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Programme Area: Light Duty Vehicles

Project: Electricity Distribution and Intelligent Infrastructure

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

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 (i.e. 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 B, covering the Conceptual Business Architecture.

Context:

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

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ETI EV Work Package 2.4

SP2/IBM/16 ETI EV Intelligent Infrastructure Conceptual Business Architecture

Version: 2.0

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v.1.0	Initial Submission 18/06/10
v.2.0	Resubmission following ETI Review 13/07/10

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Executive Summary (1) – Conceptual Business Architecture

▪ **Method Employed**

- Using the technique of Component Business Modelling ('CBM'), this deliverable describes the key business competencies and components to support the stages of evolution, intelligence and complexity of plug-in vehicles and infrastructure. Competencies are defined as large business areas with characteristic skills and capabilities, for example 'Charging Location Infrastructure Provision', and components are defined as a part of a competency that has a distinctive set of skills, for example 'Charging Location Construction'. The model is concerned with competencies of the Electric Vehicle market which apply to the Intelligent Infrastructure ('II') - the model is not concerned with **all** competencies within the Electric Vehicle Market, e.g. the design and manufacture of EV regenerative braking systems. Those which feature in the model are competencies which an actor of the II (see SP2/IBM/14) may perform or competencies which fall under the provision of the II itself. The CBM models are derived from the requirements identified in SP2/IBM/14, informed by existing CBM industry maps from IBM's CBM Library.

▪ **Component Business Model Characteristics**

- The base CBM model defines 10 Business Competencies in the EV Market needed to sustain and grow the market – they are Electric Vehicle and Battery System Delivery, Charging Location Infrastructure Provision, Charging Location Operation, Electricity System Operation, Customer Relationship Services, Payment / Billing / & Settlement Services, Intelligent Infrastructure Information Management & Analytics, Intelligent Infrastructure Provision, Beyond the Vehicle Services Provision, Strategy / Regulation & Legislation.

▪ **Conceptual Business Architecture – Simple Business Model**

- A contrived market (stimulated heavily by public investment) which exists on processes not sustainable for a mass market/long term (e.g. free electricity in non-domestic charging / no way to influence charging behaviour) requires only a limited number of competencies and components principally in the areas of EV Battery System Delivery and Charging Location Infrastructure Provision and Operation.
- Movement to the Semi-Intelligent Model requires standards in key areas (see SP2/IBM/15 & 25), regulation, and the provision of market wide communication and integration via an Intelligent Infrastructure. Timing of the move to the next evolutionary model is down to the growth in the EV market driven principally by external factors (EV Price, Battery Technology, Alternative Technologies).

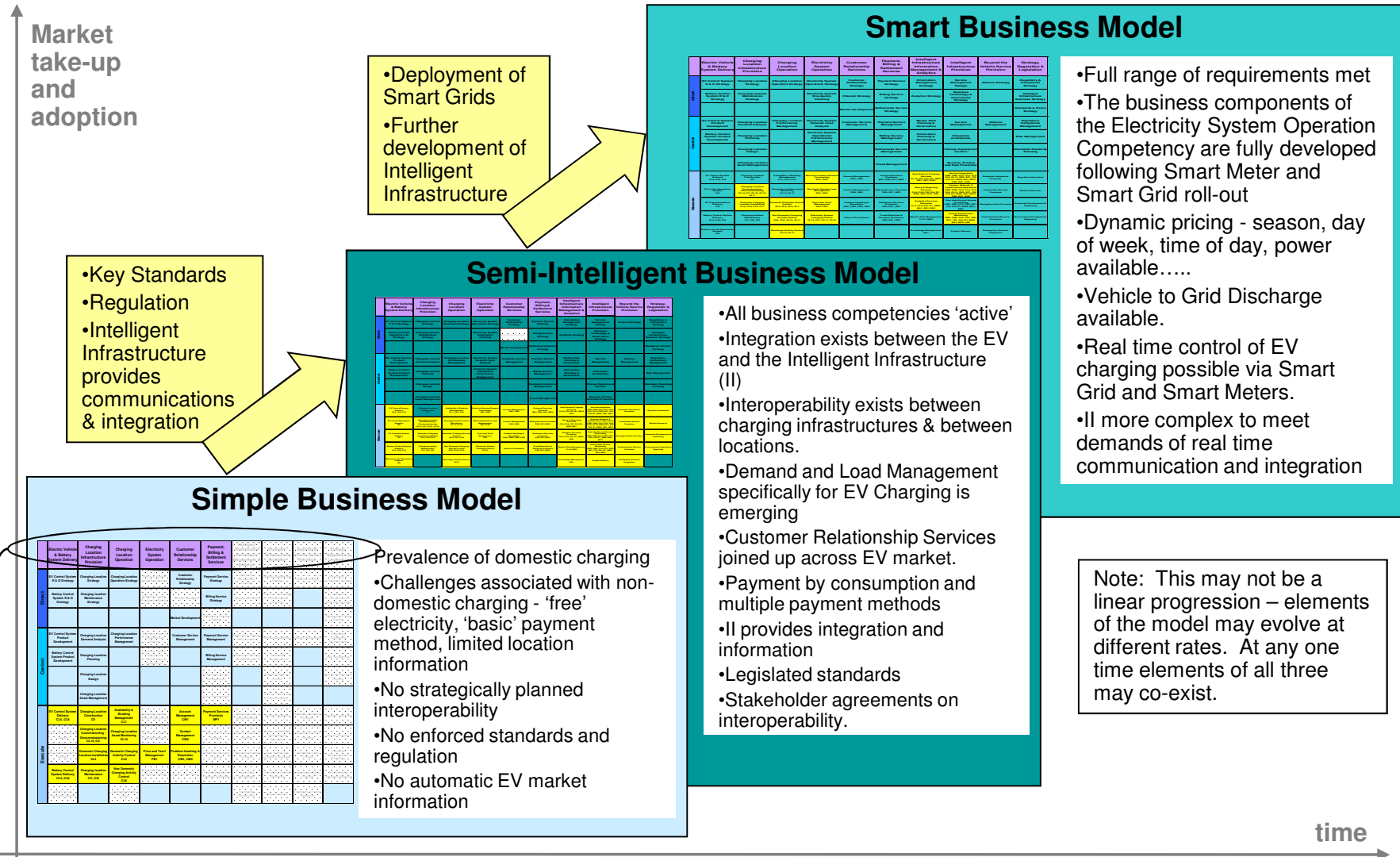
▪ **Conceptual Business Architecture – Semi-Intelligent Business Model**

- A market which is growing and approaching 'mass' needs all of the competencies in the Conceptual Business Architecture to a lesser or greater degree. Integration exists between the EV and the II, interoperability exists between charging infrastructures & between locations, electricity demand and load management specifically for EV charging is emerging (but not fully developed), customer relationship services are joined up across the EV market, payment by consumption and multiple payment methods are available, II provides integration and information, legislated standards exist in key areas, stakeholder agreements exist on interoperability.
- Movement to the Smart Business Model is heavily, but not wholly, dependent on the roll out of Electricity Supply Chain Smart Technology – meters and grids. Timing of the move is dictated by the growth in the EV market and the urgency to manage electricity demand for EV charging.

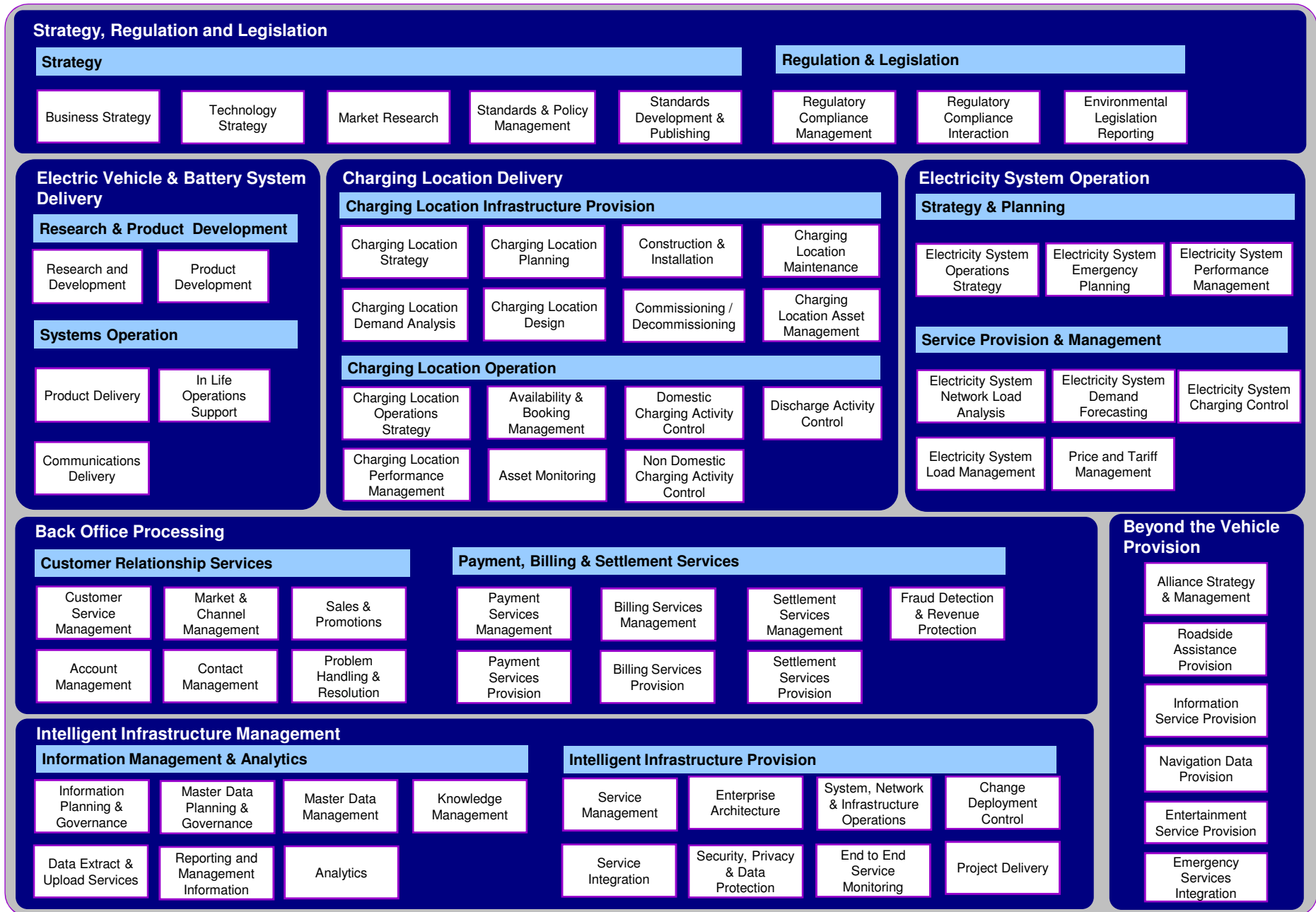
▪ **Conceptual Business Architecture – Smart Business Model**

- A mature market, the full range of requirements (SP2/IBM/14) met. The business components of the Electricity System Operation Competency are fully developed following Smart Meter and Smart Grid roll-out, allowing dynamic pricing – season / day of week / time of day / power available and real time control of charging possible. Vehicle to Grid Discharge is available. The II has grown in complexity to meet demands of real time communication and integration.

Executive Summary (2) – EV Intelligent Infrastructure (II) - Conceptual Business Architecture Evolution



Executive Summary (3) – *Capability View* of the Component Business Model for the EV Market (relevant to the Intelligent Infrastructure)



Contents

- Introduction
- Conceptual Business Architecture – Development of the Model
- Conceptual Business Architecture – Evolutionary Models
- Conceptual Business Architecture – Possible Further Use of the CBM



ETI EV Work Package 2.4

SP2/IBM/16 ETI EV Intelligent Infrastructure Conceptual Business Architecture

Introduction

ETI EV Intelligent Infrastructure - Conceptual Business Architecture - Purpose and Objective

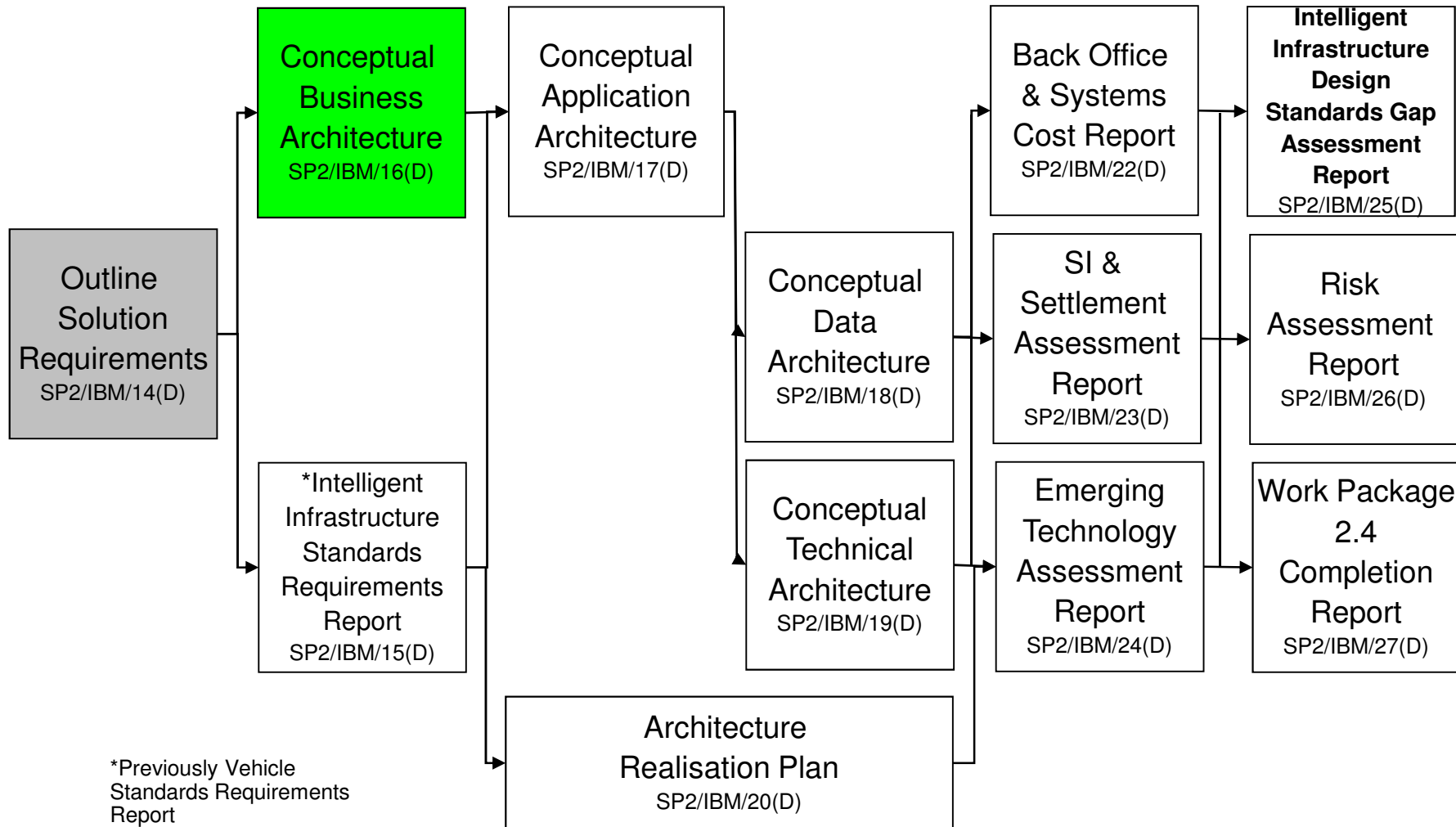
▪ Purpose

- This document is a deliverable of the ETI Technology Contract for the Electrification of Light Vehicles - Project: Electricity Distribution & Intelligent Infrastructure. The deliverable is the Intelligent Infrastructure - Conceptual Business Architecture from Work Package 2.4 – Intelligent Infrastructure.

▪ Objective

- Develop a Conceptual Business Architecture through the technique of Component Business Modelling ('CBM');
- IBM has a library of standard industry maps, which can be used as the vehicle for validating the key business capabilities and components required to support the stages of evolution of plug-in vehicles and infrastructure:
- Produce graphical representations (maps) of the key business capabilities and components required to support the stages of evolution of plug-in vehicles and infrastructure
- Develop descriptions of the key business capabilities and components required.

EV Intelligent Infrastructure - Conceptual Business Architecture - Relationship of this deliverable to other Work Package 2.4 deliverables



EV Intelligent Infrastructure - Conceptual Business Architecture - Overview of key Work Package 2.4 deliverables

Deliverable	Outline
Intelligent Infrastructure Requirements Report	Outline solution requirements; High Level System Context; High Level Initial Use Case Model
Intelligent Infrastructure Standards Requirements Report	The standards report provides a list of areas that may require a standard; it will not attempt to define or set the actual standards.
Conceptual Business / Application / Data / Technical Architectures	Decide on the overall shape and style of the architectures and evaluate alternative high-level architectures and choose between them Includes artefacts such as Component Business Model ('CBM'), component model, entity relationship diagram, operational model
Plan for Architecture Realisation	High-level plan defining scope, activities and deliverables required in Stage 2
Back Office and Supporting Systems Cost Report	Estimate high level costs for the design and build of the back office and systems
Systems Integration and Settlement Assessment Report	Settlement landscapes and alternatives and scope of systems requiring integration
Emerging Technology Assessment Report	Provide a snapshot evaluation of emerging vehicles technologies and scenarios, such as demand side management, network constraints, vehicle-to-grid and future charging options
Vehicle Design Standards Gap Assessment Report	Provides an Inventory of current vehicle design standards and a gap analysis of them against the requirements of the intelligent architecture
Risk Assessment Report	Develop recommendations as to the areas and levels of risk mitigations / avoidance and safety / security to be pursued for further analysis and design

EV Intelligent Infrastructure - Conceptual Business Architecture – Contractual Acceptance Criteria

Criteria	How the report represents the criteria
<p>3 graphical representations of the key business capabilities and components to support the stages of evolution, intelligence and complexity of plug-in vehicles and infrastructure</p> <p>Descriptions of the key business capabilities and components required to support the evolution of plug-in vehicles and infrastructure</p>	<p>Slides 12 to 29 constitute the basic Component Business Model for the EV Market, comprising the CBM model itself, and the Business Competency and Business Component descriptions.</p> <p>Slides 30 to 56 contain the 3 evolutionary models and descriptions, including how they have been derived from the basic model.</p>



ETI EV Work Package 2.4

SP2/IBM/16 EV Intelligent Infrastructure

Conceptual Business Architecture - Development
and Definition of the Model

EV Intelligent Infrastructure - Conceptual Business Architecture Background

- This section of the document provides a conceptual model of the business landscape for the EV market. The next section goes on to provide 3 variations of this model aligned to each of the stages of evolution of the EV market, using the definition of evolution provided by the ETI.
- As required the models are provided using the technique of Component Business Modelling ('CBM').
- CBM requires the identification of Business Competencies and Components. Business Competencies are defined as large business areas with characteristic skills and capabilities, for example 'Charging Location Infrastructure Provision', and Business Components are defined as a part of a competency that has a distinctive set of skills, for example 'Charging Location Planning' or 'Charging Location Construction'.
- The model is concerned with business competencies of the Electric Vehicle market **which apply to the Intelligent Infrastructure (II)** – the model is not concerned with **all** of the business competencies within the Electric Vehicle Market. Those which feature in the model are competencies which an actor of the II may perform ('Intelligent Infrastructure Actors' are defined in SP2/IBM/14) or those competencies which fall under the provision of the II itself. As an example, a competence related to the design and production of the EV Control System which interacts with the II is included, but competencies relating to other aspects of the EV which have no interaction with the II are not included – for example the design and production of the EV body, suspension etc.
- The Business Competencies in the model are derived from the requirements identified in SP2/IBM/14, informed by existing CBM industry maps from IBM's CBM Library. Likewise, the Business Components in the model have been informed by the same maps. CBM maps from the following industries have been used – Energy and Utilities, Telecommunications, Automotive and Financial Services.

EV Intelligent Infrastructure – Component Business Modeling Format

A component business model is represented in the form of a grid or table as follows:-

Columns are **Business Competencies**, defined as large business areas with characteristic skills and capabilities, for example, product development or supply chain.

	New Business Development	Sales and Marketing	Care Management	Customer Operations	Enterprise Operations	Business Administration
Direct						
Control						
Execute						

Cells are **Business Components** - parts of an enterprise that has a distinctive set of skills and the potential to operate independently – if sufficiently resourced, it could be a separate company or as part of another company.

Rows are structured by **Accountability Levels** which characterize the scope and intent of activity and decision-making. The three levels used in CBM are Directing, Controlling and Executing.

- Directing is about strategy, overall direction and policy
- Controlling is about monitoring, managing exceptions and tactical decision making
- Executing is about doing the work

EV Intelligent Infrastructure – Component Business Model

	Electric Vehicle & Battery System Delivery	Charging Location Infrastructure Provision	Charging Location Operation	Electricity System Operation	Customer Relationship Services	Payment, Billing & Settlement Services	Intelligent Infrastructure Information Management & Analytics	Intelligent Infrastructure Provision	Beyond the Vehicle Service Provision	Strategy, Regulation & Legislation
Direct	EV Control System R & D Strategy	Charging Location Strategy	Charging Location Operation Strategy	Electricity System Operations Strategy	Customer Relationship Strategy	Payment Service Strategy	Information Management Strategy	Service Management Strategy	Alliance Strategy	Regulatory & Compliance Strategy
	Battery Control System R & D Strategy	Charging location Maintenance Strategy		Electricity System Emergency Planning	Channel Strategy	Billing Service Strategy	Analytics Strategy	Business Technology & Governance Strategy		Intelligent Infrastructure Business Strategy
					Market Development	Settlements Service Strategy				Standards & Policy Strategy
Control	EV Control System Product Development	Charging Location Demand Analysis	Charging Location Performance Management	Electricity System Network Load Analysis	Customer Service Management	Payment Service Management	Master Data Planning & Governance	Service Management	Alliance Management	Regulatory Compliance Management
	Battery Control System Product Development	Charging Location Planning		Electricity System Operational Performance Management		Billing Service Management	Information Planning & Governance	Enterprise Architecture		Risk Management
		Charging Location Design				Settlements Service Management		Change Deployment Control		Standards Roadmap Planning
		Charging Location Asset Management				Fraud Management		Security, Privacy and Data Protection		
Execute	EV Control System Delivery	Charging Location Construction	Availability & Booking Management	Electricity System Demand Forecasting	Account Management	Payment Services Provision	Data Extract & Upload Services	Service Integration	Roadside Assistance Provision	Regulator Interaction
	EV In-Life Operations Support	Charging Location Commissioning / Decommissioning	Charging Location Asset Monitoring	Electricity System Load Management	Contact Management	Billing Services Provision	Query & Reporting Services	System, Network & Infrastructure Operations	Information Service Provision	Market Research
	EV Communications Delivery	Domestic Charging Location Installation	Domestic Charging Activity Control	Price and Tarrif Management	Problem Handling & Resolution	Settlement Services Provision	Analytics Services Provision	User Identity and Access Processing	Navigation Data Provision	Standards Development & Publishing
	Battery Control System Delivery	Charging location Maintenance	Non Domestic Charging Activity Control	Electricity System Charging Control	Sales & Promotions	Fraud Detection & Revenue Protection	Master Data Management	End to End Service Monitoring	Entertainment Service Provision	Environmental Legislation Reporting
	Battery In-Life Operations Support		Discharge Activity Control				Knowledge Management	Project Delivery	Emergency Services Integration	

EV Intelligent Infrastructure – Business Competencies and Definitions (1)

Business Competency	Business Competency Definition
Electric Vehicle & Battery System Delivery	<p>This competency is focused on the research, design, development and subsequent operation of the control systems that will be part of electric vehicles and batteries. These control systems will be the mechanism by which the EV and battery will participate in the end to end evolution and operation of the intelligent infrastructure. This may include functionality in support of business processes and not just communication/interoperability services. Whilst this will be an area of significant differentiation between OEMs, aspects of these systems could be standard across EV and Battery providers, e.g. message protocols and functionality such as monitoring safety.</p>
Charging Location Infrastructure Provision	<p>This competency is focused on the planning, construction, commissioning and maintenance of charging location infrastructure. It covers domestic, private commercial and public commercial charging locations. Charging Location Infrastructure relates to the non regulated electricity infrastructure, as against the regulated infrastructure which the DNO is responsible for.</p>
Charging Location Operation	<p>This competency is focused on the operational activities of a charging location. It covers domestic, private commercial, public and public commercial charging locations. This would include operational performance in relation to charging location status and availability, the management of bookings and the charging activities themselves.</p>
Electricity System Operation	<p>This competency is focused on the operational activities connected with the provision of electricity to a charging location. It covers supply to domestic, private commercial and public commercial charging locations. The major business components here are concerned with the management of the demand and supply for electricity relating to EV charging and also any retail electricity models which may be developed in support of EV charging. It does not deal with the provision of infrastructure which the DNO would be undertaking as the extension and replacement of infrastructure is already a DNO activity. It does deal with the analysis of demand which may feed into the commissioning of electricity infrastructure. If Charging Infrastructure becomes a regulated asset, then this would have a major influence on the strategy, management and activities of the competency.</p>
Customer Relationship Services	<p>This competency area is focused on the management of customers, users and accounts relating to EV charging. Included here are activities which might be performed by multiple organisations which hold relationships with users. This includes for example the management of activity providing access to the charging infrastructure, e.g. a smart card, key fob, RFID tag, etc. It does not imply that all Customer Relationship Services for all actors are done by one organization.</p>

EV Intelligent Infrastructure – Business Competencies and Definitions (2)

Business Competency	Business Competency Definition
Payment, Billing & Settlement Services	<p>This competency area is focused on the provision of information and services to support payment, billing and settlement activity. Payment Services - the focus here is on providing information and services which support the processing of payments connected with the charging activity - recipients would include the charge location operator and the electricity retailer. The II is a facilitator here and it is not expected that it would be used to take or authorise payments itself. Billing Services - the focus is on providing information and services which allow relevant actors to produce bills and statements. It is not expected that the II would be producing bills and statements directly. Settlement Services - The focus here is around ensuring that where relevant, participants in a charging activity are compensated for their part in it. It would apply to actors such as electricity retailers and charge location operators. At this stage, the term Settlement as used here is not intended to refer to the existing electricity market settlements process. There will be further consideration of this in a later deliverable (SP2/IBM/23).</p>
Intelligent Infrastructure Information Management & Analytics	<p>This competency area is focused on the management of information within the intelligent infrastructure and provision of analytics to users of it. The main components of the strategy are information management strategy, master data management and supporting the flow of information in and out of the II. Analytics is focused on the provision of capability for exploration and investigation of performance to gain insight and drive business planning. This could include the production of more traditional reports, queries, dashboards, through to enabling more dynamic investigations and queries.</p>
Intelligent Infrastructure Provision	<p>This competency area is focused on the capabilities required to operate the intelligent infrastructure, integrate the different elements of it and make sure it is performing effectively. It includes key infrastructure integrator activity around service management and integration, IT system operations, security and monitoring. This category of infrastructure does not include charge location provision and electricity system provision which are covered elsewhere.</p>
Beyond the Vehicle Service Provision	<p>This competency area is focused on additional capabilities that may be supported through utilising the intelligent infrastructure. The main elements of this area currently identified include the provision of information and services which enhance the operation of the electric vehicle intelligent infrastructure. It also identifies the provision for integration with the emergency services. The capabilities shown in the model are illustrative of the capabilities which could be potentially created – there is likely to be a lot more.</p>
Strategy, Regulation & Legislation	<p>This competency area is focused on the capability that provides strategic, regulatory and legislative services connected to the EV market where operation of the intelligent infrastructure plays a part. The strategic element covers the activity which will support the evolution of the intelligent infrastructure to help the services remain relevant and keeping it in tune with what will be an evolving situation. The regulatory element covers the activity that may develop around regulation, including for example the regulation of charging assets. This could be an official industry regulatory body, (along the lines of OFGEM), regulation of any markets which develop, ombudsmen type services. The legislative element refers to the development of laws, the development of and reporting against environmental targets and other similar activities.</p>

EV Intelligent Infrastructure – Business Components and Definitions – Electric Vehicle & Battery System Delivery

Component	Dimension	Description
EV Control System R & D Strategy	Direct	EV Control System R & D Strategy addresses the future orientated, creative work undertaken to identify and qualify the functionality of control systems which will be part of electric vehicles, and which will be the mechanism by which the EV will participate in the end to end evolution and operation of the intelligent infrastructure
Battery Control System R & D Strategy	Direct	Battery Control System R & D Strategy addresses the future orientated, creative work undertaken to identify and qualify the functionality of control systems which will be part of battery units provided for electric vehicle use, and which will be the mechanism by which the battery will participate in the end to end evolution and operation of the intelligent infrastructure
EV Control System Product Development	Control	EV Control System Product Development refers to the identification and design of electronic vehicle control system products and features. The focus here being on those products and features which are designed to be utilised as part of the intelligent infrastructure. It specifies and manages the processes, activities, rules and exception handling that will be applied.
Battery Control System Product Development	Control	Battery Control System Product Development refers to the identification and design of battery control system products and features. The focus here being on those products and features which are designed to be utilised as part of the intelligent infrastructure. It specifies and manages the processes, activities, rules and exception handling that will be applied.
EV Control System Delivery	Execute	EV Control System Delivery refers to the production of the EV Control System, providing the following functionality:- <u>EV Charging Connection</u> Includes EV control system diagnostics, condition and state information and aspects of safety monitoring relating to the EV. <u>Condition Monitoring</u> - Includes diagnostics and monitoring to determine proactively the potential for a failure whilst also being able to determine the cause of a specific fault. <u>Configuration Mgt</u> - Concerning aspects such as draw capacity, type of charging supported (standard, rapid, fast) which interfaces are supported, what services are offered <u>Vehicle State</u> - Concerning aspects such as remaining range, current charge capacity <u>Safety</u> - EV System Safety will be built in and kept in step with any relevant evolution of the EV
EV In-Life Operations Support	Execute	EV In-Life Operations Support deals with the monitoring of EV components to assess and advise on changes to the operation of the EV
EV Communications Delivery	Execute	EV Communications Delivery concerns the interaction of the vehicle with other services external to it. This would include charging posts, wireless networks and meter devices. The services utilised here allow the EV to send and receive information across a range of transactions
Battery Control System Delivery	Execute	Battery System Delivery refers to the production of the Battery Control System, providing the following functionality - battery control system diagnostics, condition and state information, (charge state, battery condition etc.) and aspects of safety monitoring relating to the battery system which are not covered through the EV Control System
Battery System In-Life Operations Support	Execute	Battery System In-Life Operations Support deals with the monitoring of Battery System components to assess and advise on changes to the operation of the Battery System.

EV Intelligent Infrastructure – Business Components and Definitions – Charging Location Infrastructure Provision

Component	Dimension	Description
Charging Location Strategy	Direct	Charging Location Strategy establishes the strategy for the development of charging locations. Most likely to be multiple strategies across stakeholders and market segments. It creates and maintains the roadmap and approach for achieving objectives, and outlines the resources required and activities involved
Charging Location Maintenance Strategy	Direct	Charging Location Maintenance Strategy is aimed towards establishing the strategy for the maintenance of charging locations and assets at those locations – will vary between actors.
Charging Location Demand Analysis	Control	Charging Location Demand Analysis concerns monitoring and identifying demand in terms of new charging locations but also at existing locations. Considering factors including trends, usage patterns, EV take up, types of charging activity and complementary developments. The latter could include establishing the potential for EV charging at new out of town commercial developments. It specifies and manages the processes, activities, rules and exception handling that will be applied to the services.
Charging Location Planning	Control	Charge Location Planning deals with all the activity required to realise the strategy for the creation and development of the charging location. Includes planning activity connected with gaining permission to develop the location as well as putting in place the logistical plans for development. It specifies and manages the processes, activities, rules and exception handling that will be applied to the services.
Charging Location Design	Control	Charging Location Design deals with the design of the location in terms of safety, usability, interaction, effectiveness and efficiency.
Charging Location Asset Management	Control	Charging Location Asset Management concerns work management, field force enablement, service management, inventory management, and procurement.
Charging Location Construction	Execute	Charging Location Construction covers the building of a charging location
Charging Location Commissioning / Decommissioning	Execute	Charging Location Commissioning incorporates the activity undertaken when bringing a charging location and / or assets at a charging location into service. Decommissioning refers to removal of a charge location / asset from service
Domestic Charging Location Installation	Execute	Domestic Charging Location Installation relates to providing the assets that will manage and deliver the charging activity at the charging location. This could include installing a smart meter in the home as well as installing charging posts
Charging Location Maintenance	Execute	Charging Location Maintenance is an activity connected to the maintenance of charging locations and the assets at those locations. Enables assets to be kept operational and for information to be provided about the status of the assets

EV Intelligent Infrastructure – Business Components and Definitions – Charging Location Operation

Component	Dimension	Description
Charging Location Operation Strategy	Direct	Charging Location Operation Strategy develops the strategy for the operation of charging locations once commissioned. It creates and maintains the roadmap and approach for achieving objectives, and outlines the resources required and activities involved.
Charging Location Performance Management	Control	Charging Location Performance Management manages the performance of charging locations once in operation. It specifies and manages the processes, activities, rules and exception handling that will be applied to the services. Includes day to day oversight and control of the activity at the locations.
Charging Location Availability and Booking Management	Execute	Charging Location Availability and Booking Management deals with the provision of information relating to the availability of charging locations to EV owners and users. Also covers the more sophisticated functionality which allows an EV owner / user to book slots at charging locations
Charging Location Asset Monitoring	Execute	Charging Location Asset Monitoring monitors the status and operation of the charging location and assets at that location. Links with the scheduling of maintenance and helps support the management of availability. Aspects of safety concerned with the asset or location itself are handled here. Enables assets to be kept operational and for information to be provided about the status of the assets.
Domestic Charging Activity Control	Execute	Domestic Charging Activity Control provides support for activities concerned with the actual charging event itself at domestic locations. Any aspects of pricing, charging variable management and scheduling are handled here. Dynamic pricing, expected to feature in more sophisticated business models - including time of day, location, availability, power availability, etc is handled here. It includes any aspects of safety related to the charging activity itself
Non Domestic Charging Activity Control	Execute	Non Domestic Charging Activity Control provides support for activities concerned with the actual charging event itself at non domestic locations - includes work, office, on-street, public car park, retail park). Any aspects of pricing for charging, charging variable management and scheduling are handled here. Dynamic pricing, expected to feature in more sophisticated business models -including time of day, location, availability, power availability, etc is handled here. It includes any aspects of safety related to the charging activity itself
Discharge Activity Control	Execute	Discharge Activity Control provides support for activity concerned with scenarios where power in the EV is discharged. The two main scenarios are Vehicle to Grid (V2G) and Vehicle to Home (V2H). In more intelligent and evolved business models this activity may be handled as a part of and end to end charging transaction. V2G in particular would include pricing for use of the electricity in the vehicle, taking into account factors such as time of day, location, availability, etc. It includes any aspects of safety related to the charging activity itself

EV Intelligent Infrastructure – Business Components and Definitions – Electricity System Operation

Component	Dimension	Description
Electricity System Operations Strategy	Direct	Electricity System Operations Strategy concerns the development of the strategy for the operation of the electricity service specifically in support of electric vehicles. It creates and maintains the roadmap and approach for achieving objectives, and outlines the resources required and activities involved. The strategy will clearly need to be compliant with any regulatory requirements – for example if it is decided that charging infrastructure should be regulated.
Electricity System Emergency Planning	Direct	Electricity System Emergency Planning develops emergency plans for the electricity service to allow for the operational impact of electric vehicles
Electricity System Network Load Analysis	Control	Electricity System Network Load Analysis concerns management of activity to analyse the impact on the electricity service of the load required to support the operation of electric vehicles. It specifies and manages the processes, activities, rules and exception handling that will be applied to the services.
Electricity System Operational Performance Management	Control	Electricity System Operational Performance Management monitors and manages the operational performance of the electricity service provided to support electric vehicles. It specifies and manages the processes, activities, rules and exception handling that will be applied to the services.
Electricity System Demand Forecasting	Execute	Electricity System Demand Forecasting relates to the assessment of demand from the operation of electric vehicles in context of the wider electricity system. It involves analysis of demand based on historic and dynamic information on usage, journeys, season, time of day, locations, etc.
Electricity System Load Management	Execute	Electricity System Load Management deals with the issues around managing the supply of electricity to the network, including the provision of constraints and rules to be factored into the use of charging locations
Electricity System Price and Tariff Management	Execute	Electricity System Price and Tariff Management is concerned with managing prices and tariffs in relation to the provision of electricity for charging an electric vehicle or battery – from an initial price which does not differentiate from the 'normal' price of electricity to, in more complex business models, dynamic pricing which would take into factors such as time of day, location, availability, network load, over / under supply, etc. It also covers the management of prices for vehicle to grid transactions.
Electricity System Charging Control	Execute	Electricity System Charging Control refers to the capability, in the Smart Business Model, to be able to control centrally individual or groups of charging activities.

EV Intelligent Infrastructure – Business Components and Definitions – Customer Relationship Services

Component	Dimension	Description
Customer Relationship Strategy	Direct	Customer Relationship Strategy develops the direction, scope and objectives for providing customer services in the intelligent infrastructure. It creates and maintains the roadmap and approach for achieving those objectives and outlines the resources required and activities involved
Channel Strategy	Direct	Channel Strategy develops the direction, scope and objectives for providing services across different channels in the intelligent infrastructure. It creates and maintains the roadmap and approach for achieving those objectives and outlines the resources required and activities involved. It considers which user segments will access services across different channels
Market Development	Direct	Market Development deals with establishing and maintaining a suitable pace and scope for the development of the market from a customer perspective
Customer Service Management	Control	Customer Service Management deals with the planning and oversight of customer services and channels supported through the intelligent infrastructure. It specifies and manages the processes, activities, rules and exception handling that will be applied to the services. It is likely that multiple different actors will establish and retain customer relationships regardless of the intelligent infrastructure so that the contribution here may be by way of integration of these relationships
Account Management	Execute	Account Management relates to the services provided through the intelligent infrastructure to allow actors to create and manage an account. This relates to the scenario where a customer will need to be registered with a central service to allow them to access EV and battery charging as the market develops
Contact Management	Execute	Contact Management supports the capability for recording relationships and interactions with customers and suppliers which are relevant to or generated from within the intelligent infrastructure
Problem Handling & Resolution	Execute	Problem Handling & Resolution supports the provision of services that assist in resolving issues with the operation of the intelligent infrastructure
Sales & Promotions	Execute	Sales & Promotions relates to activity for informing users of the intelligent infrastructure about product and service offerings which might be interesting to them and / or which might assist in the utilisation of elements of the infrastructure - e.g. registration with the intelligent infrastructure, discounts for charging if booked in advanced or at a particular location or at a particular time.

EV Intelligent Infrastructure – Business Components and Definitions – Payment, Billing & Settlement Services

Component	Dimension	Description
Payment Services Strategy	Direct	Payment Services Strategy develops the direction, scope and objectives for providing services to support payment activity in the Intelligent Infrastructure. It creates and maintains the roadmap and approach for achieving those objectives and outlines the resources required
Billing Services Strategy	Direct	Billing Services Strategy develops the direction, scope and objectives for providing services to support billing activity in the Intelligent Infrastructure. It creates and maintains the roadmap and approach for achieving those objectives and outlines the resources required
Settlement Services Strategy	Direct	Settlement Services Strategy develops the direction, scope and objectives for providing services to support settlement activity in the Intelligent Infrastructure. It creates and maintains the roadmap and approach for achieving those objectives and outlines the resources required
Payment Services Management	Control	Payment Services Management deals with the planning and oversight of the support of payment activity through the Intelligent Infrastructure. It specifies and manages the processes, activities, rules and exception handling that will be applied to the service
Billing Services Management	Control	Billing Services Management deals with the planning and oversight of the billing services provided through the Intelligent Infrastructure. It specifies and manages the processes, activities, rules and exception handling that will be applied to the service
Settlement Services Management	Control	Settlement Services Management deals with the planning and oversight of the settlement services provided through the Intelligent Infrastructure. It specifies and manages the processes, activities, rules and exception handling that will be applied to the services. A key focus here will be management of issue resolution for what will develop to be a largely automated service
Fraud Management	Control	Fraud Management deals with the planning and oversight of any fraud services provided through the Intelligent Infrastructure. It specifies and manages the processes, activities, rules and exception handling that will be applied to the services. Though actors may manage this within their own systems, the Intelligent Infrastructure is likely to have to provide services and information to support this
Payment Services Provision	Execute	Payment Services Provision allows for the provision and operation of payment services through the intelligent infrastructure. Whilst it is likely that in most scenarios, the intelligent infrastructure will not be used to request, authorise and take payment, there may be the need to provide services and information to support payment transactions
Billing Services Provision	Execute	Billing Service Provision covers activity to provide information that can be used to bill an actor for consumption of services, such as electricity, parking and information. Though individual actors may generate bills and statements from within their own customer systems, the Intelligent Infrastructure will need to provide information to support this
Settlement Service Operation	Execute	Settlement Service Operation deals with the provision and operation of settlement services concerning the charging of electric vehicles and batteries. It would include operation of any automated settlement services and the provision of manual services in support of it - e.g. resolving errors and disputes
Fraud Detection & Revenue Protection	Execute	Fraud Detection & Revenue Protection refer to the prevention, detection and recovery of losses caused by interference with electric vehicle charging services and electricity provision. Any organisation that is a major participant in supply and / or distribution will be affected. In time, it might grow to be a common service provided across key players

EV Intelligent Infrastructure – Business Components and Definitions – Intelligent Infrastructure Information Management & Analytics

Component	Dimension	Description
Information Strategy	Direct	Information Strategy establishes the overall approach for managing business information and for ensuring that the necessary content and capabilities are available to support the business strategy. It includes establishing governance policies and processes for business information, as well as assessing the information management implications of new technologies and services
Analytics Strategy	Direct	Analytics Strategy develops the approach for providing multiple stakeholders with appropriate types, levels and amounts of management information and analytics services
Master Data Planning & Governance	Control	Master Data Planning & Governance concerns the development of the approach to managing master data within the intelligent infrastructure and providing governance. It is here that the ground rules are defined and managed for master data
Information Planning & Governance	Control	Information Planning & Governance provides oversight to ensure that the collection, storage, and usage of business information / data is in accordance with established policies, standards and procedures, and that these activities are carried out effectively and efficiently
Data Extract & Upload Services	Execute	Data Extract & Upload provides operational services for data in the intelligent infrastructure. It can include services for acquiring data from outside sources, transforming the data for operational use (including aspects such as format, quality, completeness) and then uploading it for use
Query & Reporting Services	Execute	Query & Reporting Services concern provision of standard services for queries and management information type reporting
Analytics Services	Execute	Analytics Services concerns the provision of more sophisticated business intelligence to support the discovery and understanding of historical patterns with an eye to predicting and improving business performance in the future
Master Data Management	Execute	Master Data Management concerns the operational aspects of managing non-transactional data entities used within the intelligent infrastructure. The main objective is to provide capability for collecting, aggregating, matching, consolidating, quality-assuring, persisting and distributing such data to ensure consistency and control in the ongoing maintenance and application use of this information
Knowledge Management	Execute	Knowledge Management establishes the mechanisms for acquiring and disseminating the knowledge that is critical to the performance of the intelligent infrastructure. Activities include determining the overall knowledge requirements, defining roles and responsibilities, establishing a knowledge management capability, and capturing and sharing the relevant knowledge.

EV Intelligent Infrastructure – Business Components and Definitions – Intelligent Infrastructure Provision

Component	Dimension	Description
Service Management Strategy	Direct	Service Management Strategy defines the strategy, processes, standards and tools that enable and optimise IT service delivery. This includes defining service management strategy and goals together with establishing a service management framework
Business Technology & Governance Strategy	Direct	Business Technology & Governance Strategy involves monitoring current and emerging technologies, mapping these to required business capabilities, and articulating strategic assumptions that provide clear guidance for infrastructure deployment, use and decision-making
Service Delivery Control	Control	Service Delivery Control involves planning the environment in which services will be executed and delivered on a day-to-day basis
Enterprise Architecture	Control	Enterprise Architecture defines, and maintains the interrelationships between, the business process architecture, the information architecture, the application and services architectures, and the infrastructure architecture
Change Deployment Control	Control	Change Deployment Control, when appropriate, approves and coordinates the deployment of changes / releases to services and solutions. It ensures compliance with relevant policies, standards and approvals and manages risks and dependencies associated with any deployment
Security, Privacy and Data Protection	Control	Security, Privacy and Data Protection addresses issues and risks related to the ability to control access to business / personal information and data. Its scope includes both physical and logical security measures which might be required
Service Integration	Execute	Service Integration addresses the requirement to manage the provision of services from multiple providers as part of an end to end capability. This is a key capability as it will help to ensure the effective, efficient and safe operation of the intelligent infrastructure
Service, Network and Infrastructure Operations	Execute	Service, Network and Infrastructure Operations involves the day-to-day operation of the intelligent infrastructure capabilities to meet the service workload in line with user expectations. It also involves assisting internal and external users to resolve issues and problems with IT services
User Identity and Access Processing	Execute	User Identity and Access Processing controls access to applications, data, and resources, protecting business and personal information from unauthorised access, in addition to enforcing policies for acceptable use of the infrastructure and services
End to End Service Monitoring	Execute	End to End Service Monitoring provides any capabilities required to monitor the end to end effectiveness, performance and availability of the intelligent infrastructure
Project Delivery	Execute	Project Delivery, where required and appropriate, provides a capability to support the successful deployment of a changes / release to the intelligent infrastructure

EV Intelligent Infrastructure – Business Components and Definitions – Beyond the Vehicle Service Provision

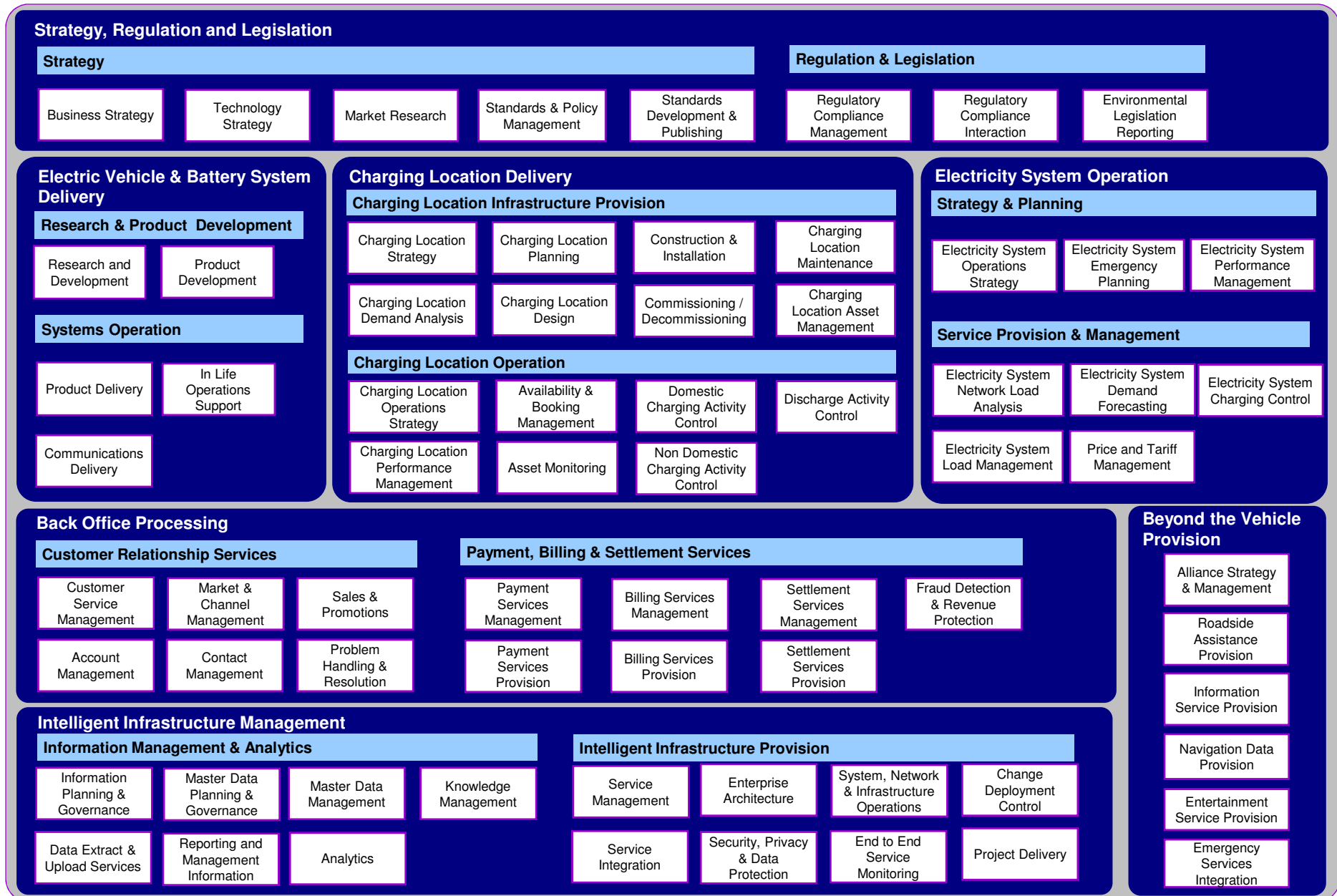
Component	Dimension	Description
Alliance Strategy	Direct	Alliance Strategy develops the direction, scope and objectives for development of alliances in respect of the provision of added value services via the Intelligent Infrastructure. It creates and maintains the roadmap and approach for achieving those objectives and outlines the resources required.
Alliance Management	Control	Alliance Management - the management of alliances with added value service providers including contract management and performance management
Roadside Assistance Provision	Execute	Roadside Assistance - services providing roadside assistance in the context of electric vehicles - e.g. able to rapid charge, replace battery, etc
Information Service Provision	Execute	Information Service Provision - information services that can be integrated and used within the Intelligent Infrastructure - e.g. weather data, event details, etc
Navigation Data Provision	Execute	Navigation Data Provision - navigation data and services that can be integrated and used within the Intelligent Infrastructure
Entertainment Service Provision	Execute	Entertainment Service Provision - entertainment services that can be integrated and made available as part of the Intelligent Infrastructure
Emergency Services Integration	Execute	Emergency Services Integration enables the Intelligent Infrastructure to link with the provision of emergency services

EV Intelligent Infrastructure – Business Components and Definitions – Strategy, Regulation & Legislation

Component	Dimension	Description
Regulatory & Compliance Strategy	Direct	Regulatory & Compliance Strategy involves developing the end to end strategy for regulation and compliance in the market. Includes definition of the areas where regulation might apply (e.g. charging infrastructure assets) and what the rules and objectives are for regulation and compliance, as well as timescales
Intelligent Infrastructure Business Strategy	Direct	Intelligent Infrastructure Business Strategy covers activity for the development and support of a long term plan of action designed to achieve the goals and objectives for the Intelligent Infrastructure and EV market development. Provides the game plan for strengthening the performance of end to end markets and illustrates how things will be conducted to achieve the desired goals
Standards & Policy Strategy	Direct	Standards & Policy Strategy concerns the identification of policy concerning the Intelligent Infrastructure and identification of areas which require standards to be defined. Establishes which standards groups or initiatives are key – addresses how to influence and participate in these efforts.
Regulatory Compliance Management	Control	Regulatory Compliance Management concerns elements of the market which are regulated, this involves providing oversight and control for business activities relating to regulatory interactions.
Risk Management	Control	Risk Management concerns the identification, assessment, and prioritisation of risks followed by coordinated and economical application of resources to monitor and mitigate the impact of unfortunate events impacting the intelligent infrastructure
Standards Roadmap Planning	Control	Standards Roadmap Planning concerns identification of specific standards based on the strategy and also the definition of the approach that will be taken to the subsequent development of standards. Involves liaison with government and industry to understand the timelines.
Regulator Interaction	Execute	Regulator Interaction encompasses activity relevant to elements of the market which are regulated. It supports the execution of business as usual interaction with the appropriate regulator(s), producing the information that maybe required by them
Market Research	Execute	Market Research takes forward the continual assessment of the trends, perceptions and requirements of actors in the electric vehicle market. Includes consumers, service providers and infrastructure developers. Helps keep the intelligent infrastructure relevant
Standards Development & Publishing	Execute	Standards Development & Publishing concerns the development and publishing of standards relating to the intelligent infrastructure and electric vehicle market. It would be undertaken against the roadmap and use the approach defined in the Control area.
Environmental Legislation Reporting	Execute	Environmental Legislation Reporting relates to supporting the need to demonstrate the contribution of electric vehicle market development and promotion to environmental targets

EV Intelligent Infrastructure - *Capability View* of the Component Business Model

A view of the Business Component Model is presented below in an alternative format which readers may find easier to take in. This format is used for presentation purposes only – all analysis is undertaken on the full version of the model shown earlier on slide 14.

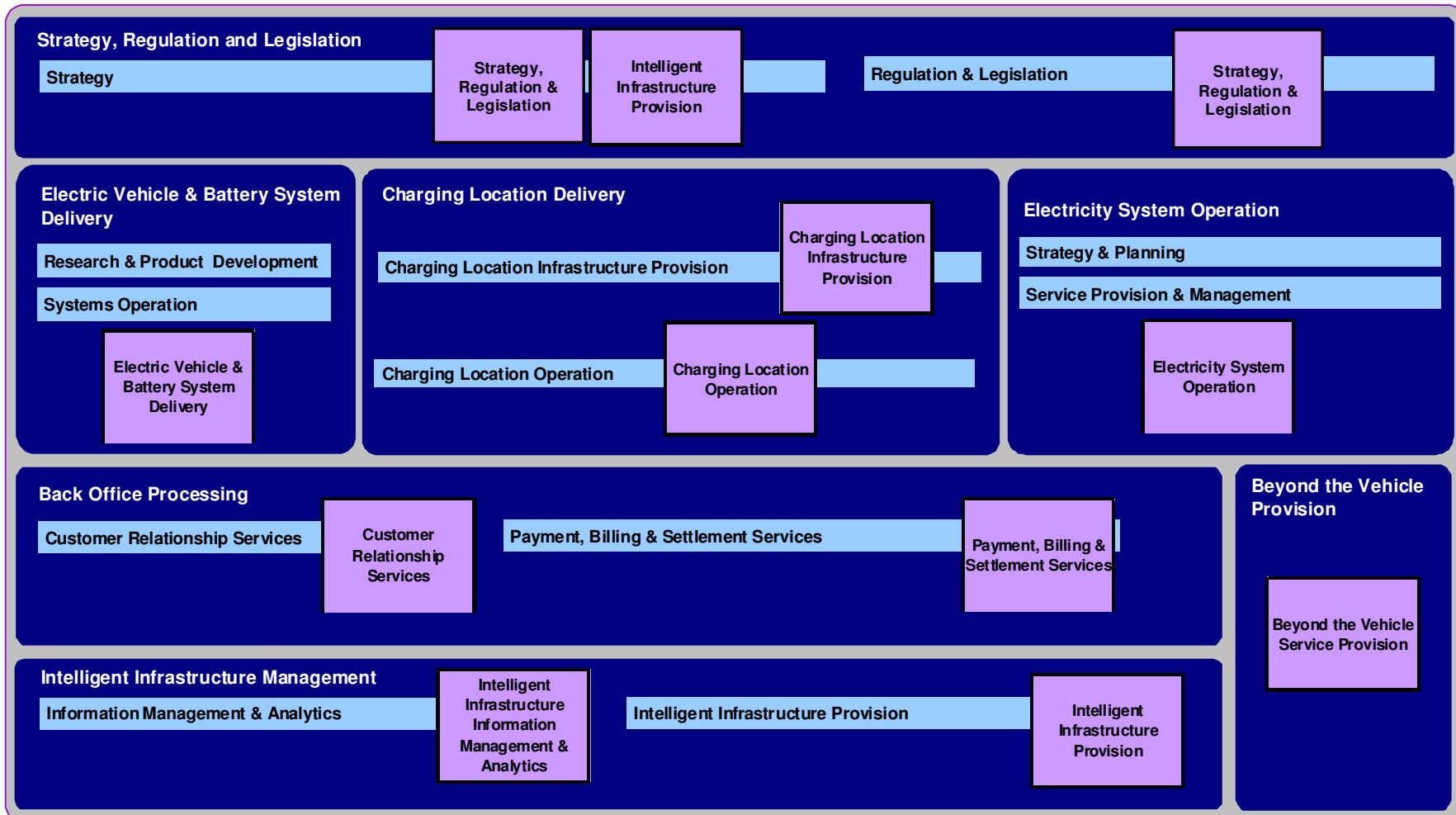


EV Intelligent Infrastructure – Mapping of the Full Version of the CBM (Slide 14) to the Capability View

The following Business Competencies (and their related components – not shown for practical reasons) from the full model:-

Electric Vehicle & Battery System Delivery	Charging Location Infrastructure Provision	Charging Location Operation	Electricity System Operation	Customer Relationship Services	Payment, Billing & Settlement Services	Intelligent Infrastructure Information Management & Analytics	Intelligent Infrastructure Provision	Beyond the Vehicle Service Provision	Strategy, Regulation & Legislation
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....have been mapped to the Capability view as follows:-



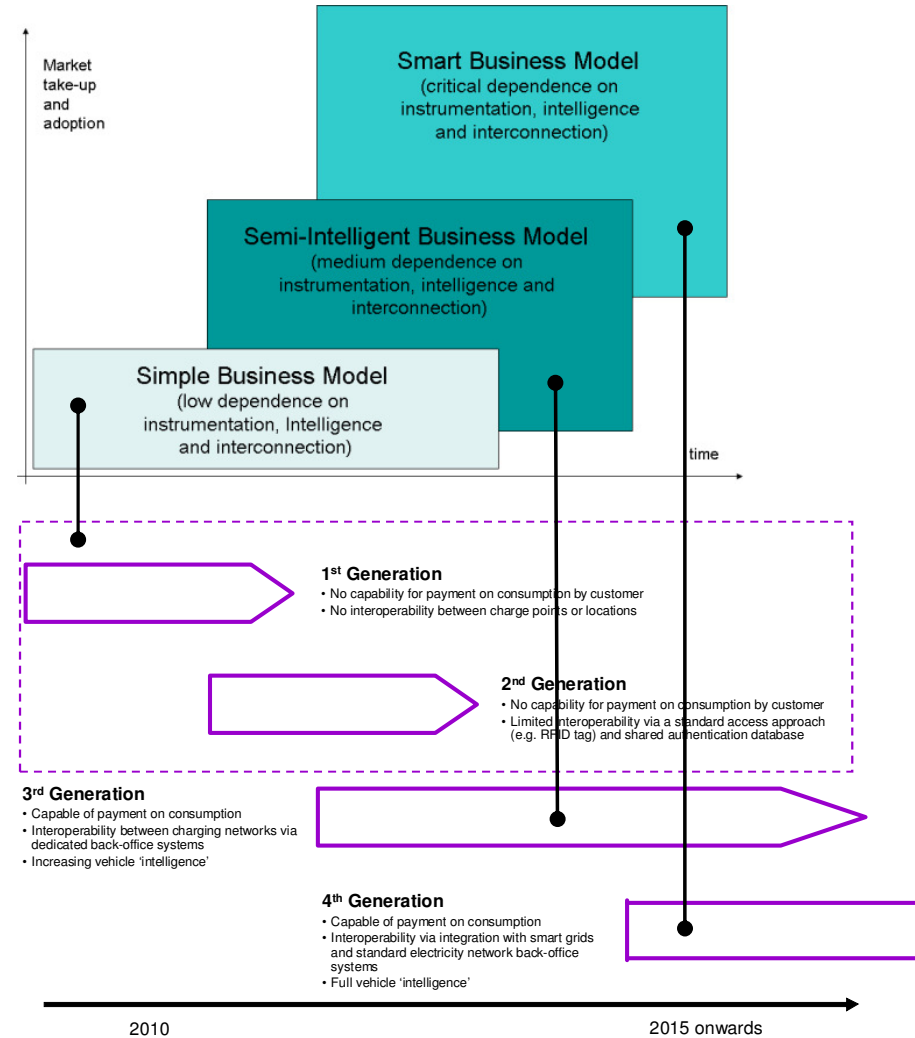


ETI EV Work Package 2.4

SP2/IBM/16 EV Intelligent Infrastructure Conceptual Business Architecture – Evolutionary Models

EV Intelligent Infrastructure - Conceptual Business Architecture – Evolutionary Models Background

- The model defined in the previous section is the full model – comprising all competencies and components that have been analysed currently. As such the model ignores the dimension of time and does not consider at which stages of evolution a competency and its associated components will come into existence, or how they will develop to cope with more sophisticated requirements. As an example, the current EV market has no Intelligent Infrastructure Competency and no Regulation Competency, but the market exists and is functioning. In the analysis that follows it is proposed that these competencies would come into existence in the next stage of market evolution (Semi-Intelligent) and would develop further in subsequent stages.
- So, the questions to be answered are, at what point are these competencies likely to come into existence, what are the primary requirements they must meet and how will they develop going forwards – in response to the growing complexity of requirements they must provide for?
- In order to start to answer these questions, three versions of the model are provided in this section - one for each of the stages of evolution of the market as defined by the ETI (as shown right). The three models show competencies and components which are likely to exist at that stage of the market evolution, and highlights those which may not.
- Note the timelines on the lower graphic - during the production of this deliverable, it has become very clear that there are wide discrepancies amongst stakeholders concerning the timelines for the realization of the 3rd Generation and 4th Generation Business Models.*

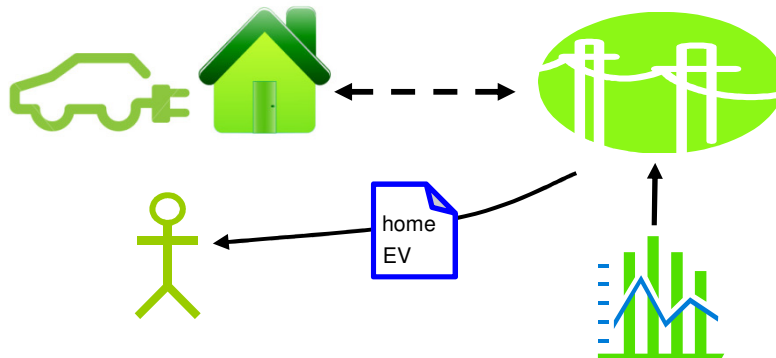


Derived from : Plugging-in Ultra Low Carbon Vehicles Developing and Testing the Pathways to a Self-sustaining Mass-market – ETI March 2010

EV Intelligent Infrastructure - Conceptual Business Architecture – Evolutionary Stages – Illustrative Business Process Models

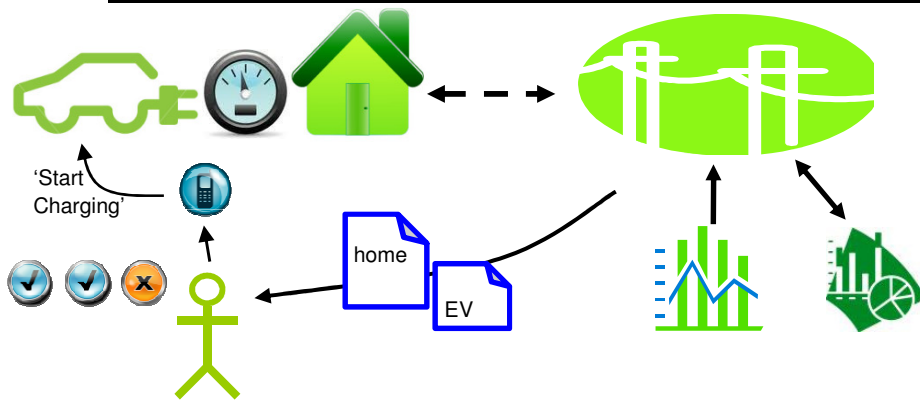
- As an aid to understanding the stages of evolutionary development, a number of illustrative business process models have been developed depicting a likely process at each evolutionary stage.
- The purpose of these depictions is to give the reader an insight into the business processes occurring at that stage of the evolution of the EV market – they are not intended to be formal business process definitions.

EV Intelligent Infrastructure - Conceptual Business Architecture - Illustrative Business Process Model - Domestic Charging – Simple/Semi/Smart Scenarios



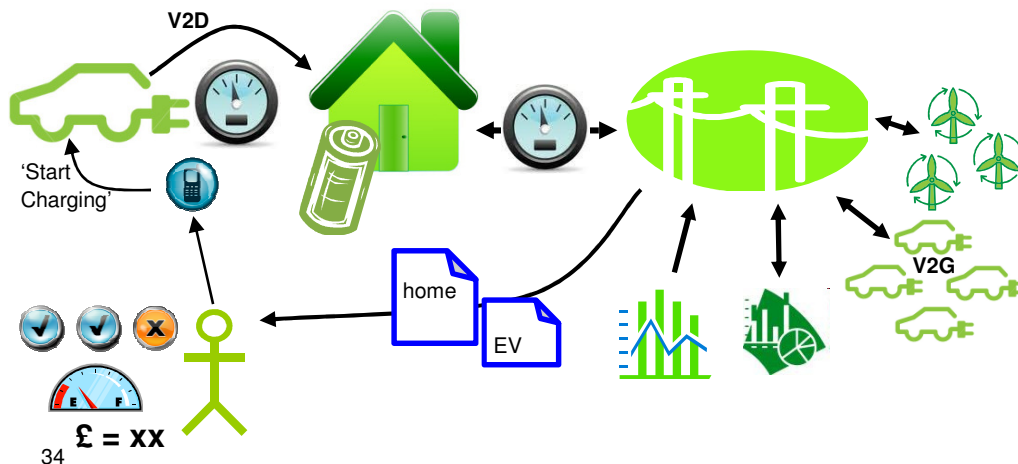
Simple Model

- EV plugged in at home
- Simple cable or specific charge point
- Start charging immediately on plugging in, or simple delay timing to start charging when off peak electricity available – either by use of a plug in timer switch or built in to the home charge point
- Normal domestic connection to LV / HV network
- Usage accounted for on existing electricity bill
- No changes to the way in which demand for electricity is managed currently - largely by historic and trend based information



Semi-Intelligent Model

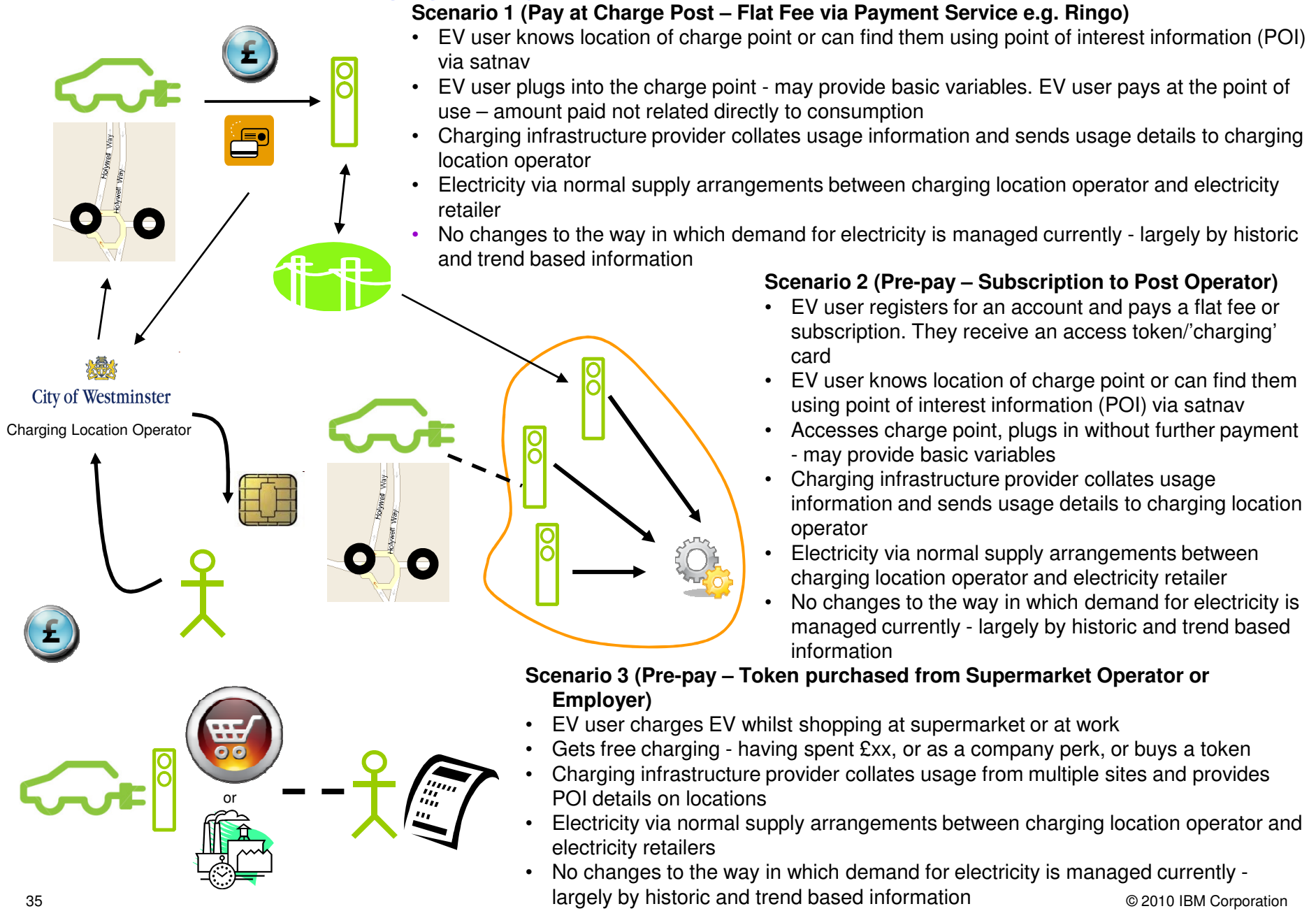
- Increased use of specific charge points
- More time of use management through the car and charge point but still based around timing rather than interaction with the grid
- Ability to control charging remotely via mobile phone / internet
- Ability to specify some variables for when / how to charge
- User may have a specific tariff or separate bill for EV charging usage
- Demand for electricity managed using similar information but collected at a lower granularity and higher frequency



Smart Model

- Increased use of specific charge points
- Domestic buffer stationary storage where the 'smart' aspect is applied to the lower tech stationary store which can be used to top up the car when required ie decoupling of the vehicle and the network constraints
- Sophisticated time of use management through interactions with the smart meter and grid
- Able to specify increased range of variables including price, etc
- User likely to have flexible and specific tariff for EV charging usage
- Demand for electricity managed more dynamically with real time decisions made on demand and supply based on historical, projected and actual network loads

EV Intelligent Infrastructure - Conceptual Business Architecture - Illustrative Business Process Model - Non-Domestic Charging – Simple Scenarios



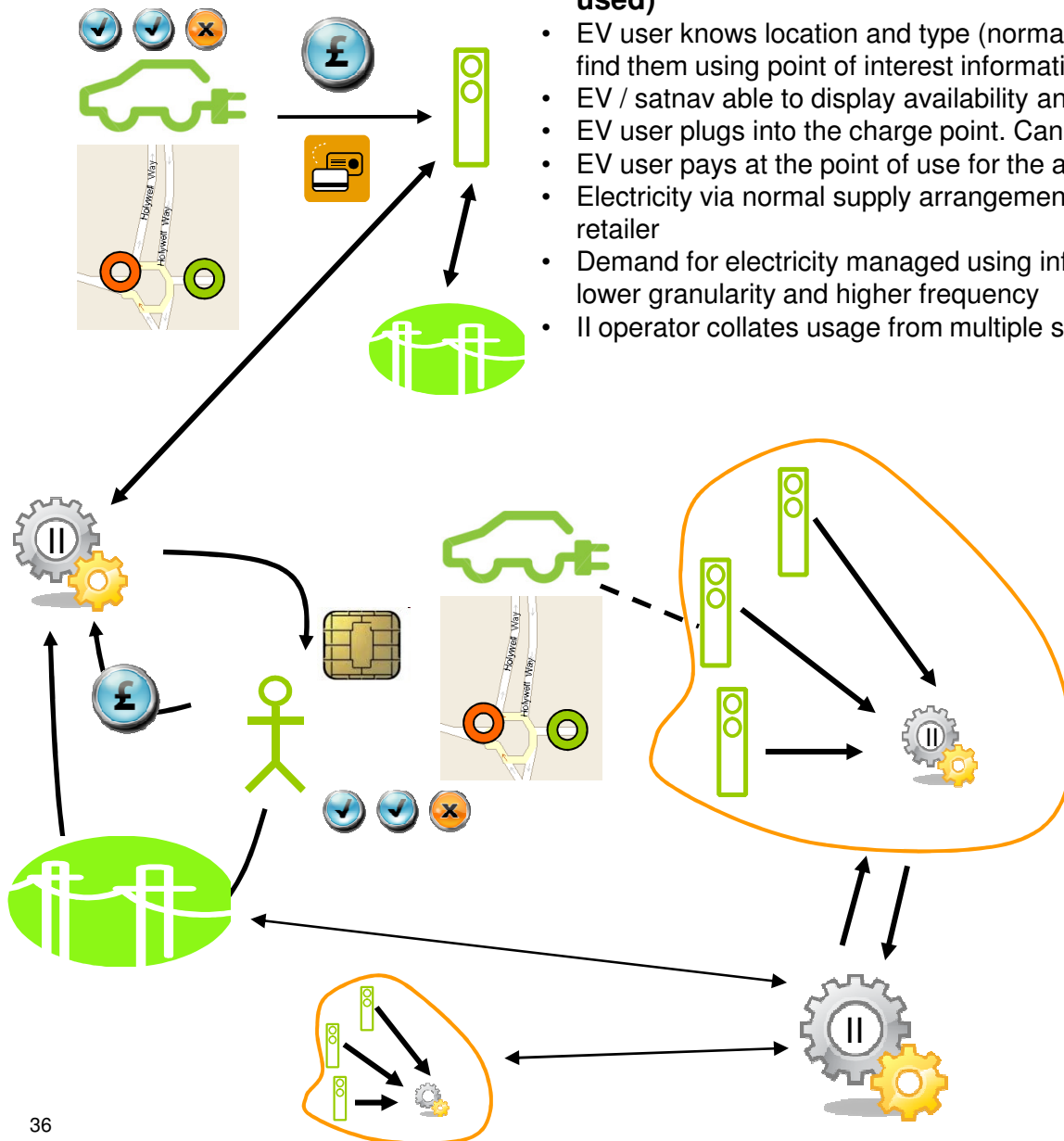
EV Intelligent Infrastructure - Conceptual Business Architecture - Illustrative Business Process Model - Non-Domestic Charging – Semi Intelligent Scenarios

Scenario 1 (Pay by consumption, at point of use depending on actual services used)

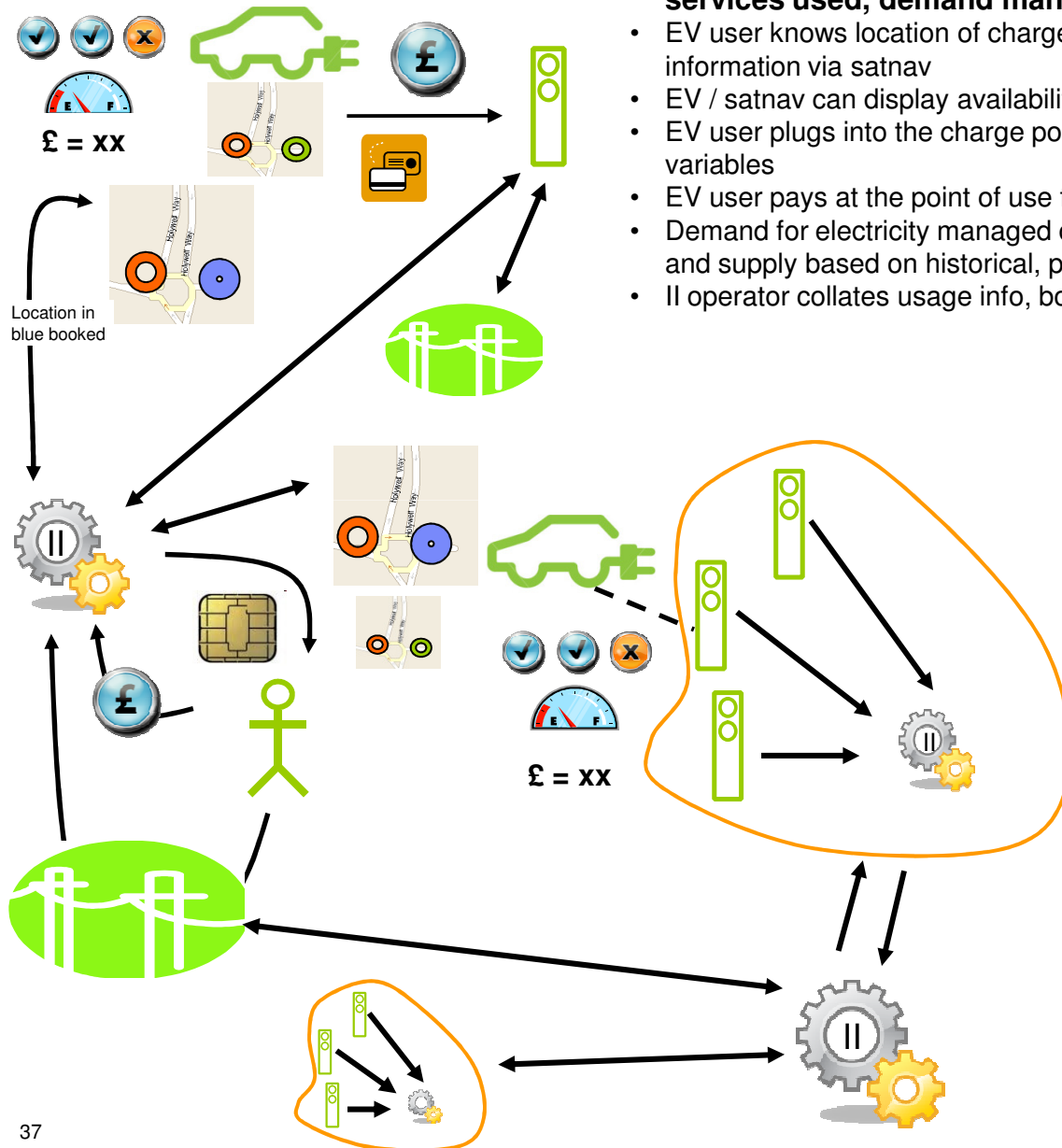
- EV user knows location and type (normal/fast/rapid & connector type) of charge point or can find them using point of interest information via satnav
- EV / satnav able to display availability and other information to the driver
- EV user plugs into the charge point. Can specify some variables on charging
- EV user pays at the point of use for the actual services consumed, including electricity
- Electricity via normal supply arrangements between charging location operator and electricity retailer
- Demand for electricity managed using information similar to Simple Model - but collected at a lower granularity and higher frequency
- II operator collates usage from multiple sites & provides location POI details

Scenario 2 (Pay by account, post-use)

- EV User registers for an account and pays a flat fee or subscription or indicates an existing account with an energy provider. They receive an access token/'charging' card
- EV user knows location and type (normal/fast/rapid & connector type) of charge point or can find them using point of interest information through a satnav
- EV / satnav able to display availability and other information to the driver
- Accesses charge point, plugs in without further payment. Can specify some variables on charging
- Charging location operator collates usage information and sends usage details to II operator
- II operator generates and distributes information to allow settlement and clearing of billing and payments
- Demand for electricity managed using similar information but collected at a lower granularity and higher frequency
- II operator collates usage from multiple sites & provides location POI details



EV Intelligent Infrastructure - Conceptual Business Architecture - Illustrative Business Process Model - Non-Domestic Charging – Smart Scenarios



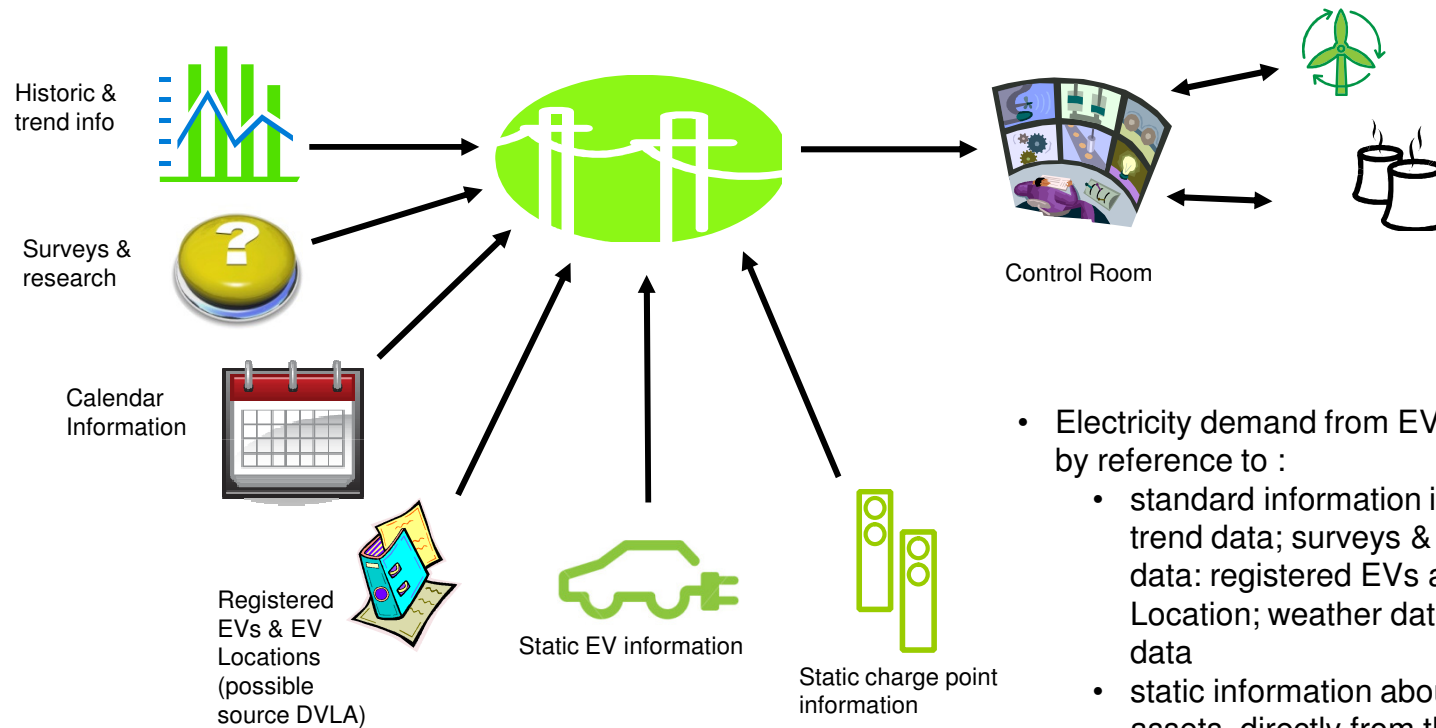
Scenario 1 (Pay by consumption, at point of use depending on actual services used, demand managed in real-time)

- EV user knows location of charge point or can find them using point of interest information via satnav
- EV / satnav can display availability – EV / user able to book slot before or during travel
- EV user plugs into the charge point and selects required options from list of charging variables
- EV user pays at the point of use for services and electricity consumed
- Demand for electricity managed dynamically with real time decisions made on demand and supply based on historical, projected and actual network loads
- II operator collates usage info, bookings info, demand info, etc

Scenario 2 (Pay by account, post-use, demand managed in real-time)

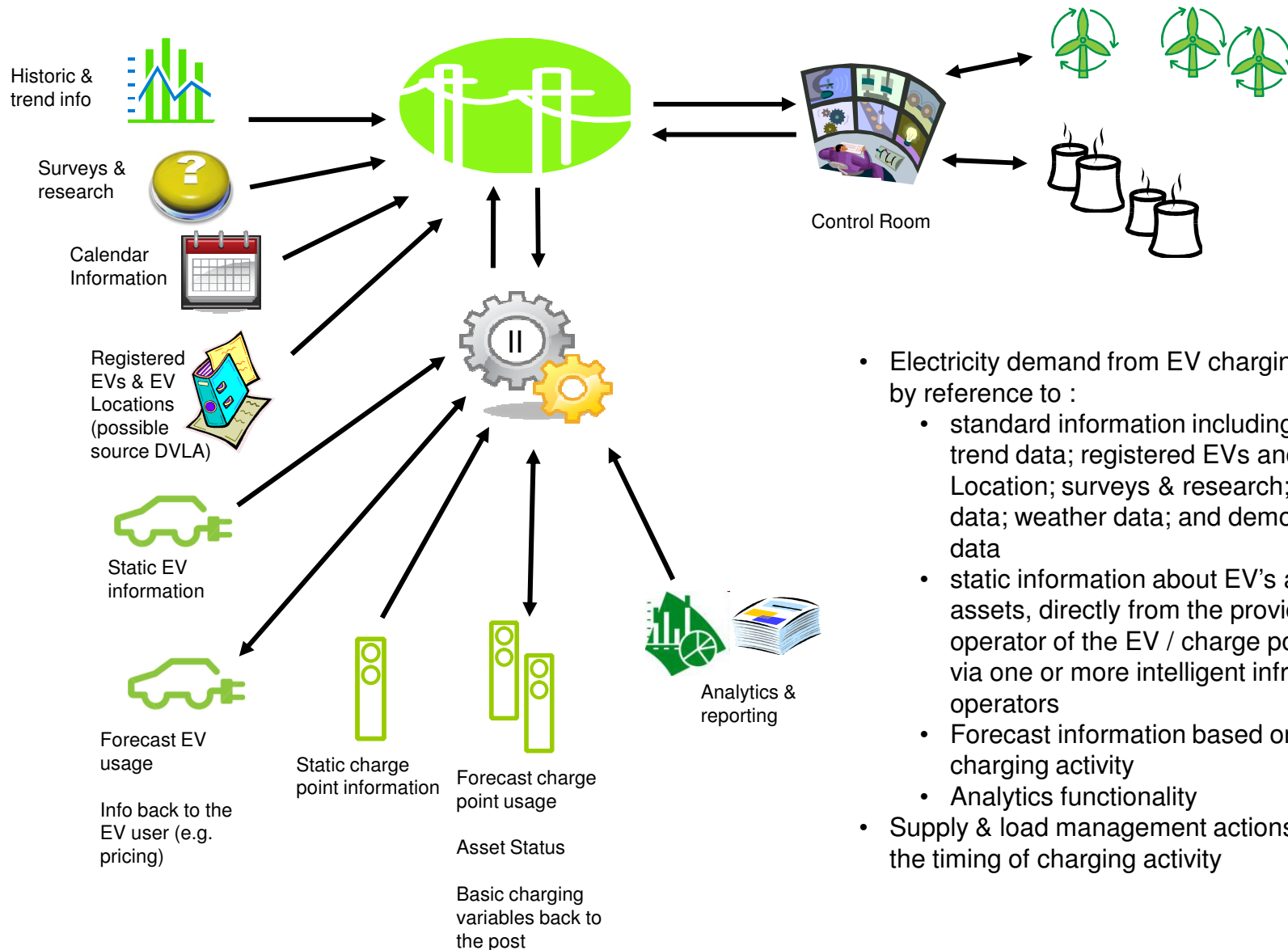
- EV User registers for an account and pays a flat fee or subscription or indicates an existing account with an energy provider They receive an access token/'charging' card
- EV user knows location of charge point or can find them using point of interest information through a satnav
- EV / satnav able to display availability – EV / user able to book slot before or during travel
- Accesses charge point, plugs in without further payment and selects required options from range of variables including for example type of charge – normal, fast, rapid (noting difference in prices).
- Charging location operator collates usage information and sends usage details to II operator
- II operator generates and distributes information to allow settlement and clearing of billing and payments
- Demand for electricity managed dynamically with real time decisions made on demand and supply based on historical, projected and actual network loads
- II collates usage info, bookings info, demand info, etc

EV Intelligent Infrastructure - Conceptual Business Architecture - Illustrative Business Process Model - Demand & Supply Management - Simple



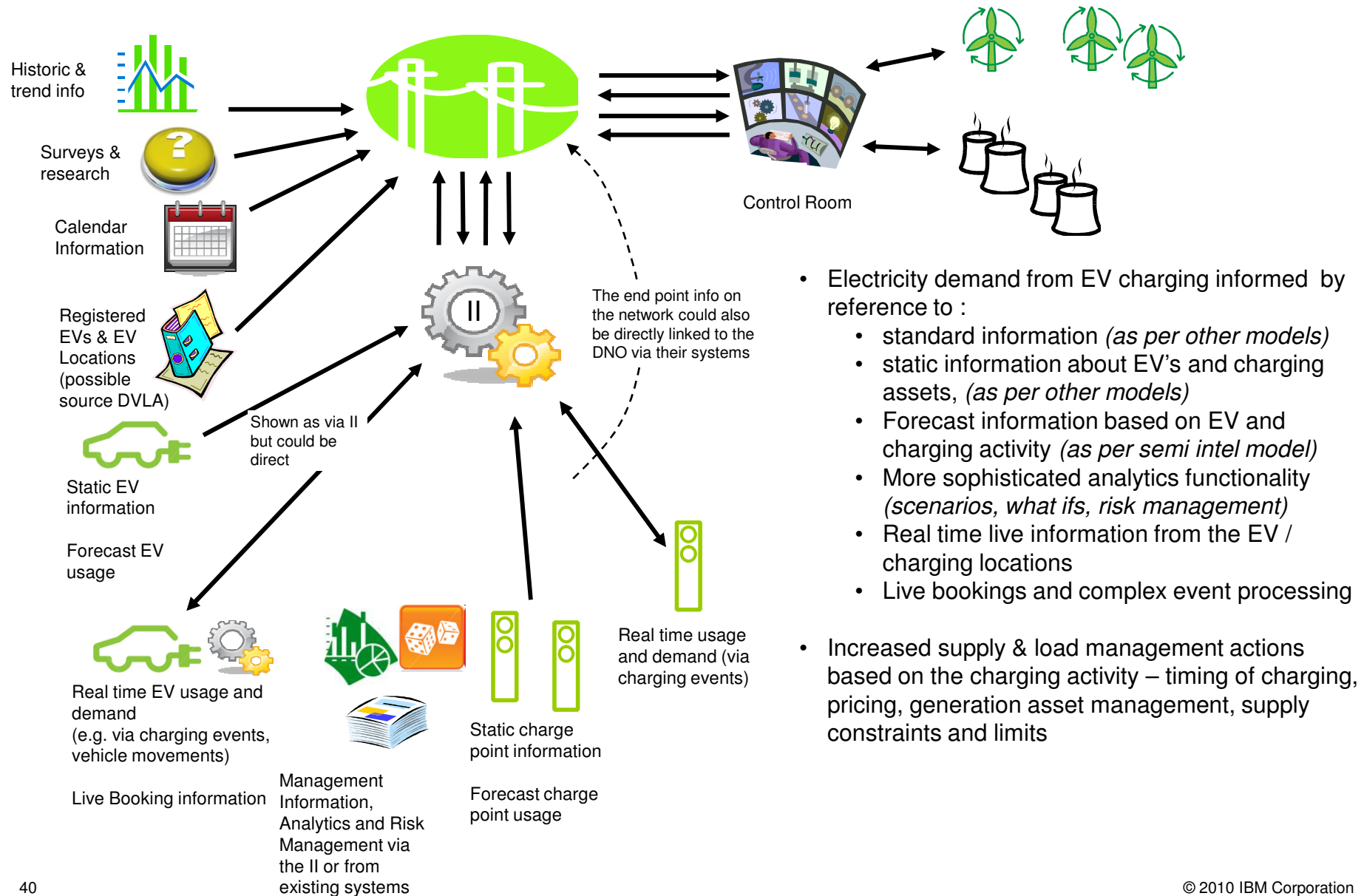
- Electricity demand from EV charging informed by reference to :
 - standard information including historic & trend data; surveys & research; calendar data: registered EVs and registered Location; weather data; and demographic data
 - static information about EV's and charging assets, directly from the provider / operator of the EV / charge point infrastructure provider / charge point operator
- No EV charging specific supply / load management beyond normal capping of location supply

EV Intelligent Infrastructure - Conceptual Business Architecture - Illustrative Business Process Model - Demand & Supply Management – Semi Intelligent



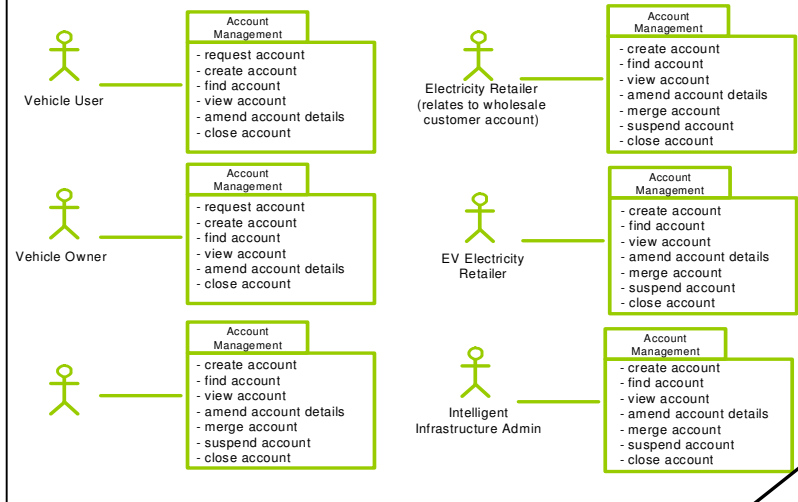
- Electricity demand from EV charging informed by reference to :
 - standard information including historic & trend data; registered EVs and registered Location; surveys & research; calendar data; weather data; and demographic data
 - static information about EV's and charging assets, directly from the provider / operator of the EV / charge point and / or via one or more intelligent infrastructure operators
 - Forecast information based on EV and charging activity
 - Analytics functionality
- Supply & load management actions based on the timing of charging activity

EV Intelligent Infrastructure - Conceptual Business Architecture - Illustrative Business Process Model - Demand & Supply Management – Smart



EV Intelligent Infrastructure - Conceptual Business Architecture – Process for the Development of the Evolutionary Models

1. Take the Requirements (Use Cases) from SP2/IBM/14



2. Create a modified, prioritized list of requirements as follows:-

Use Case Number	Use Case Description	Business Components	SIMPLE	SEMI - INT	SMART	Justification / Comments
CL1	Charging Location Management - Availability Management (Local)	Availability and Booking Management	✓	✓	✓	In the simple business model, charging post operators/manufacturers are making availability information available.
CL2	Charging Location Management - Availability Management (Regional, National, International)	Availability and Booking Management, Service Integration, Service and Infrastructure Operations, End to End Service Monitoring		✓	✓	Aggregation of availability information can only be provided following the introduction of integration capabilities
CL3	Charging Location Management - Bookings Management (Local, Regional, National, International)	Availability and Booking Management, Service Integration, Service and Infrastructure Operations, User Identity and Access, End to End Service Monitoring		✓	✓	Booking management but requires integration in the local area. Many of these are a cost-effective requirement - if at all.
CL4	Charging Location Management - Domestic Charging - Ability (Range)	Domestic Charging Location, Installation, Domestic Charging Activity Control, Electricity Configuration and State Management, Battery Configuration and State Management	✓	✓	✓	Required in the Simple Model
CL5	Charging Location Management - Charging - Smart (Charge Location)	Domestic Charging Location, Installation, Domestic Charging Activity Control, Query Reporting Services, Analytics Services Provision		✓		Not required in the simple model - requires communications, integration
CL6	Charging Location Management - Activity Management (Controlled Locally)	Domestic Charging Location, Installation, Domestic Charging Activity Control		✓		Not required in the simple model - however there are devices on the market that require off-peak electricity
CL7	Charging Location Management - Activity Management (Controlled Centrally)	Charging Location, Installation, Activity Control, Electricity System				Smart grid roll out required - requirements can be fulfilled.

Requirement ID

Components involved in meeting the Requirement

Justification

Requirement s (Use Cases)

Stage of Evolution at which the requirement will be realized – Simple, Semi-Intelligent, Smart

3. Map each requirement in each stage of evolution onto the basic model and highlight the competencies (in yellow) involved in providing services and functionality to meet each requirement

	Electric Vehicle & Battery System Delivery	Charging Location Infrastructure Provision	Charging Location Operation	Electricity System Operation	Customer Relationship Services	Payment, Billing & Settlement Services	Intelligent Infrastructure Information Management (Analytics)	Intelligent Infrastructure Provision	Beyond the Vehicle Service Provision	Strategy, Regulation & Legislation
Direct	EV Control System R & D Strategy	Charging Location Strategy	Charging Location Operation Strategy	Electricity System Operators Strategy	Customer Relationship Strategy	Payment Service Strategy	Intelligent Infrastructure Strategy	Service Management Strategy	Alliance Strategy	Regulatory & Compliance Strategy
Control	Battery Control System R & D Strategy	Charging Location Maintenance Strategy	Charging Location Performance Management	Electricity System Emergency Planning	Channel Strategy	Billing Service Strategy	Analytics Strategy	Business Technology & Governance Strategy		Intelligent Infrastructure Strategy
Enable	EV Control System Product Development	Charging Location Planning	Charging Location Design	Electricity System Demand Analysis	Customer Service Management	Billing Service Management	Information Planning & Governance	Enterprise Architecture	Compliance Management	Regulatory Compliance Management
	Battery Control System Product Development	Charging Location Design	Charging Location Asset Management	Electricity System Demand Analysis	Customer Service Management	Billing Service Management	Information Planning & Governance	Enterprise Architecture	Compliance Management	Regulatory Compliance Management
	EV Control System Delivery	Charging Location Commissioning / Decommissioning	Charging Location Asset Management	Electricity System Demand Forecasting	Contact Management	Billing Services Provision	Query & Reporting Services	System, Network & Infrastructure Operations	Service Integration	Market Research
	EV Control System Delivery	Charging Location Commissioning / Decommissioning	Charging Location Asset Management	Electricity System Demand Forecasting	Contact Management	Billing Services Provision	Query & Reporting Services	System, Network & Infrastructure Operations	Service Integration	Market Research
	Battery Control System Delivery	Charging Location Maintenance	Charging Location Asset Management	Electricity System Demand Forecasting	Contact Management	Billing Services Provision	Query & Reporting Services	System, Network & Infrastructure Operations	Service Integration	Market Research
	Battery In-Use Operations Support	Discharge Activity Control	Charging Location Asset Management	Electricity System Demand Forecasting	Contact Management	Billing Services Provision	Query & Reporting Services	System, Network & Infrastructure Operations	Service Integration	Market Research

4. ...when completed for all requirements, results in a model showing which competencies & components may be required /not required at that stage.

	Electric Vehicle & Battery System Delivery	Charging Location Infrastructure Provision	Charging Location Operation	Electricity System Operation	Customer Relationship Services	Payment, Billing & Settlement Services	Intelligent Infrastructure Information Management (Analytics)	Intelligent Infrastructure Provision	Beyond the Vehicle Service Provision	Strategy, Regulation & Legislation
Direct	EV Control System R & D Strategy	Charging Location Strategy	Charging Location Operation Strategy	Electricity System Operators Strategy	Customer Relationship Strategy	Payment Service Strategy	Intelligent Infrastructure Strategy	Service Management Strategy	Alliance Strategy	Regulatory & Compliance Strategy
Control	Battery Control System R & D Strategy	Charging Location Maintenance Strategy	Charging Location Performance Management	Electricity System Emergency Planning	Channel Strategy	Billing Service Strategy	Analytics Strategy	Business Technology & Governance Strategy		Intelligent Infrastructure Strategy
Enable	EV Control System Product Development	Charging Location Planning	Charging Location Design	Electricity System Demand Analysis	Customer Service Management	Billing Service Management	Information Planning & Governance	Enterprise Architecture	Compliance Management	Regulatory Compliance Management
	Battery Control System Product Development	Charging Location Design	Charging Location Asset Management	Electricity System Demand Analysis	Customer Service Management	Billing Service Management	Information Planning & Governance	Enterprise Architecture	Compliance Management	Regulatory Compliance Management
	EV Control System Delivery	Charging Location Commissioning / Decommissioning	Charging Location Asset Management	Electricity System Demand Forecasting	Contact Management	Billing Services Provision	Query & Reporting Services	System, Network & Infrastructure Operations	Service Integration	Market Research
	EV Control System Delivery	Charging Location Commissioning / Decommissioning	Charging Location Asset Management	Electricity System Demand Forecasting	Contact Management	Billing Services Provision	Query & Reporting Services	System, Network & Infrastructure Operations	Service Integration	Market Research
	Battery Control System Delivery	Charging Location Maintenance	Charging Location Asset Management	Electricity System Demand Forecasting	Contact Management	Billing Services Provision	Query & Reporting Services	System, Network & Infrastructure Operations	Service Integration	Market Research
	Battery In-Use Operations Support	Discharge Activity Control	Charging Location Asset Management	Electricity System Demand Forecasting	Contact Management	Billing Services Provision	Query & Reporting Services	System, Network & Infrastructure Operations	Service Integration	Market Research

EV Intelligent Infrastructure - Conceptual Business Architecture – Development of Prioritized Requirements (1)

The following tables define (a) the mapping of the requirements identified in SP2/IBM14 - to the CBM components involved in delivery of the requirement, and (b) the prioritization which has been applied - i.e. in which business model the requirement occurs

Customer Management Requirements						
Use Case Number	Use Case Description	Business Components	SIMPLE	SEMI - INT	SMART	Justification / Comments
CM1	Customer Management – Account Management (Local, Non-integrated)	Account Management, Problem Handling and Resolution	✓	✓	✓	In the simple business business model some form of account management is required.
CM2	Customer Management – Account Management (Regional, National, International)	Account Management, Problem Handling and Resolution, Service Integration, Service Infrastructure and Operations, User Identity and Access Processing, End to End Service Monitoring		✓	✓	Aggregation of account management can only be provided following the introduction of integration capabilities
CM3	Customer Management – Contact Management (Local, Non-integrated)	Contact Management, Problem Handling and Resolution	✓	✓	✓	In the simple business business model some form of contact management is required.
CM4	Customer Management – Contact Management (Regional, National, International)	Contact Management, Problem Handling and Resolution, Service Integration, Service Infrastructure and Operations, User Identity and Access Processing, End to End Service Monitoring		✓	✓	Aggregation of contact management can only be provided following the introduction of integration capabilities

...continued

EV Intelligent Infrastructure - Conceptual Business Architecture – Development of Prioritized Requirements (2)

The following tables define (a) the mapping of the requirements identified in SP2/IBM14 - to the CBM components involved in delivery of the requirement, and (b) the prioritization which has been applied - i.e. in which business model the requirement occurs

Charging Location Management Requirements						
Use Case Number	Use Case Description	Business Components	SIMPLE	SEMI - INT	SMART	Justification / Comments
CL1	Charging Location Management – Availability Management (Local)	Availability and Booking Management	✓	✓	✓	In the simple business model, charging post operators/manufacturers are making availability information available.
CL2	Charging Location Management – Availability Management (Regional, National, International)	Availability and Booking Management, Service Integration, Service and Infrastructure Operations, End to End Service Monitoring		✓	✓	Aggregation of availability information can only be provided following the introduction of integration capabilities
CL3	Charging Location Management – Bookings Management (Local, Regional, National, International)	Availability and Booking Management, Service Integration, Service and Infrastructure Operations, User Identity and Access Processing, End to End Service Monitoring		✓	✓	Booking management builds on availability management and requires integration capabilities to work other than just in the local area. Many open questions over whether booking is a cost-effective requirement due to issues with enforcement and no-shows. Semi intelligent at the earliest - if at all.
CL4	Charging Location Management – Charging Activity Management (Domestic Charging - Ability to Charge)	Domestic Charging Location Installation, Domestic Charging Activity Control, EV Control System Delivery, Battery Control System Delivery	✓	✓	✓	Required in the Simple Model
CL5	Charging Location Management – Charging Activity Management (Domestic Charging - Charge Information)	Domestic Charging Location Installation, Domestic Charging Activity Control, Query and Reporting Services, Analytics Services Provision, Service Integration, Service and Infrastructure Operations		✓	✓	Not required in the simple model, and requires communications, integration, and analytical services
CL6	Charging Location Management – Charging Activity Management (Domestic Charging - Smart Charging - Controlled Locally)	Domestic Charging Location Installation, Domestic Charging Activity Control		✓	✓	Not required in the simple model, however there are devices on the market currently which delay charging until after a certain time to take advantage of off-peak electricity
CL7	Charging Location Management – Charging Activity Management (Domestic Charging - Smart Charging - Controlled Centrally)	Domestic Charging Location Installation, Domestic Charging Activity Control, Electricity System Charging Control			✓	Smart grid roll out required before this requirements can be fulfilled.
CL8	Charging Location Management – Charging Activity Management (Non-Domestic Charging - Ability to Charge)	Non-Domestic Charging Activity Control, EV Control System Delivery, Battery Control System Delivery	✓	✓	✓	Required in the Simple Model

...continued

EV Intelligent Infrastructure - Conceptual Business Architecture – Development of Prioritized Requirements (3)

The following tables define (a) the mapping of the requirements identified in SP2/IBM14 - to the CBM components involved in delivery of the requirement, and (b) the prioritization which has been applied - i.e. in which business model the requirement occurs

Charging Location Management Requirements (continued)						
Use Case Number	Use Case Description	Business Components	SIMPLE	SEMI - INT	SMART	Justification / Comments
CL9	Charging Location Management – Charging Activity Management (Non-Domestic Charging - Charge Information)	Non-Domestic Charging Activity Control, Query and Reporting Services, Analytics Services Provision, Service Integration, Service and Infrastructure Operations		✓	✓	Not required in the simple model, and requires communications, integration, and analytical services
CL10	Charging Location Management – Charging Activity Management (Non-Domestic Charging - Smart Charging - Controlled Locally)	Charging Location Commissioning / Decommissioning, Non-Domestic Charging Activity Control		✓	✓	Not required in the simple model, assumed to appear in the Semi-Intelligent Phase when some level of communication will be available to control charging.
CL11	Charging Location Management – Charging Activity Management (Non-Domestic Charging - Smart Charging - Controlled Centrally)	Charging Location Commissioning / Decommissioning, Non-Domestic Charging Activity Control, Electricity System Charging Control			✓	Smart grid roll out required before this requirements can be fulfilled.
CL12	Charging Location Management – Charging Activity Management V2G(rid)	Discharge Activity Control, Electricity System Charging Control			✓	Smart grid roll out required before this requirements can be fulfilled.
CL13	Charging Location Management – Charging Activity Management V2H(ome)	Discharge Activity Control, Electricity System Charging Control		✓	✓	Not required in the simple model, assumed to appear in the Semi-Intelligent Phase if at all - there is much scepticism about the value to the end user of functionality to fulfill this requirement.
CL14	Charging Location Management – Location Details Reference Data Mgt (Local, Non-integrated)	Charging Location Commissioning / Decommissioning, Charging Location Asset Monitoring	✓	✓	✓	Basic requirement of the Simple Model
CL15	Charging Location Management – Location Details Reference Data Mgt (Regional, National, International)	Charging Location Commissioning / Decommissioning, Charging Location Asset Monitoring, Data Extract and Upload Services, Master Data Management, Service Integration, Service and Infrastructure Operations		✓	✓	Aggregation of Location Details can only be provided following the introduction of integration capabilities

...continued

EV Intelligent Infrastructure - Conceptual Business Architecture – Development of Prioritized Requirements (4)

The following tables define (a) the mapping of the requirements identified in SP2/IBM14 - to the CBM components involved in delivery of the requirement, and (b) the prioritization which has been applied - i.e. in which business model the requirement occurs

Pricing & Billing Management, Settlement and Clearance Services Requirements						
Use Case Number	Use Case Description	Business Components	SIMPLE	SEMI - INT	SMART	Justification / Comments
PB1	Pricing & Billing Management – Pricing & Tariff Management (Static)	Price and Tarrif Management	✓	✓	✓	Static pricing required by the Simple Model
PB2	Pricing & Billing Management – Pricing & Tariff Management (Dynamic)	Price and Tarrif Management, Service Integration, Service and Infrastructure Operations, End to End Service Monitoring			✓	Smart Grid roll out required in order to meet the requirements for dynamic pricing, e.g. time of day/season/power
PB3	Pricing & Billing Management – Billing Information Management	Payment Services Provision, Billing Services Provision, Settlement Services Provision, Fraud Detection and Revenue Protection, Service Integration, Service and Infrastructure Operation, User Identity and Access Processing, End to End Service Monitoring		✓	✓	Billing information management becomes a requirement when variable charging/payment by consumption starts leading to more complicated forms of payment - this is in the semi intelligent model
SC1	Settlement & Clearance Services	Payment Services Provision, Billing Services Provision, Settlement Services Provision, Fraud Detection and Revenue Protection, Service Integration, Service and Infrastructure Operation, User Identity and Access Processing, End to End Service Monitoring		✓	✓	Settlement and Clearance Services becomes a requirement when variable charging/payment by consumption starts leading to more complicated forms of payment - this is in the semi intelligent model

...continued

EV Intelligent Infrastructure - Conceptual Business Architecture – Development of Prioritized Requirements (5)

The following tables define (a) the mapping of the requirements identified in SP2/IBM14 - to the CBM components involved in delivery of the requirement, and (b) the prioritization which has been applied - i.e. in which business model the requirement occurs

Demand/Supply Management, Charging Infrastructure Management & Safety Requirements						
Use Case Number	Use Case Description	Business Components	SIMPLE	SEMI - INT	SMART	Justification / Comments
DS1	Demand / Supply Management – Demand Profile Forecasts	Electricity System Demand Forecasting, Electricity System Load Forecasting, Data Extract and Upload Services, Query and Reporting Service, Analytics Services Provision, Service Integration, Service and Infrastructure Operations		✓	✓	Requirement starts to be met in the Semi-Intelligent Model with the growing demand for charging. Meeting the full requirements requires aggregation across locations, historical storage and trend analysis (analytics) and hence is provided in the Smart Model
DS2	Demand / Supply Management – Supply Profile Commitments	Electricity System Demand Forecasting, Electricity System Load Forecasting, Data Extract and Upload Services, Query and Reporting Service, Analytics Services Provision, Service Integration, Service and Infrastructure Operations		✓	✓	Requirement starts to be met in the Semi-Intelligent Model with the growing demand for charging. Meeting the full requirements requires aggregation across locations, historical storage and trend analysis (analytics) and hence is provided in the Smart Model
CI1	Charging Infrastructure Management & Safety – Charging Assets Management	Charging Location Construction, Charging Location Commissioning / Decommissioning, Charging Location Maintenance	✓	✓	✓	Needed by the Simple Model
CI2	Charging Infrastructure Management & Safety – Condition & Status Monitoring (Manual, Local Remote Monitoring)	Charging Location Maintenance	✓	✓	✓	Manual, 'local' remote monitoring needed by the Simple Model
CI3	Charging Infrastructure Management & Safety – Condition & Status Monitoring (Regional, National, International Remote Monitoring)	Charging Location Maintenance, Data Extract and Upload Services, Query and Reporting Services, Analytics Services Provision, Service Integration, Service and Infrastructure Operation, User Identity and Access Processing, End to End Service Monitoring		✓	✓	The requirement for full remote monitoring cannot be met until a level on communication and integration is available. Assumed to be in the Semi-Intelligent Business Model
CI4	Charging Infrastructure Management & Safety – Telemetry & Control	EV Control System Delivery, EV In Life Operations Support, EV Communications Delivery, Battery Control System Delivery, Battery In-Life Operations Support, Data Extract and Upload Services, Query and Reporting Services, Service Integration, Service and Infrastructure Operation, User Identity and Access Processing, End to End Service Monitoring		✓	✓	Requires agreement on standards between EV OEMs, Charging Equipment Suppliers and eventually the II Operators - this may become a requirement which is only met in the Smart model. For the moment however it is assumed that this is a semi-intelligent requirement and that some form of telemetry to the EV will be provided sooner rather than later.

EV Intelligent Infrastructure - Conceptual Business Architecture – Development of Prioritized Requirements (6)

The following tables define (a) the mapping of the requirements identified in SP2/IBM14 - to the CBM components involved in delivery of the requirement, and (b) the prioritization which has been applied - i.e. in which business model the requirement occurs

Information Provision, Master Reference Data Management, Business Analytics and Reporting, Manage Payments Requirements						
Use Case Number	Use Case Description	Business Components	SIMPLE	SEMI - INT	SMART	Justification / Comments
IP1	Information Provision	Data Extract and Upload Services, Query and Reporting Services, Analytics Services Provision, Knowledge Management, Service Integration, Service and Infrastructure Operation, User Identity and Access Processing, End to End Service Monitoring		✓	✓	Provision of information based on aggregated data can only be provided following the introduction of communications and integration capabilities
MD1	Master Reference Data Management (Non-integrated)		✓	✓	✓	Master data management is required from the Simple Model onwards
MD2	Master Reference Data Management (Integrated)	Data Extract and Upload Services, Query and Reporting Services, Analytics Services Provision, Master Data Management, Service Integration, Service and Infrastructure Operation, User Identity and Access Processing, End to End Service Monitoring		✓	✓	More extensive master data management requirements will be met from the semi-intelligent model onwards, as the underlying communications and integration capabilities are provided.
BA1	Business Analytics & Reporting	Data Extract and Upload Services, Query and Reporting Services, Analytics Services Provision, Knowledge Management, Service Integration, Service and Infrastructure Operation, User Identity and Access Processing, End to End Service Monitoring		✓	✓	Business Analytics and Reporting Functionality can be provided on the back of communications and integration which in turn leads to the capability to aggregate data. This requirement will be fulfillable from the semi-intelligent model onwards.
MP1	Manage Payments - Simple	Payment Services Provision	✓	✓	✓	All models require the ability to make payments - even if it is the simple payment of a flat fee and hence is required from the Simple Model onwards
MP2	Manage Payments - Complex	Payment Services Provision, Billing Services Provision, Settlement Services Provision, Fraud Detection and Revenue Protection, Service Integration, Service and Infrastructure Operation, User Identity and Access Processing, End to End Service Monitoring		✓	✓	More sophisticated payment requirements - based on payment by consumptions will only be possible following the implementation of communications and integration functionality.

EV Intelligent Infrastructure - Conceptual Business Architecture – Evolutionary Stages – Simple Business Model

- Mapping the Simple Business Model requirements to the base CBM results in the CBM for the Simple Business Model, which is shown on the next slide.
- The mapping is done at the Execute Accountability Level ('bottom up') and is shown by turning the components - to which the requirement is mapped – yellow
- Components which are shown as required in the Execute Accountability Level means that the Competency (column) to which they belong, and the higher level components in the Direct and Control Accountability Levels, are also required
- Where there are components and 'whole' competencies with no requirements mapped to them, then these are greyed out
- ... please see next slide

	Electric Vehicle & Battery System Delivery	Charging Location Infrastructure Provision	Charging Location Operation	Electricity System Operation	Customer Relationship Services	Payment, Billing & Settlement Services	Intelligent Infrastructure Information Management & Analytics	Intelligent Infrastructure Provision	Beyond the Vehicle Service Provision	Strategy, Regulation & Legislation
Direct	EV Control System R & D Strategy	Charging Location Strategy	Charging Location Operation Strategy	Electricity System Operations Strategy	Customer Relationship Strategy	Payment Service Strategy	Information Management Strategy	Service Management Strategy	Alliance Strategy	Regulatory & Compliance Strategy
	Battery Control System R & D Strategy	Charging location Maintenance Strategy		Electricity System Emergency Planning	Channel Strategy	Billing Service Strategy	Analytics Strategy	Business Technology & Governance Strategy		Intelligent Infrastructure Business Strategy
					Market Development	Settlements Service Strategy				Standards & Policy Strategy
Control	EV Control System Product Development	Charging Location Demand Analysis	Charging Location Performance Management	Electricity System Network Load Analysis	Customer Service Management	Payment Service Management	Master Data Planning & Governance	Service Management	Alliance Management	Regulatory Compliance Management
	Battery Control System Product Development	Charging Location Planning		Electricity System Operational Performance Management		Billing Service Management	Information Planning & Governance	Enterprise Architecture		Risk Management
		Charging Location Design				Settlements Service Management		Change Deployment Control		Standards Roadmap Planning
		Charging Location Asset Management				Fraud Management		Security, Privacy and Data Protection		
Execute	EV Control System Delivery CL4, CL8	Charging Location Construction C1	Availability & Booking Management CL1	Electricity System Demand Forecasting	Account Management CM1	Payment Services Provision MP1	Data Export & Upload Services	Service Integration	Needs Assistance Provision	Regulatory Interaction
	EV In-Life Operations Support	Charging Location Commissioning / Decommissioning CL14, C1	Charging Location Asset Monitoring CL14	Electricity System Load Management	Contact Management CM3	Billing Services Provision	Identify & Repairing Services	System Network & Infrastructure Operations	Information Service Provision	Market Research
	EV Communications Delivery	Domestic Charging Location Installation CL4	Domestic Charging Activity Control CL4	Price and Tarrif Management PB1	Problem Handling & Resolution CM1, CM3	Settlement Services Provision	Analytics Services Provision	User Identity and Access Processing	Navigation Data Provision	Standards Development & Publishing
	Battery Control System Delivery CL4, CL8	Charging location Maintenance C1, C2	Non Domestic Charging Activity Control CL8	Electricity System Charging Control	Sales & Promotions	Fraud Detection & Revenue Protection	Master Data Management	End to End Service Monitoring	Entertainment Service Provision	Environmental Legislation Reporting
	Battery In-Life Operations Support		Discharge Activity Control				Knowledge Management	Project Delivery	Emergency Services Integration	

EV Intelligent Infrastructure - Conceptual Business Architecture – Evolutionary Stages – Simple Business Model Observations and Conclusions

	Electric Vehicle & Battery System Delivery	Charging Location Infrastructure Provision	Charging Location Operation	Electricity System Operation	Customer Relationship Services	Payment, Billing & Settlement Services	Information Management	Operational Services	Regulatory Services
Direct	EV Control System R & D Strategy	Charging Location Strategy	Charging Location Operation Strategy		Customer Relationship Strategy	Payment Service Strategy			
	Battery Control System R & D Strategy	Charging Location Hardware Strategy				Billing Service Strategy			
Channel	EV Control System Product Development	Charging Location Demand Analysis	Charging Location Performance Management		Customer Service Management	Payment Service Management			
	Battery Control System Product Development	Charging Location Planning	Charging Location Management			Billing Service Management			
Enabling	EV Control System Delivery (O&M, O&M)	Charging Location Construction (CI)	Availability & Reliability Management (O&M)		Account Management (O&M)	Payment Services Program (SP)			
	Charging Location Commissioning (O&M, O&M)	Charging Location Asset Reporting (O&M, O&M)			Contract Management (O&M)				
	Domestic Charging Location Installation (O&M, O&M)	Domestic Charging Activity Control (O&M)	Price and Tariff Management (SP)		Problem Solving (O&M, O&M)				
	Battery Control System Delivery (O&M, O&M)	Charging Location Test, O&M, O&M	Reliability Charging Activity Control (O&M)						

Commentary

- The more sophisticated requirements involving communications and integration between the EV and the II are not yet catered for – focus remains on electrical connectivity
- The Charging Location Infrastructure Providers and Location Operators are focused on providing raw charging capability, a simple method of payment and a necessary element of customer relationship services.
- The Electricity System Operators have not yet engaged in the market and are simply aware of posts being rolled out through the DNOs.
- No Intelligent Infrastructure, no comprehensive ‘beyond the vehicle’ services, no regulation and legislation

...about the Simple Model

First step in market development with inevitable limitations:-

- EV Owner/User has to join multiple charging operator schemes depending on usage and charging requirements
- EV Owner/User has limited joined-up information on charging infrastructure availability
- Challenges and limitations associated with non-domestic charging including ‘basic’ payment method (flat fee – no payment on consumption), and provision of ‘free’ electricity (which it isn’t, and which is not a sustainable strategy for the Location Operator and the Electricity System Operators as EV take-up increases)
- Electricity System Operators, especially, and other stakeholders in general, have no automatic information regarding EV charging requirements and performance
- For the market as a whole, there is no strategically planned interoperability, no standards and no regulation specific for the EV market

EV Intelligent Infrastructure - Conceptual Business Architecture – Evolutionary Stages – Semi Intelligent Business Model

- Mapping the Semi-Intelligent Business Model requirements to the Simple Model CBM results in the CBM for the Semi-Intelligent Business Model, which is shown on the next slide.
- The mapping is again done at the Execute Accountability Level ('bottom up') and is shown by turning the components - to which the requirement is mapped – yellow. Hence the components shaded yellow in this model show the components which must cope with an increased number of requirements or which were not previously required in the Simple Model - but now are required.
- As with the Simple Model, components which are shown as required in the Execute Accountability Level means that the Competency (column) to which they belong, and the higher level components in the Direct and Control Accountability Levels, are also required.
- Where there are components and 'whole' competencies with no requirements mapped to them, then these are greyed out
- ... please see next slide

	Electric Vehicle & Battery System Delivery	Charging Location Infrastructure Provision	Charging Location Operation	Electricity System Operation	Customer Relationship Services	Payment, Billing & Settlement Services	Intelligent Infrastructure Information Management & Analytics	Intelligent Infrastructure Provision	Beyond the Vehicle Service Provision	Strategy, Regulation & Legislation
Direct	EV Control System R & D Strategy	Charging Location Strategy	Charging Location Operation Strategy	Electricity System Operations Strategy	Customer Relationship Strategy	Payment Service Strategy	Information Management Strategy	Service Management Strategy	Alliance Strategy	Regulatory & Compliance Strategy
	Battery Control System R & D Strategy	Charging location Maintenance Strategy		Electricity System Emergency Planning	Charmet Strategy	Billing Service Strategy	Analytics Strategy	Business Technology & Governance Strategy		Intelligent Infrastructure Business Strategy
					Market Development	Settlements Service Strategy				Standards & Policy Strategy
Control	EV Control System Product Development	Charging Location Demand Analysis	Charging Location Performance Management	Electricity System Network Load Analysis	Customer Service Management	Payment Service Management	Master Data Planning & Governance	Service Management	Alliance Management	Regulatory Compliance Management
	Battery Control System Product Development	Charging Location Planning		Electricity System Operational Performance Management		Billing Service Management	Information Planning & Governance	Enterprise Architecture		Risk Management
		Charging Location Design				Settlements Service Management		Change Deployment Control		Standards Roadmap Planning
		Charging Location Asset Management				Fraud Management		Security, Privacy and Data Protection		
Execute	EV Control System Delivery CL4, CL8, C14	Charging Location Construction C11	Availability & Booking Management CL1, CL2, CL3	Electricity System Demand Forecasting DS1, DS2	Account Management CM1, CM2	Payment Services Provision MP1, PB3, SC1, MP2	Data Extract & Upload Services CL15, C13, C14, IP1, MD2, BA1	Service Integration CM2, CM4, CL2, CL3, CL5, CL9, CL15, PB3, SC1, C13, C14, IP1, MD2, BA1, MP2	Roadside Assistance Provision	Regulator Interaction
	EV In-Life Operations Support C14	Charging Location Commissioning / Decommissioning CL14, C11, CL10, CL15	Charging Location Asset Monitoring CL14, CL15	Electricity System Load Management DS1, DS2	Contact Management CM3, CM4	Billing Services Provision PB3, SC1, MP2	Query & Reporting Services CL5, CL9, C13, C14, IP1, MD2, BA1	System, Network & Infrastructure Operations CM2, CM4, CL2, CL3, CL5, CL9, CL15, PB3, SC1, C13, C14, IP1, MD2, BA1, MP2	Information Service Provision	Market Research
	EV Communications Delivery C14	Domestic Charging Location Installation CL4, CL5, CL6	Domestic Charging Activity Control CL4, CL5, CL6	Price and Tarrif Management PB1	Problem Handling & Resolution CM1, CM2, CM3, CM4	Settlement Services Provision PB3, SC1, MP2	Analytics Services Provision CL5, CL9, C13, IP1, MD2, BA1	User Identity and Access Processing CM2, CM4, CL3, PB3, SC1, C13, C14, IP1, MD2, BA1, MP2	Navigation Data Provision	Standards Development & Publishing
	Battery Control System Delivery CL4, CL8, C14	Charging location Maintenance C11, C12, C13	Non Domestic Charging Activity Control CL8, CL9, CL10	Electricity System Charging Control CL13	Sales & Promotions	Fraud Detection & Revenue Protection PB3, SC1, MP2	Master Data Management CL15, MD2	End to End Service Monitoring CM2, CM4, CL2, CL3, PB3, SC1, C13, C14, IP1, MD2, BA1, MP2	Entertainment Service Provision	Environmental Legislation Reporting
	Battery In-Life Operations Support C14		Discharge Activity Control CL13				Knowledge Management BA1	Project Delivery	Emergency Services Integration	

EV Intelligent Infrastructure - Conceptual Business Architecture – Evolutionary Stages – Semi Intelligent Business Model Commentary

	Electric Vehicle & Battery System Delivery	Charging Location Infrastructure Provision	Charging Location Operation	Electricity System Operation	Customer Relationship Services	Payment, Billing & Settlement Services	Intelligent Infrastructure Information Management & Analytics	Intelligent Infrastructure Provision	Beyond the Vehicle Service Provision	Strategy, Regulation & Legislation
Direct	EV Control System R & D Strategy	Charging Location Strategy	Charging Location Operation Strategy	Electricity System Operations Strategy	Customer Relationship Strategy	Payment Service Strategy	Information Management Strategy	Service Management Strategy	Alliance Strategy	Regulatory & Compliance Strategy
	Battery Control System R & D Strategy	Charging Location Maintenance Strategy		Electricity System Emergency Planning	Market Development	Billing Service Strategy	Analytics Strategy	Business Technology & Governance Strategy		Intelligent Infrastructure Business Strategy
Control	EV Control System Product Development	Charging Location Demand Analysis	Charging Location Performance Management	Electricity System Network Load Analysis	Customer Service Management	Payment Service Management	Master Data Planning & Governance	Service Management	Alliance Management	Regulatory Compliance Management
	Battery Control System Product Development	Charging Location Planning		Electricity System Operational Performance Management		Billing Service Management	Information Planning & Governance	Enterprise Architecture		Risk Management
		Charging Location Design				Settlements Service Management		Change Deployment Control		Standards Roadmap Planning
Execute	EV Control System Support	Charging Location Commissioning	Availability & Booking Management	Electricity System Demand Forecasting	Account Management	Payment Services Provision	Data Extract & Import Services	Service Integration	Resilience Assessment	EV Interoperation
	EV-ICM Operation Support	Charging Location Commissioning Decommissioning	Charging Location Asset Reliability	Electricity System Load Management	Contract Management	Billing Service Provision	Charge & Reporting	System Network & Interconnection Operations	Information Service Provision	Market Research
	EV Communications Delivery	Domestic Charging Location Installation	Domestic Charging Activity Control	Price and Tariff Management	Problem Handling & Resolution	Settlements Services Provision	Analytics Services Provision	User Identity and Access Management	Navigation Data Provision	Product Development & Publishing
	Battery Control System Delivery	Charging Location Maintenance	Non-Domestic Charging Activity Control	Electricity System Charging Control	Sales & Promotion	Fraud Detection & Revenue Protection	Master Data Management	Site and Asset Provision	Entertainment Service Provision	Environmental Impact Reporting
	Battery System Support		Discharge Activity Control				Knowledge Management	Product Delivery	Emergency Service Management	

Commentary

All of the market competencies are required to exist to one degree or another to meet the requirements of the Semi-Intelligent Business Model:-

- EV OEMs have integrated with the Intelligent Infrastructure.
- Interoperability exists between charging infrastructure and locations.
- The Electricity System Operators recognize EV consumption as a market segment and are starting to account for EV charging demand in their Demand and Load Management activities.
- There are joined up Customer Relation Services across the EV market.
- Payment by consumption is enabled and multiple payment methods are possible.
- Intelligent Infrastructure functionality is available and is making possible the provision of all kinds of joined up services.
- Minimum standards have been legislated and interoperability has resulted from voluntary agreements between major stakeholders.

The Development of the Semi Intelligent Business Model

The key actions required to allow the development of this business model, (the increase in the take up of EVs having been assumed), are:-

- the implementation of necessary and sufficient standards to allow interoperability,
- the deployment of the basic communication and integration services of intelligent infrastructures - deployment of these services will provide the backbone capability on which additional and improved services can be provided to all EV market stakeholders

The key factor determining the timescales for the move to the Semi-Intelligent Business Model is the rate of growth in the EV market which is determined principally by EV Price, Battery Technology, and availability and relevant attractiveness of alternatives (e.g. ICE, Hydrogen Fuel Cell)

EV Intelligent Infrastructure - Conceptual Business Architecture – Evolutionary Stages – Smart Business Model

- Mapping the Smart Business Model requirements to the Semi-Intelligent Model CBM results in the CBM for the Smart Business Model, which is shown on the next slide.
- The mapping is again done at the Execute Accountability Level ('bottom up') and is shown by turning the components - to which the requirement is mapped – yellow. Hence the components shaded yellow in this model show the components which must cope with an increased number of requirements or which were not previously required in the Semi-Intelligent Model - but now are required.
- As with the Semi-Intelligent Model, components which are shown as required in the Execute Accountability Level means that the Competency (column) to which they belong, and the higher level components in the Direct and Control Accountability Levels, are also required.
- Where there are components and 'whole' competencies with no requirements mapped to them, then these are greyed out
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	Electric Vehicle & Battery System Delivery	Charging Location Infrastructure Provision	Charging Location Operation	Electricity System Operation	Customer Relationship Services	Payment, Billing & Settlement Services	Intelligent Infrastructure Information Management & Analytics	Intelligent Infrastructure Provision	Beyond the Vehicle Service Provision	Strategy, Regulation & Legislation
Direct	EV Control System R & D Strategy	Charging Location Strategy	Charging Location Operation Strategy	Electricity System Operations Strategy	Customer Relationship Strategy	Payment Service Strategy	Information Management Strategy	Service Management Strategy	Alliance Strategy	Regulatory & Compliance Strategy
	Battery Control System R & D Strategy	Charging location Maintenance Strategy		Electricity System Emergency Planning	Channel Strategy	Billing Service Strategy	Analytics Strategy	Business Technology & Governance Strategy		Intelligent Infrastructure Business Strategy
					Market Development	Settlements Service Strategy				Standards & Policy Strategy
Control	EV Control System Product Development	Charging Location Demand Analysis	Charging Location Performance Management	Electricity System Network Load Analysis	Customer Service Management	Payment Service Management	Master Data Planning & Governance	Service Management	Alliance Management	Regulatory Compliance Management
	Battery Control System Product Development	Charging Location Planning		Electricity System Operational Performance Management		Billing Service Management	Information Planning & Governance	Enterprise Architecture		Risk Management
		Charging Location Design				Settlements Service Management		Change Deployment Control		Standards Roadmap Planning
		Charging Location Asset Management				Fraud Management		Security, Privacy and Data Protection		
Execute	EV Control System Delivery CL4, CL8, CI4	Charging Location Construction CI1	Availability & Booking Management CL1, CL2, CL3	Electricity System Demand Forecasting DS1, DS2	Account Management CM1, CM2	Payment Services Provision MP1, PB3, SC1, MP2	Data Extract & Upload Services CL15, CI3, CI4, IP1, MD2, BA1, DS1, DS2	Service Integration CM2, CM4, CL2, CL3, CL5, CL9, CL15, PB3, SC1, CI3, CI4, IP1, MD2, BA1, MP2, PB2, DS1, DS2	Roadside Assistance Provision	Regulator Interaction
	EV In-Life Operations Support CI4	Charging Location Commissioning / Decommissioning CL14, CI1, CL10, CL15, CL11	Charging Location Asset Monitoring CL14, CL15	Electricity System Load Management DS1, DS2	Contact Management CM3, CM4	Billing Services Provision PB3, SC1, MP2	Query & Reporting Services CL5, CL9, CI3, CI4, IP1, MD2, BA1, DS1, DS2	System, Network & Infrastructure Operations CM2, CM4, CL2, CL3, CL5, CL9, CL15, PB3, SC1, CI3, CI4, IP1, MD2, BA1, MP2, PB2, DS1, DS2	Information Service Provision	Market Research
	EV Communications Delivery CI4	Domestic Charging Location Installation CL4, CL5, CL6, CL7	Domestic Charging Activity Control CL4, CL5, CL6, CL7	Price and Tariff Management PB1, PB2	Problem Handling & Resolution CM1, CM2, CM3, CM4	Settlement Services Provision PB3, SC1, MP2	Analytics Services Provision CL5, CL9, CI3, IP1, MD2, BA1, DS1, DS2	User Identity and Access Processing CM2, CM4, CL3, PB3, SC1, CI3, CI4, IP1, MD2, BA1, MP2	Navigation Data Provision	Standards Development & Publishing
	Battery Control System Delivery CL4, CL8, CI4	Charging location Maintenance CI1, CI2, CI3	Non Domestic Charging Activity Control CL8, CL9, CL10, CL11	Electricity System Charging Control CL13, CL7, CL11, CL12	Sales & Promotions	Fraud Detection & Revenue Protection PB3, SC1, MP2	Master Data Management CL15, MD2	End to End Service Monitoring CM2, CM4, CL2, CL3, PB3, SC1, CI3, CI4, IP1, MD2, BA1, MP2, PB2	Entertainment Service Provision	Environmental Legislation Reporting
	Battery In-Life Operations Support CI4		Discharge Activity Control CL13, CL12				Knowledge Management BA1	Project Delivery	Emergency Services Integration	

EV Intelligent Infrastructure - Conceptual Business Architecture – Evolutionary Stages – Smart Business Model Commentary

	Electric Vehicle & Battery System Delivery	Charging Location Infrastructure Provision	Charging Location Operation	Electricity System Operation	Customer Relationship Services	Payment, Billing & Settlement Services	Intelligent Infrastructure Information Management & Analytics	Intelligent Infrastructure Provision	Beyond the Vehicle Service Provision	Strategy, Regulation & Legislation
Direct	EV Control System R & D Strategy	Charging Location Strategy	Charging Location Operation Strategy	Electricity System Operations Strategy	Customer Relationship Strategy	Payment Service Strategy	Information Management Strategy	Service Management Strategy	Alliance Strategy	Regulatory & Compliance Strategy
	Battery Control System R & D Strategy	Charging Location Maintenance Strategy		Electricity System Emergency Planning	Channel Strategy	Billing Service Strategy	Analytics Strategy	Business Technology & Governance Strategy		Intelligent Infrastructure Business Strategy
Control	EV Control System Product Development	Charging Location Demand Analysis	Charging Location Performance Management	Electricity System Network Load Analysis	Customer Service Management	Payment Service Management	Master Data Planning & Governance	Service Management	Alliance Management	Regulatory Compliance Management
	Battery Control System Product Development	Charging Location Planning		Electricity System Operational Performance Management		Billing Service Management	Information Planning & Governance	Enterprise Architecture		Risk Management
Execute		Charging Location Design				Settlements Service Management		Charge Deployment Control		Standards Roadmap Planning
		Charging Location Asset Management				Fraud Management		Security, Privacy and Data Protection		
	EV Control System Delivery CLA, CLB, CLC	Charging Location Commissioning CLD, CLE, CLF, CLG, CLH, CLI, CLJ, CLK	Availability & Booking Management CLM, CLN, CLO, CLP, CLQ, CLR, CLS, CLT, CLU, CLV, CLW, CLX, CLY, CLZ	Electricity System Demand Forecasting CLD, CLF, CLH, CLJ, CLK	Account Management CLM, CLN, CLO, CLP, CLQ, CLR, CLS, CLT, CLU, CLV, CLW, CLX, CLY, CLZ	Payment Services Provision CLM, CLN, CLO, CLP, CLQ, CLR, CLS, CLT, CLU, CLV, CLW, CLX, CLY, CLZ	Smart Contracts & Services CLM, CLN, CLO, CLP, CLQ, CLR, CLS, CLT, CLU, CLV, CLW, CLX, CLY, CLZ	Service Management CLM, CLN, CLO, CLP, CLQ, CLR, CLS, CLT, CLU, CLV, CLW, CLX, CLY, CLZ	Regulatory, Standards & Compliance CLM, CLN, CLO, CLP, CLQ, CLR, CLS, CLT, CLU, CLV, CLW, CLX, CLY, CLZ	Regulatory Interaction
	EV In-Life Operations Support CLB, CLC, CLD, CLE, CLF, CLG, CLH, CLI, CLJ, CLK	Charging Location Commissioning CLD, CLE, CLF, CLG, CLH, CLI, CLJ, CLK	Charging Location Asset Monitoring CLM, CLN, CLO, CLP, CLQ, CLR, CLS, CLT, CLU, CLV, CLW, CLX, CLY, CLZ	Electricity System Load Management CLD, CLF, CLH, CLJ, CLK	Contract Management CLM, CLN, CLO, CLP, CLQ, CLR, CLS, CLT, CLU, CLV, CLW, CLX, CLY, CLZ	Billing Service Provision CLM, CLN, CLO, CLP, CLQ, CLR, CLS, CLT, CLU, CLV, CLW, CLX, CLY, CLZ	Query & Reporting CLM, CLN, CLO, CLP, CLQ, CLR, CLS, CLT, CLU, CLV, CLW, CLX, CLY, CLZ	System, Services & User Interface Operation CLM, CLN, CLO, CLP, CLQ, CLR, CLS, CLT, CLU, CLV, CLW, CLX, CLY, CLZ	Information Service Provision	Master Interface
	EV Control System Delivery CLA, CLB, CLC, CLD, CLE, CLF, CLG, CLH, CLI, CLJ, CLK	Dynamic Charging Location Provision CLM, CLN, CLO, CLP, CLQ, CLR, CLS, CLT, CLU, CLV, CLW, CLX, CLY, CLZ	Dynamic Charging Activity Control CLM, CLN, CLO, CLP, CLQ, CLR, CLS, CLT, CLU, CLV, CLW, CLX, CLY, CLZ	Price and Tariff Management CLM, CLN, CLO, CLP, CLQ, CLR, CLS, CLT, CLU, CLV, CLW, CLX, CLY, CLZ	Prizes Handling & Resolution CLM, CLN, CLO, CLP, CLQ, CLR, CLS, CLT, CLU, CLV, CLW, CLX, CLY, CLZ	Settlement Services Provision CLM, CLN, CLO, CLP, CLQ, CLR, CLS, CLT, CLU, CLV, CLW, CLX, CLY, CLZ	Analytics Services Provision CLM, CLN, CLO, CLP, CLQ, CLR, CLS, CLT, CLU, CLV, CLW, CLX, CLY, CLZ	User Identity and Access Provision CLM, CLN, CLO, CLP, CLQ, CLR, CLS, CLT, CLU, CLV, CLW, CLX, CLY, CLZ	Navigation Data Provision	Standards Development & Planning
Battery Control System Delivery CLB, CLC, CLD, CLE, CLF, CLG, CLH, CLI, CLJ, CLK	Charging Location Maintenance CLM, CLN, CLO, CLP, CLQ, CLR, CLS, CLT, CLU, CLV, CLW, CLX, CLY, CLZ	New Revenue Charging Activity Control CLM, CLN, CLO, CLP, CLQ, CLR, CLS, CLT, CLU, CLV, CLW, CLX, CLY, CLZ	Electricity System Charging Control CLM, CLN, CLO, CLP, CLQ, CLR, CLS, CLT, CLU, CLV, CLW, CLX, CLY, CLZ	Sales & Promotions CLM, CLN, CLO, CLP, CLQ, CLR, CLS, CLT, CLU, CLV, CLW, CLX, CLY, CLZ	Fraud Protection & Resource Protection CLM, CLN, CLO, CLP, CLQ, CLR, CLS, CLT, CLU, CLV, CLW, CLX, CLY, CLZ	Master Data Management CLM, CLN, CLO, CLP, CLQ, CLR, CLS, CLT, CLU, CLV, CLW, CLX, CLY, CLZ	Data Disposition Management CLM, CLN, CLO, CLP, CLQ, CLR, CLS, CLT, CLU, CLV, CLW, CLX, CLY, CLZ	Enterprise Service Provision	Enterprise Legal/Compliance Reporting	
Battery In-Life Operations Support CLB, CLC, CLD, CLE, CLF, CLG, CLH, CLI, CLJ, CLK	Charging Location Control CLM, CLN, CLO, CLP, CLQ, CLR, CLS, CLT, CLU, CLV, CLW, CLX, CLY, CLZ					Knowledge Management CLM, CLN, CLO, CLP, CLQ, CLR, CLS, CLT, CLU, CLV, CLW, CLX, CLY, CLZ	Project Delivery CLM, CLN, CLO, CLP, CLQ, CLR, CLS, CLT, CLU, CLV, CLW, CLX, CLY, CLZ		Enterprise Service Integration	

Commentary

In this model the full gamut of requirements is met as follows:-

- The number of business components which are enabled or affected by Smart enablement is not large but those that are, do provide significantly more sophisticated functionality, particularly in the Electricity System Operation Competency around demand / supply management and control
- The Charging Location Infrastructure Provision Capability is highlighted as yellow it must now take account of Smart Meters
- The Charging Location Operation Capability changes in this model, as dynamic pricing by the Electricity System Operators is functionality which can be delivered, as can the Vehicle to Grid Discharge functionality.
- The intelligent Infrastructure communication and integration components become significantly more complex to cope with the requirements of real time communication and integration

The Development of the Smart Business Model

The key actions required to allow the development of this business model, are:-

- the implementation of Smart Meter and Smart Grid Technology,
- the development of the Intelligent Infrastructure to handle more sophisticated and extensive real-time communications and integration

The key factor determining the timescales for the move to this stage of evolution is the growth in the EV market and specifically the growth in demand for electricity for EV Charging and the associated urgency to control this demand.

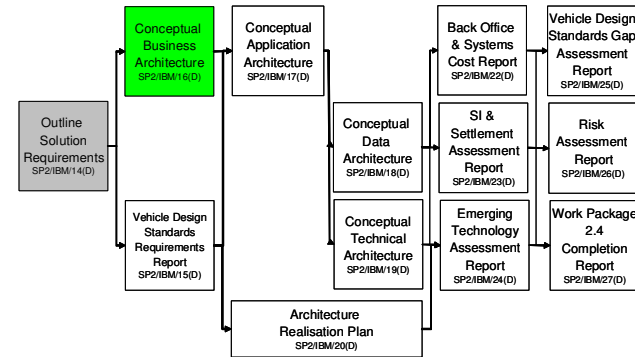


ETI EV Work Package 2.4 Intelligent Infrastructure - Conceptual Business Architecture

Possible Further Use of the CBM

EV Intelligent Infrastructure - Conceptual Business Architecture – Possible Further Use of the CBM

- The Conceptual Business Architecture will, when approved by the ETI, form the basis of the next stages of work on Work Package 2.4 – in particular it is a key input into the Application, Data and Technical Architecture Models – as shown right:-



- Once approved the CBM Model can also be used in the analysis of other aspects of the EV market. Examples are:-
 - An analysis of which actors might deliver which business competency components going forwards – i.e. how a business rooted in one particular part of the market might grow into other parts of the markets – for example how EV manufacture might venture into provision of information services. An illustrative analysis is presented on the next slide, slide 57.
 - An analysis of the Technology Risk Areas across the EV market – an illustrative analysis is presented on slide 58.
- The examples use a technique which CBM refers to as ‘attribution’ and the development of ‘heat’ maps. These are views of the model that identify components that provide the greatest opportunity for development, improvement, innovation, transformation or management based on predefined evaluation criteria.

EV Intelligent Infrastructure – Possible Further Use of the CBM – EV Market – Who might deliver what?

	Electric Vehicle & Battery System Delivery	Charging Location Infrastructure Provision	Charging Location Operation	Electricity System Operation	Customer Relationship Services	Payment, Billing & Settlement Services	Intelligent Infrastructure Information Management & Analytics	Intelligent Infrastructure Provision	Beyond the Vehicle Service Provision	Strategy, Regulation & Legislation
Direct	EV Control System R & D Strategy 	Charging Location Strategy 	Charging Location Operation Strategy 	Electricity System Operations Strategy 	Customer Relationship Strategy 	Payment Service Strategy 	Information Management Strategy 	Service Management Strategy 	Alliance Strategy 	Regulatory & Compliance Strategy
	Battery Control System R & D Strategy 	Charging Location Maintenance Strategy 		Electricity System Emergency Planning 	Channel Strategy 	Billing Service Strategy 	Analytics Strategy 	Business Technology & Governance Strategy 		Intelligent Infrastructure Business Strategy
					Market Development 	Settlements Service Strategy 				Standards & Policy Strategy
Control	EV Control System Product Development 	Charging Location Demand Analysis 	Charging Location Performance Management 	Electricity System Network Load Analysis 	Customer Service Management 	Payment Service Management 	Master Data Planning & Governance 	Service Management 	Alliance Management 	Regulatory Compliance Management
	Battery Control System Product Development 	Charging Location Planning 		Electricity System Operational Performance Mgt 		Billing Service Management 	Information Planning & Governance 	Enterprise Architecture 		Risk Management
		Charging Location Design 				Settlements Service Management 		Change Deployment Control 		Standards Roadmap Planning
		Charging Location Asset Management 				Fraud Management 		Security, Privacy and Data Protection 		
Execute	EV Configuration & State Management 	Charging Location Construction 	Availability & Booking Management 	Electricity System Demand Forecasting 	Account Management 	Payment Services Provision 	Data Extract & Upload Services 	Service Integration 	Roadside Assistance Provision 	Regulator Interaction
	EV In-Life Operations Support 	Charging Location Commissioning / Decommissioning 	Charging Location Asset Monitoring 	Electricity System Load Management 	Contact Management 	Billing Services Provision 	Query & Reporting Services 	Service & Infrastructure Operations 	Information Service Provision 	Market Research
	EV Communications Delivery 	Domestic Charging Location Installation 	Domestic Charging Activity Control 	Price and Tarrif Management 	Problem Handling & Resolution 	Settlement Services Provision 	Analytics Services Provision 	User Identity and Access Processing 	Navigation Data Provision 	Standards Development & Publishing
	Battery Configuration & State Management 	Charging location Maintenance 	Non Domestic Charging Activity Control 		Sales & Promotions 	Fraud Detection & Revenue Protection 	Master Data Management 	End to End Service Monitoring 	Entertainment Service Provision 	Environmental Legislation Reporting
	Battery In-Life Operations Support 		Discharge Activity Control 				Knowledge Management 	Project Delivery 	Environmental Legislation Reporting 	

Key:-



Government



Info Provider



EV OEM



Charge Location OEM



Electricity supply Chain



Service Operators

EV Intelligent Infrastructure – Possible Further Use of the CBM – EV Market - Technology Risk Areas

	Electric Vehicle & Battery System Delivery	Charging Location Infrastructure Provision	Charging Location Operation	Electricity System Operation	Customer Relationship Services	Payment, Billing & Settlement Services	Intelligent Infrastructure Information Management & Analytics	Intelligent Infrastructure Provision	Beyond the Vehicle Service Provision	Strategy, Regulation & Legislation
Execute	EV Configuration & State Management [H] [H] [L]	Charging Location Construction [L] [L] [M]	Availability & Booking Management [M] [M] [H]	Electricity System Demand Forecasting [H] [H] [M]	Account Management [M] [M] [H]	Payment Services Provision [M] [H] [H]	Data Extract & Upload Services [M] [M] [H]	Service Integration [H] [H] [M]	Roadside Assistance Provision [L] [M] [M]	Regulator Interaction [M] [M] [M]
	EV In-Life Operations Support [M] [L] [M]	Charging Location Commissioning / Decommissioning [L] [L] [M]	Charging Location Asset Monitoring [M] [M] [M]	Electricity System Load Management [H] [H] [M]	Contact Management [M] [M] [H]	Billing Services Provision [M] [M] [H]	Query & Reporting Services [M] [M] [H]	Service & Infrastructure Operations [H] [M] [M]	Information Service Provision [M] [M] [M]	Market Research [L] [L] [H]
	EV Communications Delivery [H] [H] [L]	Domestic Charging Location Installation [L] [L] [M]	Domestic Charging Activity Control [M] [H] [L]	Price and Tariff Management [M] [H] [M]	Problem Handling & Resolution [L] [L] [H]	Settlement Services Provision [H] [M] [M]	Analytics Services Provision [H] [M] [M]	User Identity and Access Processing [H] [M] [M]	Navigation Data Provision [M] [M] [M]	Standards Development & Publishing [L] [L] [M]
	Battery Configuration & State Management [H] [M] [L]	Charging location Maintenance [M] [M] [M]	Non Domestic Charging Activity Control [M] [H] [L]		Sales & Promotions [L] [M] [H]	Fraud Detection & Revenue Protection [H] [H] [H]	Master Data Management [H] [H] [H]	End to End Service Monitoring [H] [H] [M]	Entertainment Service Provision [M] [M] [M]	Environmental Legislation Reporting [L] [L] [M]
	Battery In-Life Operations Support [M] [L] [M]		Discharge Activity Control [H] [H] [L]				Knowledge Management [M] [L] [H]	Project Delivery [L] [L] [H]		

Key:-

H	M	L	H	M	L	L	M	H
Technology Requirement Requirement			Potential Technology Complexity			Current Technology Maturity		

- areas for 'tight' management of the technology risk



ETI EV Work Package 2.4 Intelligent Infrastructure - Conceptual Business Architecture

End of Document