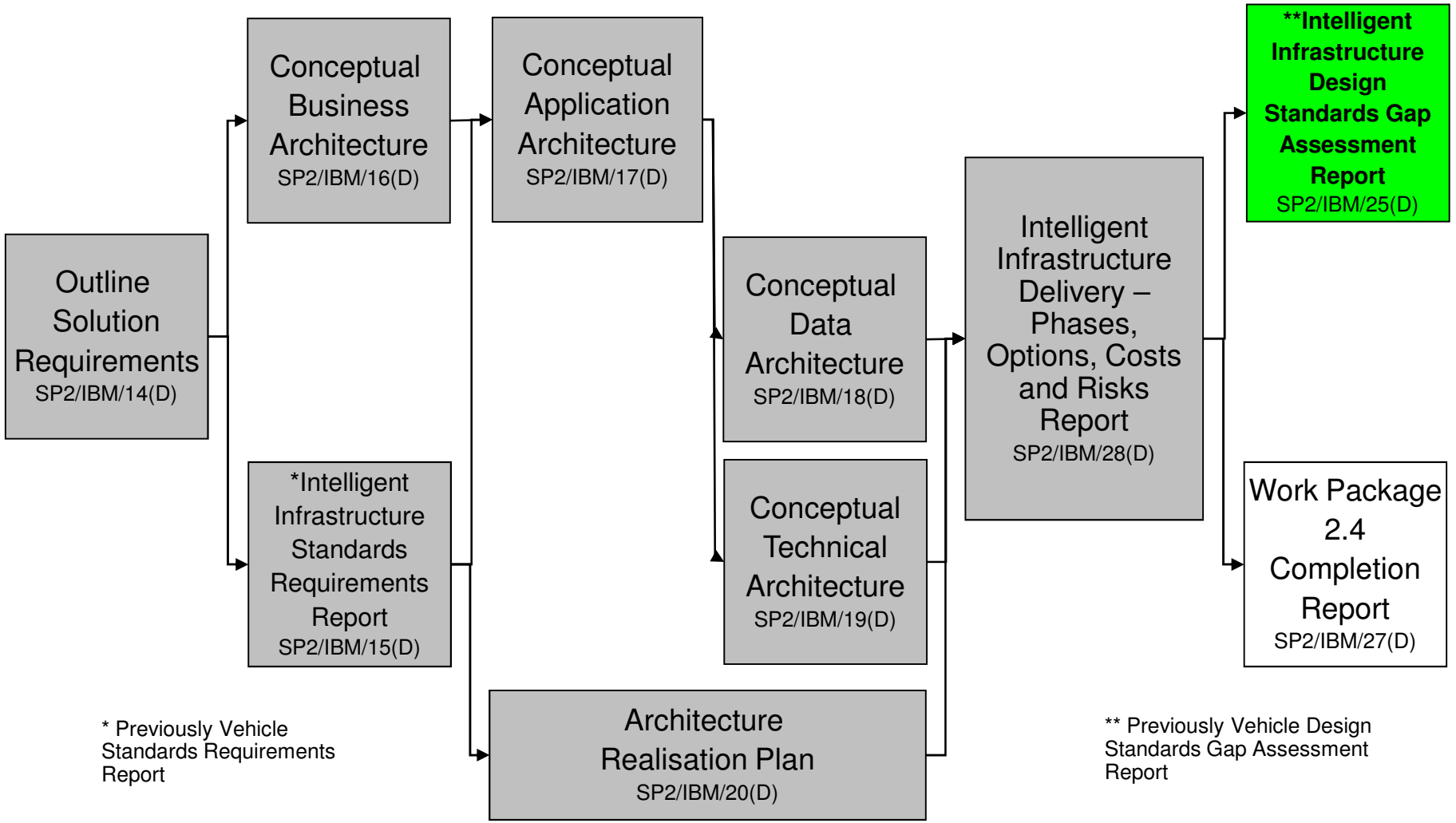
- Original Purpose and Objective (Source: Contract)
  - Inventory of current vehicle design standards
  - Gap analysis on current vehicle design standards against the requirements of the intelligent architecture. There is ultimately a dependency between this deliverable and the assessment of the future capabilities of vehicles from the Consumers and Vehicles work stream. However, the Vehicle Design Standards Gap Assessment Report can still complete its inventory of current vehicle design standards and subsequent gap analysis. Through close cooperation with the Consumers and Vehicles work stream, any early thinking can be accommodated in the Vehicle Design Standards Gap Assessment Report. Once the Consumers and Vehicles work stream has finally published its assessment, the results could be mapped to the findings of the Vehicle Design Standards Gap Assessment Report.
  - 10 days of effort have been allocated to this task, to set a pragmatic limit to the extent of world-wide exploration of vehicle standards
- ***Rationale for Change to the Purpose and Objective***
  - ***This deliverable follows on from SP2/IBM/15 – Intelligent Infrastructure Standards Requirements Report which was renamed from the original 'Vehicle Standards Requirement Report' following review by the ETI. The reviewers of SP2/IBM/15 all indicated that they felt the title of the report did not accurately reflect the scope of the information it contained – specifically that the content covered standards for the Intelligent Infrastructure as a whole and not purely the Vehicle. Consequently it is proposed that this report should be renamed 'Intelligent Infrastructure Design Standards Gap Assessment Report', and the objectives and scope updated to reflect this change – this is covered on the next slide.***

ETI EV Intelligent Infrastructure Design Standards Gap Assessment Report – Modified Purpose/Objective and Scope (2/2)

- Modified Objective – The original objective specifies an inventory of current vehicle design standards and then a gap analysis against the requirements of the Intelligent Infrastructure. It is proposed that the modified objective of this report reflect the renaming of the document and the priorities discussed within the project since the writing of the contract and the original objectives above. So the report considers the wider Intelligent Infrastructure (not just the vehicle) and the standards which would proactively assist in the development of an Intelligent Infrastructure which in turn contributes positively to the development of a mass market. These standards are concerned with interfaces for data and information between Intelligent Infrastructure actors, locations and components. The primary purpose of the standards is to ensure interoperability, universal access to services and promotion of market engagement by prospective actors and competition between them.

- Modified Scope – The original scope specified an inventory of current vehicle design standards – this inventory was delivered as part of SP2/IBM/15. Existing standards focus on vehicle design, electrical connectivity and safety - all of which are being handled in other work streams of Sub Project 2. It is proposed that this report focuses on standards for interfaces / data / information exchange between actors, locations and components as defined in the Conceptual Design produced for the ETI in SP2/IBM/28. This design is unique to the ETI and this deliverable is the first move in defining standards relating to this design. Section 4 indicates where existing work on interface standards might fit with the ETI's Conceptual Design.

Work Package 2.4 – Intelligent Infrastructure – Recap of the Structure of the Work Package



EV Intelligent Infrastructure Delivery – Design Standards Gap Assessment Report – Contractual Acceptance Criteria

- Original Acceptance Criteria:-
  - Inventory of current vehicle design standards
  - Gap analysis on current vehicle design standards against the requirements of the intelligent architecture
- Acceptance Criteria for Modified Objective and Scope:-

Proposed Criteria	How the report meets the criteria
Identify standards required for the Intelligent Infrastructure and prioritize	Covered in Section 4
Consider composition of a body capable of developing and publishing these standards	Covered in Section 5

ETI EV Work Package 2.4

SP2/IBM/25 ETI EV Intelligent Infrastructure Design Standards Gap Assessment Report

Section 3 – Key Messages from SP2/IBM/15 – Intelligent Infrastructure Standards Requirement Report

Copy of SP2/IBM/15 is embedded here:

Microsoft Word Document

EV Intelligent Infrastructure – Key Messages from SP2/IBM/15 (1/2)

- Stakeholders in all areas of the market around vehicle electrification have indicated that the identification, definition and adoption of standards is key to enabling and accelerating wide-spread adoption of EVs. The standardisation of components such as electric plug connectors, communication protocols, billing arrangements, safety and telemetry are key areas

- Currently a wide variety of industry groups, working councils and research bodies are specifying and investigating candidate standards. For example, significant progress is being made through international bodies like SAE, ISO and IEC

- Policy makers are also aware of the need in this area - The European Union agreed in early 2010 that the European Commission should push for the standardisation of electric vehicles and lead in drafting a strategy to avoid obstacles that might delay deployment

EV Intelligent Infrastructure – Key Messages from SP2/IBM/15 (2/2)

- Standardisation work should represent the interests of all stakeholders concerned, both producers and consumers. Having a pragmatic set of standards around the components of the intelligent infrastructure provides a number of benefits, such as:
  - encouraging investment and fostering innovation – contributing positively to the take-up of EVs;
  - providing reassurance and confidence in the quality of a product or service;
  - helping provide the EV user with a consistent recharging solution, for example, avoiding the need to carry different cables and access tokens;
  - supporting consistent and secure communication between key components and actors;
  - avoidance of serious barriers to any large scale deployment and adoption of EV's and infrastructure to support them;
  - providing useful education, presenting guidance and information to both user and manufacturer who want to make or use a new product;
  - supporting simplification and rationalisation, reducing time and material expenditures and thus allowing a conservation of energy and material resources – very relevant in the case of electric vehicles and the intelligent infrastructure;
  - contributing to future proofing, minimising the potential impact of taking decisions which might constrain the development of the industry or lead to technology and process dead ends.

EV Intelligent Infrastructure – SP2/IBM/15 >> SP2/IBM/25

- To summarize, SP2/IBM/15:-
  - provided an initial investigation into the standards bodies which are researching and developing standards around electric vehicles. It also identified 'candidate' areas for standards and also provided an initial view on prioritization.
- Since SP2/IBM/15 was accepted further work has been done on the architecture of the Intelligent Infrastructure. Combining the initial investigation and the architectural and conceptual design work, SP2/IBM/25 focuses on the key areas of the Intelligent Infrastructure where standards are *necessary* for the development of a mass market for Electric Vehicles.
- For the purposes of this analysis, standards are categorized into two key areas:-
  - Electrical and Safety
    - This deliverable is not intended to cover this area - there are other work streams in Sub Project 2 which are contracted to do this
  - Interfaces, Data and Information
    - The deliverable will analyze the need for standards around interfaces, data and information providing an updated prioritized list of the areas of the Intelligent Infrastructure where standards are necessary.

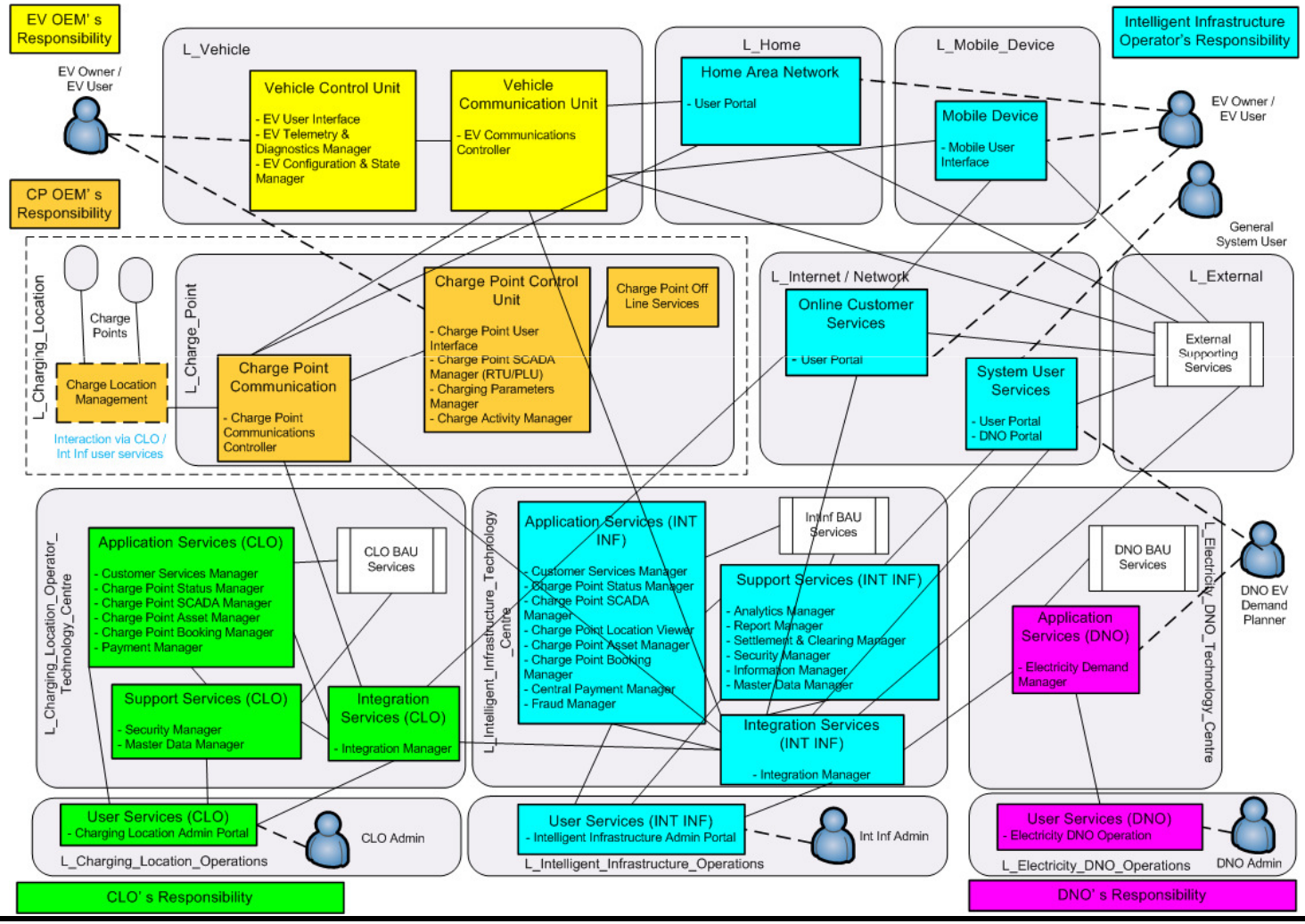
ETI EV Work Package 2.4

SP2/IBM/25 ETI EV Intelligent Infrastructure Design Standards Gap Assessment Report

Section 4 – Intelligent Infrastructure Standards Required

EV Intelligent Infrastructure – Conceptual Design and the Importance of Standards (1/2)

- The Conceptual Design of the Intelligent Infrastructure, as presented in SP2/IBM/28 and shown below, is not a single computer system residing in a single data centre but a set of connected capabilities which reside in a number of locations, each of which 'host' a number of components or systems. The responsibility for the provision of the Intelligent Infrastructure is spread across a number of different actors, and the timings of investments needed to provide the Intelligent Infrastructure will vary according to actors' individual investment priorities, business cases and horizons.



EV Intelligent Infrastructure – Conceptual Design and the Importance of Standards (2/2)

- So the Intelligent Infrastructure exists in a disaggregated ecosystem, where the exchange of data and information between disparate locations and systems is key to its functioning and this is the area of the Intelligent Infrastructure where standards are key to its development.

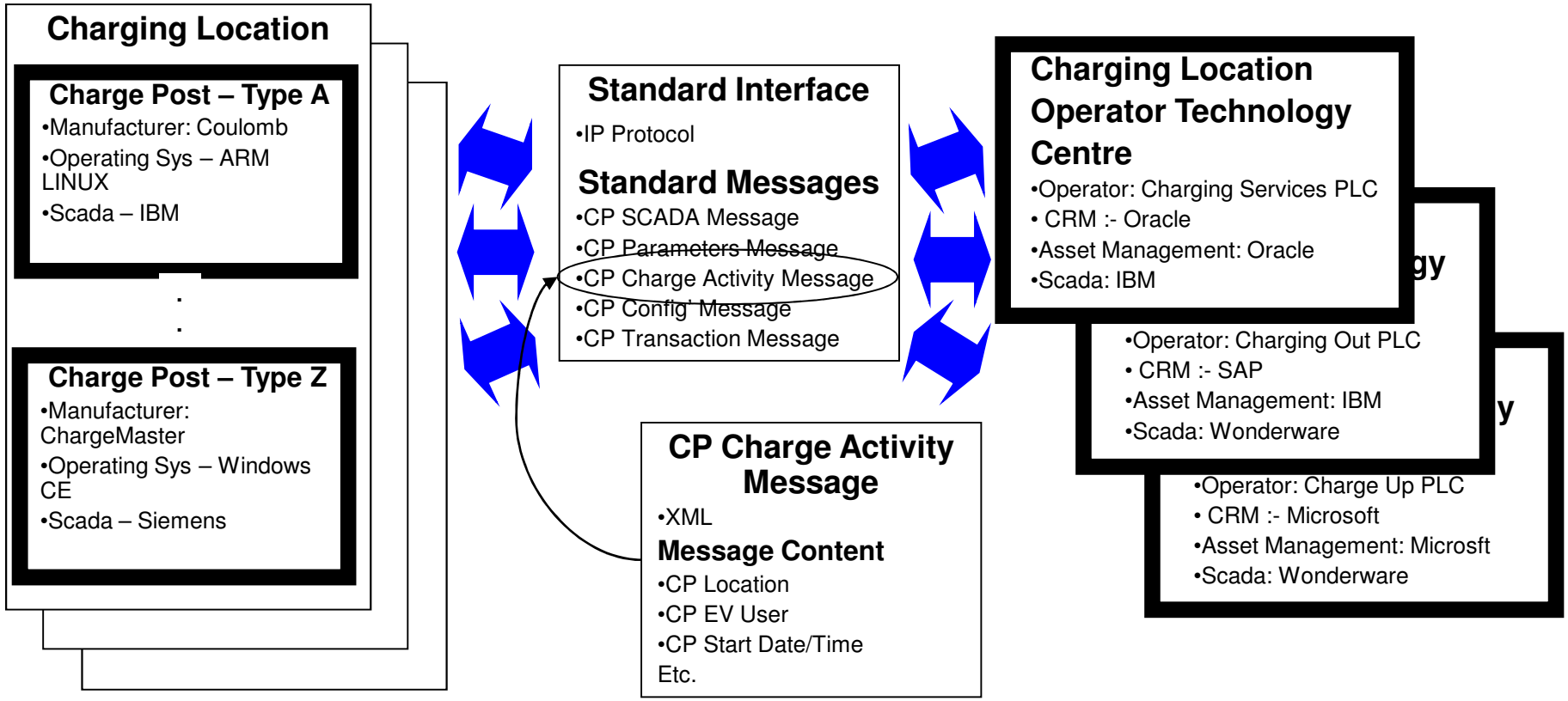
- The recommended approach for the development of standards is:-
  - Focus on standards for the exchange of information and data between actors/locations/components,
  - whilst allowing actors the freedom to build components using standards and technologies of their choice to timescales which fit their investment priorities.

- This is a typical IT Industry approach which has been adopted in various markets, including for example in Financial Services and the Retail Industry, using various technologies including EDI ('Electronic Data Interchange') and XML ('Extensible Markup Language').

- The approach is described further on the next slide

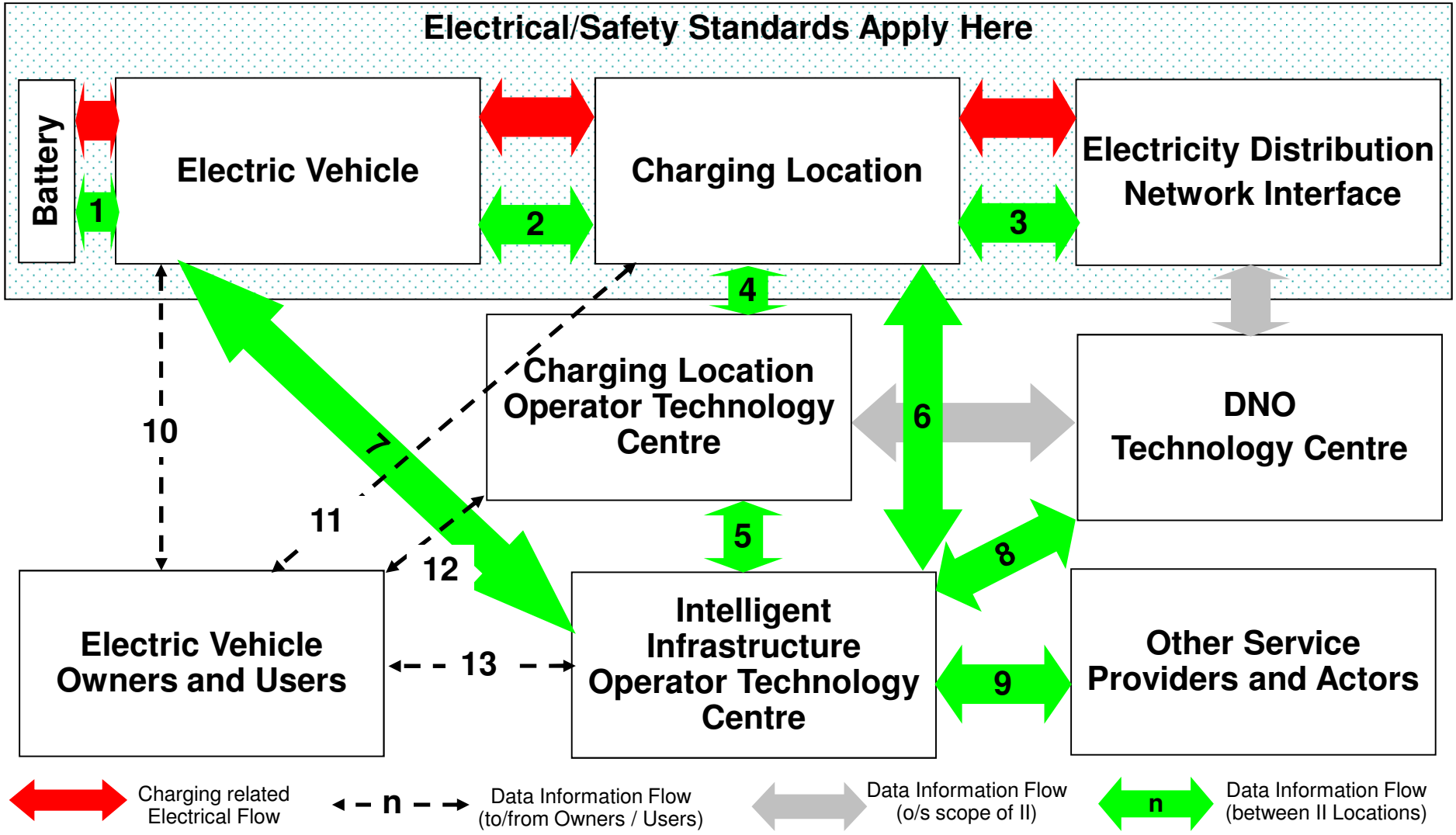
EV Intelligent Infrastructure – Recommended Approach to the Development of Standards

- Following broad agreement on the overall purpose and functionality of the Intelligent Infrastructure, standards are developed for the exchange of data and information between actors/locations/components, comprising interface definitions and message types - defining how the actor/location communicates with others and what the communications (messages) contain.
- Components hosted in actors' locations are effectively treated as 'black boxes' – how that component is designed and built and how it functions internally is immaterial to the rest of the ecosystem as long at it meets the interfacing and message standards. An example would be that one Charge Post could be designed, built and operate very differently from another Charge Post built by a different OEM (using different hardware components, different software etc), but both would be able to connect to the same Charging Location Operator Technology Centre because they both adhere to the approved interface and message content standards. This example is depicted below:-



EV Intelligent Infrastructure – Data, Information and Interface Standards

The numbered arrows in the diagram below highlight where standards are required for interfaces and the exchange of data and information between actors/locations/components



EV Intelligent Infrastructure – Data, Information & Interface Standards (1/6)

From the Conceptual Design Block Diagram, the following table describes the standards necessary for the development of the EV mass market.

Data /Information Flow Number	Actors /Locations /Components	Description	Standards Requirement (see below for further details)	Realization Priority for the Intelligent Infrastructure	Existing Related Standards
1	Battery (Control System) <> EV	Refers to the flow of data between the Battery Control System and the EV. Operational control of the battery, together with health and status monitoring information about the battery are critical to the functioning of the EV, let alone making this data available to the Intelligent Infrastructure. This is a fundamental EV engineering interface without which the EV would not be able to function.	Standards for the exchange of data between the Battery and the Electric Vehicle are driven by Vehicle OEMs and Battery Suppliers – as it is in the best interests of both to have a transparent standard which allows interoperability across OEMs and Suppliers.	High – driven by the needs of EV OEMs and Battery Suppliers	SAE J2289:2000
2	Electric Vehicle <> Charging Location	Refers to the flow of data between the Charge Point and the Electric Vehicle. The physical carrier could be either via the electrical connection or via a wireless protocol such as Bluetooth. This flow refers to the data and information being carried as opposed to any electric current, and signals implemented for safety purposes.	This flow requires standards for the following message types:- 2.1 EV Telemetry & Diagnostics Message – from the EV to the Charge Point 2.2 EV Configuration and Status Message – from the EV to the Charge Point 2.3 EV Charge Point User Interface Proxy – from the Charge Point to the EV	High – driven by the needs of EV OEMs, Charging Infrastructure OEMs and the wider needs of the Intelligent Infrastructure	SAE J1772:2010, IEC 62196 and others

EV Intelligent Infrastructure – Data, Information & Interface Standards (2/6)

Data /Information Flow Number	Actors /Locations /Components	Description	Standards Requirement (see below for further details)	Realization Priority for the Intelligent Infrastructure	Existing Related Standards
3	Charging Location <> Electricity Distribution Network Interface	Refers to the flow of data between the Charging Location and the Electricity Distribution Network Interface relating to data to support the Smart Meter in the Network Interface Unit	Standards are required for the exchange of data between the Charging Location and the Network Interface Unit principally to support the Smart Meter functionality. These standards should be covered by the emerging Smart Meter standards and connected devices in both Commercial and Domestic situations. The Intelligent Infrastructure is therefore not the primary driver for the definition of these standards, but rather the UK Government Smart Meter Initiative.	Medium – driven by the needs of the DNO and Regulators	Smart Meter Initiative
4	Charging Location <> Charging Location Operator Technology Centre	Refers to the flow of data between the Charging Location and the Operator's Technology/Data Centre.	This flow requires standards for the following message types:- 4.1 CP SCADA Message – from the Charge Point to the Tech Centre 4.2 CP Parameters Message – from the Tech Centre to the Charge Point 4.3 CP Charge Activity Message – from the Charge Point to the Tech Centre 4.4 CP Config' Message – from the Tech Centre to the Charge Point 4.5 CP Transaction Message – from the Charge Point to the Tech Centre	High – driven by the needs of Charging Infrastructure OEMs and Charging Location Operators	None found

EV Intelligent Infrastructure – Data, Information & Interface Standards (3/6)

Data /Information Flow Number	Actors /Locations /Components	Description	Standards Requirement (see below for further details)	Realization Priority for the Intelligent Infrastructure	Existing Related Standards
5	Charging Location Operator Tech Centre <> Intelligent Infrastructure Operator Tech Centre	Refers to the flow of data between the Charging Location Tech Centre and the Intelligent Infrastructure Technology Centre – commonality of requirements with messages between Charging Locations and Charging Location Operator Technology Centre need to be exploited.	This flow requires standards for the following message types:- 5.1 CLO Customer Message 5.2 CLO CP Status Message 5.3 CLO CP Asset Message 5.4 CLO CP Booking Message 5.5 CLO CP Master Data Message (…all the above are from the CLO Tech Centre to the Intelligent Infrastructure Tech Centre) 5.6 CLO Settlement Message - both directions	Medium – driven by the needs of the Intelligent Infrastructure Operator	None found
6	Charging Location <> Intelligent Infrastructure Operator Tech Centre	Refers to the flow of data between the Charging Location and the Intelligent Infrastructure Operator's Technology/Data Centre. It is not clear that these flows will exist, which result from the Intelligent Infrastructure Operator directly interfacing to the Charge Point, but the Conceptual Design allows for this.	As for standard message types for flow 4 between the Charging Location and the Charging Location Operator Technology Centre	Low – see comments	None found

EV Intelligent Infrastructure – Data, Information & Interface Standards (4/6)

Data /Information Flow Number	Actors /Locations /Components	Description	Standards Requirement (see below for further details)	Realization Priority for the Intelligent Infrastructure	Existing Related Standards
7	Electric Vehicle <> Intelligent Infrastructure Operator Tech Centre	Refers to the flow of data between the Electric Vehicle and the Intelligent Infrastructure Technology Centre directly – in this flow, the EV acts as any other mobile device – therefore see the flow - EV Owners and Users <> Intelligent Infrastructure Operator	As for the flow EV Owners and Users <> Intelligent Infrastructure Operator	Medium – driven by the needs of the Intelligent Infrastructure Operator and the EV Owners, Users and Operators	None found
8	Intelligent Infrastructure Operator Tech Centre <> DNO Tech Centre	Refers to the flow of data and information between the Intelligent Infrastructure Operator's Technology/Data Centre and the Distribution Network Operator's Tech Centre.	This flow requires standards for the following message types:- 8.1 II DNO Master Data Message – both directions 8.2 II DNO EV Charging Demand Management Message – from the Intelligent Infrastructure Operator Tech Centre to the DNO Technical Centre 8.3 II DNO Charging Parameters – from the DNO Technical Centre to the Intelligent Infrastructure Operator Tech Centre	High – fundamental interface for the Intelligent Infrastructure Operator – driven by the needs of the DNO, the II and Regulators	None found

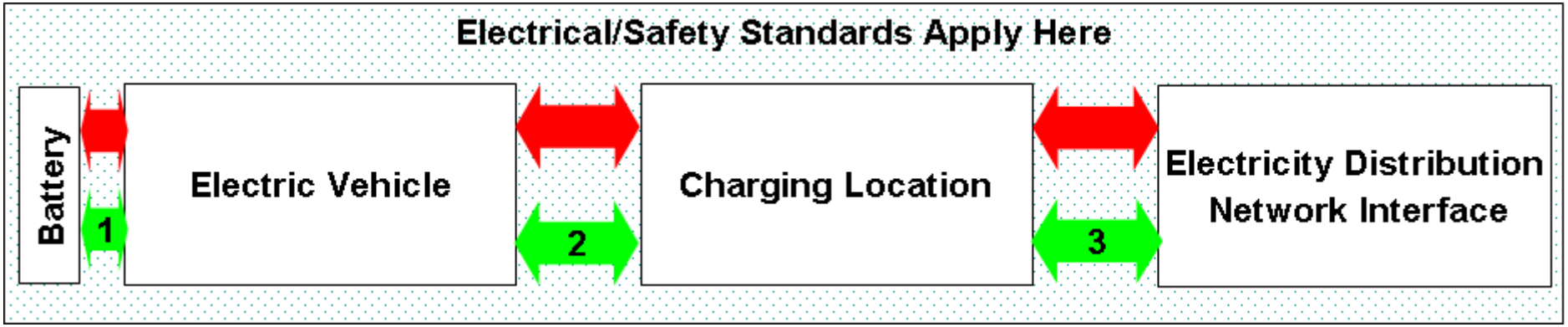
EV Intelligent Infrastructure – Data, Information & Interface Standards (5/6)

Data /Information Flow Number	Locations / Components	Description	Standards Requirement (see below for further details)	Realization Priority for the Intelligent Infrastructure	Existing Related Standards
9	Intelligent Infrastructure Operator Tech Centre <> Other Service Providers and Actors	Refers to the flow of data between the Intelligent Infrastructure Technology Centre to the outside world	This flow requires standards for the following message types:- 9.1 II External Settlement Message (The need for additional message standards will emerge as service provision – particularly requiring EV market data – crystallizes)	High – fundamental interface for the Intelligent Infrastructure Operator – to meet its settlement responsibilities	None
10	EV Owner/User <> Electric Vehicle	Refers to the flow of data and information between the EV Owner/User and the EV via a mobile device.	This flow would benefit from standards for the following message types:- 10.1 EV User Pre-Conditioning Enquiry and Message – both directions 10.2 EV User EV Status Enquiry and Message – both directions 10.3 EV User Charging Control Message – both directions	Very low – EV OEMs may prefer to keep these flows directly between the EV and Owner proprietary to establish competitive advantage.	None found

EV Intelligent Infrastructure – Data, Information & Interface Standards (6/6)

Data /Information Flow Number	Actors /Locations /Components	Description	Standards Requirement (see below for further details)	Realization Priority for the Intelligent Infrastructure	Existing Related Standards
11	EV Owner /User <> Charging Location	Refers to the interface between the EV Owner and User and the Charge Point. This is a critical interface requiring standards which will allow universal access to charging infrastructure.	This interface requires the following standards:- 11.1 CP Access Token Standard 11.2 CP Electronic Purse Standard 11.3 CP Payment Card Standard 11.4 CP Payment Transaction Message 11.5 CP Home Area Network Standard	Very high – fundamental to the operation of the Intelligent Infrastructure in its widest sense.	None
12	EV Owner/User <> CLO Tech Centre	Refers to the interface between the EV Owner and User and the Charging Location Operator	Standards not required for primarily account (non-financial and financial) related messages.	N/A	N/A
13	EV Owner/User <> Intelligent Infrastructure Operator Tech Centre	Refers to the interface between the EV Owner and User and the Intelligent Infrastructure Operator	This interface requires the following standards:- 13.1 CP Location Details / Availability Enquiry and Message – both directions 13.2 CP Location Booking Enquiry and Message - both directions	Very high – fundamental to the operation of the Intelligent Infrastructure in its widest sense	None

EV Intelligent Infrastructure – Electrical and Safety Standards, and Data, Information & Interface Standards



- Electrical/Safety Standards are required across the Battery, the Electric Vehicle, the Charging Location (including Domestic and Non-Domestic) and the Interface into the Electricity Distribution Network. Consideration of these standards is not within the scope of this deliverable but is being dealt with in other work streams of Sub Project 2.

- Definition of Electrical Standards in these areas will have an impact on data and information flow as it may provide or affect the underlying physical connection to be used for transmission - the most obvious example being the electrical connection between the EV and the Charge Post, where provision of additional pins and connectivity in the electrical connector could be used for the data/information connection. Hence, development of electrical and safety standards and standards for data and information need to be developed co-operatively.

EV Intelligent Infrastructure – Summary of the Data, Information & Interface Standards (1/2)

Standard Number	Standard Name	Actor /Location /Component (From)	Actor /Location /Component (To)	Global / EU / UK Standard	Priority	Impact If No Standard – (see notes)
2.1	EV Telemetry & Diagnostics Message	EV	Charge Point	Global	High	Med- info' availability
2.2	EV Configuration and Status Message	EV	Charge Point	Global	High	High– info' availability
2.3	EV Charge Point User Interface Proxy	Charge Point	EV	Global	Low	Low– nice to have
4.1	CP SCADA Message	Charge Point	CLO Tech Centre	EU	High	High– info' availability
4.2	CP Parameters Message	CLO Tech Centre	Charge Point	EU	High	High– additional cost
4.3	CP Charge Activity Message	Charge Point	CLO Tech Centre	EU	High	High– additional cost
4.4	CP Config' Message	CLO Tech Centre	Charge Point	EU	High	High– additional cost
4.5	CP Transaction Message	Charge Point	CLO Tech Centre	EU	High	High– additional cost
5.1	CLO Customer Message	CLO Tech Centre	II Tech Centre	EU	Medium	High– service restrict'
5.2	CLO CP Status Message	CLO Tech Centre	II Tech Centre	EU	Medium	High– info' availability
5.3	CLO CP Asset Message	CLO Tech Centre	II Tech Centre	EU	Medium	High- info' availability
5.4	CLO CP Booking Message	CLO Tech Centre	II Tech Centre	EU	Medium	Med– service restrict'
5.5	CLO CP Master Data Message	CLO Tech Centre	II Tech Centre	EU	Medium	Med– additional cost
5.6	CLO Settlement Message	CLO Tech Centre	II Tech Centre	EU	Medium	High– additional cost
8.1	II DNO Master Data Message	DNO Tech Centre	II Tech Centre	UK	High	High– additional cost
8.2	II DNO EV Charging Demand Management Message	II Tech Centre	DNO Tech Centre	UK	High	Med– additional cost
8.3	II DNO Charging Parameters	DNO Tech Centre	II Tech Centre	UK	High	Med– additional cost
9.1	II External Settlement Message	II Tech Centre	External	EU	High	High– service restrict'
10.1	EV User Pre-Conditioning Enquiry and Message	EV User	EV	Global	Very Low	Low – nice to have

EV Intelligent Infrastructure – Summary of the Data, Information & Interface Standards (2/2)

Standard Number	Standard Name	Actor /Location /Component (From)	Actor /Location /Component (To)	Global / EU / UK Standard	Priority	Impact If No Standard – (see notes)
10.2	EV User EV Status Enquiry and Message	EV User	EV	Global	Very Low	Low – nice to have
10.3	EV User Charging Control Message	EV User	EV	Global	Very Low	Low – nice to have
11.1	CP Access Token Standard	EV User	Charge Point	EU	V. High	High- service restrict'
11.2	CP Electronic Purse Standard	EV User	Charge Point	EU	V. High	High- service restrict'
11.3	CP Payment Card Standard	EV User	Charge Point	EU	V. High	High- service restrict'
11.4	CP Payment Transaction Message	Charge Point	CLO Tech Centre	EU	High	High- service restrict'
11.5	CP Home Area Network Standard	HAN	Charge Point	UK	Medium	Med- additional cost
13.1	CP Location Details / Availability Enquiry and Message	EV User	II Tech Centre	EU	High	High- service restrict'
13.2	CP Location Booking Enquiry and Message	EV User	II Tech Centre	EU	High	High- service restrict'

Notes:

- Table *proposes* level at which Standard should be agreed – Global/EU/UK – clearly global standards everywhere would be the ideal but impractical to achieve
- Table *indicates* impact of not having a standard and cites primary impact – namely:-
  - Absence of a standard will restrict the quality or extent of the service - 'service restrict'
  - Absence of a standard will increase market costs – 'additional cost'
  - Absence of a standard will reduce the quality or scope of information which can be provided to actors – 'info availability'
- Table assumes that Standards for the Interface and Data Exchange between the Battery Control System and the EV are being driven by the Battery and EV OEMs
- Table assumes that Standards for the Interface and Data Exchange between the Charging Location and the Network Interface Unit to support Smart Meter Functionality are being driven by Smart Meter Initiatives

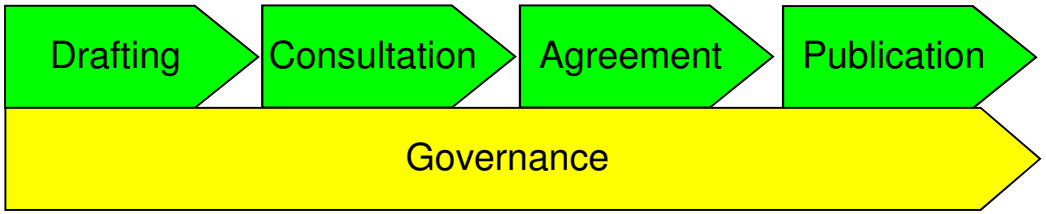
ETI EV Work Package 2.4

SP2/IBM/25 ETI EV Intelligent Infrastructure Design Standards Gap Assessment Report

Section 5 – Process and Governance for the Development of Standards

EV Intelligent Infrastructure – Process and Governance of the Development of Standards

- A typical Standards Development Process would be:-



- The required Intelligent Infrastructure Standards would need governance from a multi disciplinary body comprising actors from the EV ecosystem – critical to have representatives from:-
  - EV OEMs
  - Charging Infrastructure OEMs
  - Location Operators
  - DNOs
  - Electricity Retailers
  - Intelligent Infrastructure Operator/IT Enterprise Services
  - Regulators
- Agreement would include engagement with International Bodies to ensure international compatibility.
- The current Intelligent Architecture Steering Group created by the ETI for the purposes of Stage 1 of the project could form a good starting point of the governance needed going forwards.

ETI EV Work Package 2.4

SP2/IBM/25 ETI EV Intelligent Infrastructure Design Standards Gap Assessment Report

Appendix A – List of Candidate Areas for Standards for the Intelligent Infrastructure from SP2/IBM/15

EV Intelligent Infrastructure – Summary List of Key Areas for Standards from SP2/IBM/15 (1/3)

- Communications
  - Between the EV and Charging Equipment before / during charging
  - Between the EV and Charging Equipment for diagnostics
  - Between the EV and Electricity Supply Grid
  - Between the Charging Equipment and the Electricity Supply Grid
  - Between the EV / Charging Location and Customers
  - Between the EV / Charging Location and external information provision (e.g. internet, GPS, weather)
  - Between the EV / Charging Equipment and other roadside furniture and traffic management systems (e.g. UTMC Framework Technical Specification)
  - Vehicle Gateway to allow all consumer devices to work in harmony in all vehicles and with all infrastructures

- Physical Connections
  - Physical connection between EV and Battery
  - Physical Connection between the EV and Charging Point
  - The socket in the EV / Battery – specification, location on the EV, charging capability, etc

- Charging Activity
  - Standard procedures
  - Standard for different types of charging, e.g. fast charging

EV Intelligent Infrastructure – Summary List of Key Areas for Standards from SP2/IBM/15 (2/3)

- Security & Authentication
  - Authentication of the EV with any account based service provision
  - Checking credentials with the DVLA
  - Authentication of a token – in the EV or held by the user

- Payment, Billing and Settlement
  - Standards for production of bills
  - Settlement standards
  - International / cross scheme roaming standards
  - Energy Trading standards – amendments or additions such as around tariffs and pricing, V2G 'price', storage of electricity, etc

- Safety
  - For on board rechargeable energy storage systems
  - When charging the EV / Battery at home
  - For operation of a commercial EV / Battery charging facility
  - Design of the physical connection to the EV
  - Information provision in the event of an emergency, such as providing details to emergency services

EV Intelligent Infrastructure – Summary List of Key Areas for Standards from SP2/IBM/15 (3/3)

- Energy & Utility
  - Smart Grid and Smart Meter interactions with each other and with the EV
  - Links between demand forecasting, the charging locations and generation capacity
  - Domestic and commercial property electricity standards
  - Vehicle to Grid and Vehicle to Home may require a range of standards to be created / amended specific to the energy supply
- Metrics
  - Units for measurement of the charging activity
- User Interface
  - For the EV and the Charging Location – what to display, how to display it
  - Alerts and warnings
- Information Technology
  - Interface standards
  - Data standards
  - Mobile devices
- Other
  - Regulatory and Compliance
  - Customer Services

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Appendix B – Existing Standards Bodies Activity from SP2/IBM/15

Standard Bodies activity (1)

Society of Automotive Engineers

- SAE have a task force developing a suite of standards for EV communications, the first was published in May 2010, the others will come later in the year / early next year
  - SAE J2836/1 & J2847/1 - Communication between Plug-in Vehicles and the Utility Grid
  - SAE J2836/2 & J2847/2 - Communication between Plug-in Vehicles and the Off-board charger in the EV Supply Equipment (EVSE)
  - SAE J2836/3 & J2847/3 - Communication between Plug-in Vehicles and the Utility Grid for Reverse Power Flow
  - SAE J2836/4 & J2847/4 - Diagnostic Communication for Plug-in (all vehicles) Vehicles
  - SAE J2836/5 & J2847/5 - Communication between (all vehicles) Plug-in Vehicles and the their customers
- SAE also have J1772 which is related to the design of the connector used for charging vehicles

International Organisation for Standardization – ISO

- ISO have a number of standards around EV's, including in the areas of
  - ISO 6469 concerns EV Safety and includes ISO 6469-1:2009 – On-board rechargeable energy storage system (RESS); ISO 6469-2:2009 - Vehicle operational safety means and protection against failures; ISO 6469-3:2009 - Protection of persons against electric hazards
  - ISO 8713:2005 establishes a vocabulary of terms used in International Standards generally in relation to electric road vehicles

Standard Bodies activity (2)

International Electrotechnical Commission (IEC)

- The IEC is the world's leading organization that prepares and publishes International Standards for all electrical, electronic and related technologies — collectively known as "electrotechnology“. In the UK they are active through the British Standards Institution (BSI)
- Have a specific Technical Committee for EV’s – TC 69 : Electric road vehicles and electric industrial trucks which aims to prepare international standards for road vehicles, totally or partly electrically propelled from self-contained power sources, and for electric industrial trucks. Have looked into power supplies and chargers, on board electrical storage, inductive charging, communication between vehicle and grid, electrical interfaces
- Have various standards in this area
  - IEC 61851, Electric vehicle conductive charging system which seeks to provide a common charging standard to enable widespread deployment of charging stations for different EVs
  - IEC 62196, Plugs, socket-outlets, vehicle couplers and vehicle inlets - Conductive charging of electric vehicles

International Telecommunications Union (ITU)

- Would be relevant in the areas of communications between the EV and other components of the intelligent infrastructure

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