



Electricity network charging infrastructure

SHIFT 2009
3rd December 2009, Cambridge

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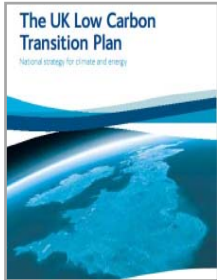
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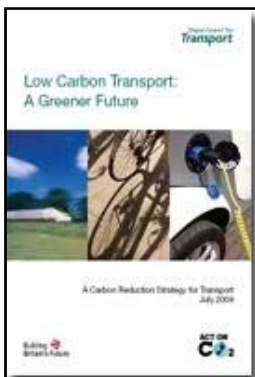
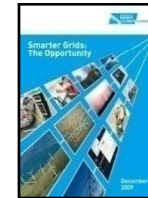


❖ UK Response to climate change challenges



The UK Low Carbon Transition Plan. This White Paper sets out the UK's transition plan, to 2020, for becoming a low carbon country:

- 40% of energy from low carbon sources including 30% of energy from renewables;
- rolling out smart meters to all homes by 2020;
 - Government's conclusions and decisions published 2nd December
- CO2 emissions from new cars to be cut across the EU by 40% on 2007 levels and increased support for electric cars;
- sourcing 10% of UK transport energy from renewable sources.



Low Carbon Transport Strategy. Key component of The UK Low Carbon Transition Plan, focusing on Transport.

- It sets out how DfT intend to reduce greenhouse gas emissions from transport.
- It also shows how transport will make a major contribution to UK efforts to reduce CO2 emissions by 2022 and 2050.

❖ Electrification of Transport Test Bed UK

- Government lead initiative to form collaborative environment to make the UK a world leading destination to develop, demonstrate, manufacture and use ultra low carbon vehicles.

£400m committed to encourage development and uptake of ultra-low emission vehicles. **£300m** to infrastructure deployment and vehicle incentives. **£100m** to vehicle technology development.

- £23m for the Technology Strategy Board (TSB) Low Carbon Vehicle Innovation Platform
- £100m for the TSB Low Carbon Vehicle Integrated Delivery Programme
- £20m for the Department for Transport (DfT) Low Carbon Vehicle Public Procurement Programme
- £250m for the DfT EV consumer incentive package

❖ Test Bed UK

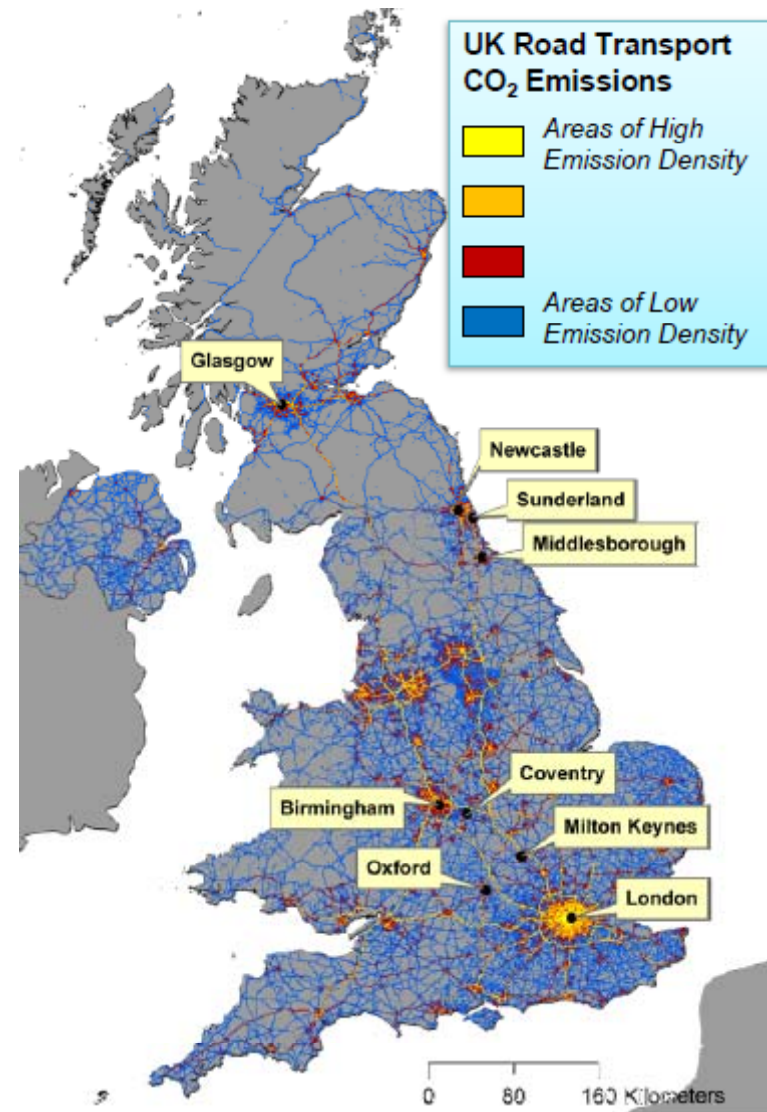
□ Plugged in Places:

- Government (OLEV) has committed up to £30m seed funding
- Help a number of lead cities or regions in the UK to establish themselves as front-runners in the trialling and adoption of electric vehicle re-charging infrastructure
- Plugged in Places is expected to be launched later this year.
- It is anticipated that around 3 – 6 cities and regions will receive funding initially, bringing together consortia of public authorities and companies to install publicly accessible charging points on streets, car parks and in commercial, retail and leisure facilities.
- The Plugged in Places framework will also offer a way of sharing information and lessons learned more widely across the UK.

OLEV (Office for Low Emissions Vehicles) is responsible for allocating the £260m made available in the Budget 2009, of which £230m is meant to subsidise EV acquisition and £30m for infrastructure through their Plugged In Places programme.

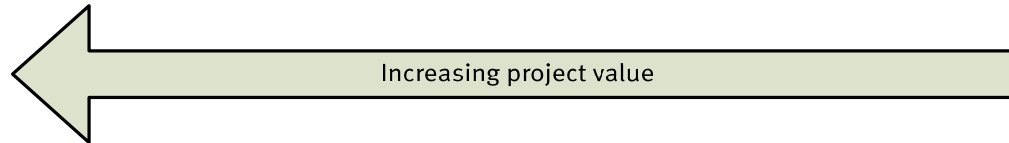
❖ The Joined Cities Plan

- ❑ £11m scheme launched by the Energy Technologies Institute (ETI) that will help cities deploy a network of recharging points for electric and plug-in hybrid vehicles.
- ❑ Through the Joined-Cities Plan, local authorities and electricity distribution network operators will install recharging infrastructure allowing consumers to easily use their electric vehicles in any of the other major UK cities in the scheme.
- ❑ Other elements of the Joined Cities Plan will include research into how to market electric vehicles, investigating consumers' preferences, and establishing what infrastructure is needed to support the electric vehicle market.



**Plug-in Vehicle Economics
and Infrastructure Project**

❖ Ofgem's Low Carbon Networks Fund



Tier2 Innovation
£320m over 5 years
Small number of “flagship” projects (<20)
Annual call for proposals
Competitive bidding
Allows trialling new technologies and carbon arrangements to better prepare for low carbon economy

Tier1 Innovation
£80m over 5 years allocated across DNOs (according to their customer numbers)
Allocated annually on a use it or lose it basis.
Reasonable number of smaller projects
DNOs to register proposals with Ofgem to avoid duplication of trials across DNOs

Trial innovative commercial and technical **networks** solutions to:

- Connect increasing renewables
- **Managing network impact of increased renewables, demand side management, electric vehicles, etc**
- Explore active network management, smart grids and other commercial services

£ 500m (over 5 years) to prepare the distribution networks for the role they will have to play as GB moves to a low carbon economy



❖ Analysing Impact of EVs on GB Electricity System

❑ Illustrative studies of the impact on:

- Load curve and system peak demand, and
- LV distribution network operation and reinforcement

❑ Work carried out by Imperial College, London – Led by Prof. Goran Strbac



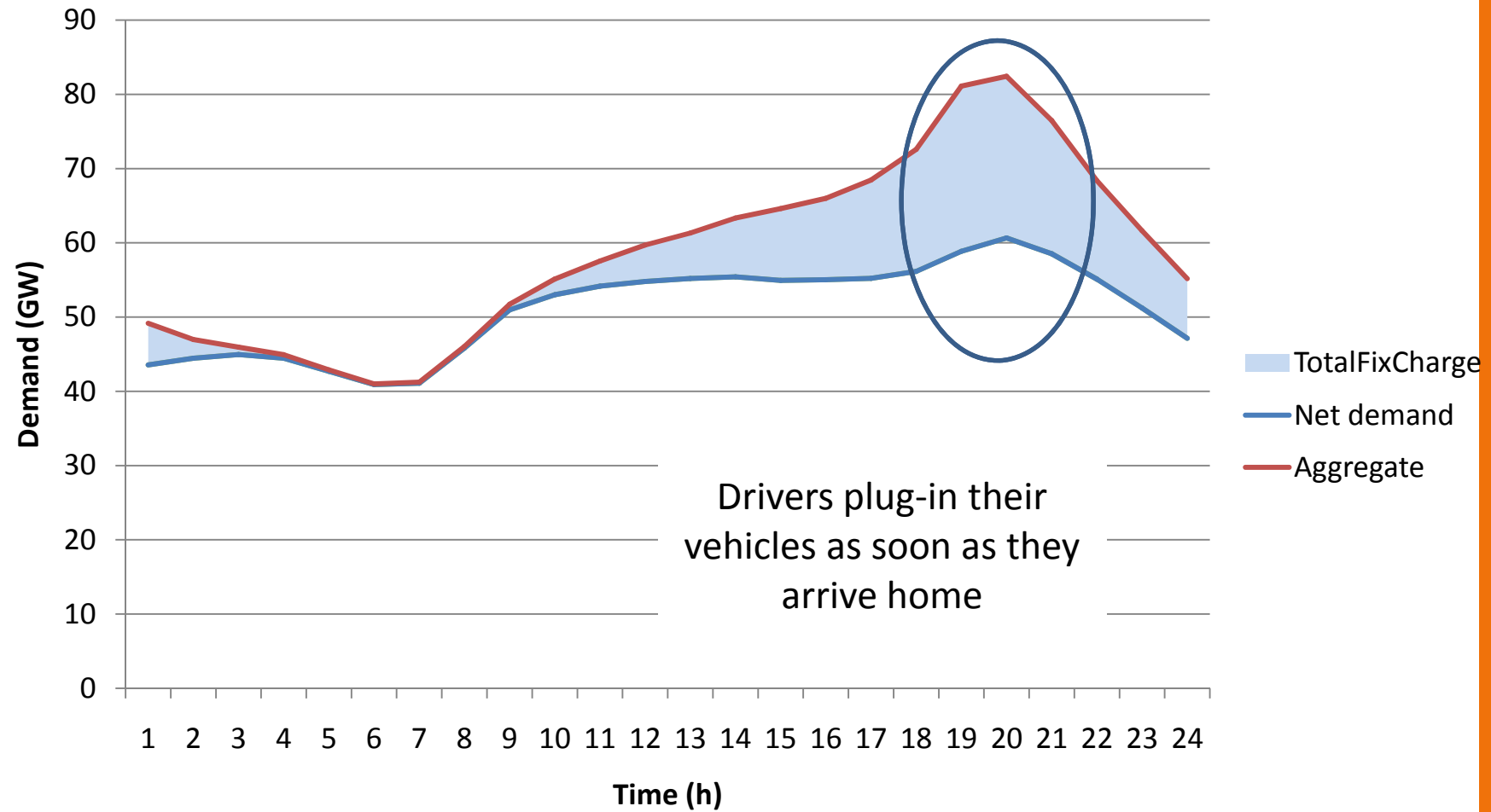
Imperial College
London

Some key statistics

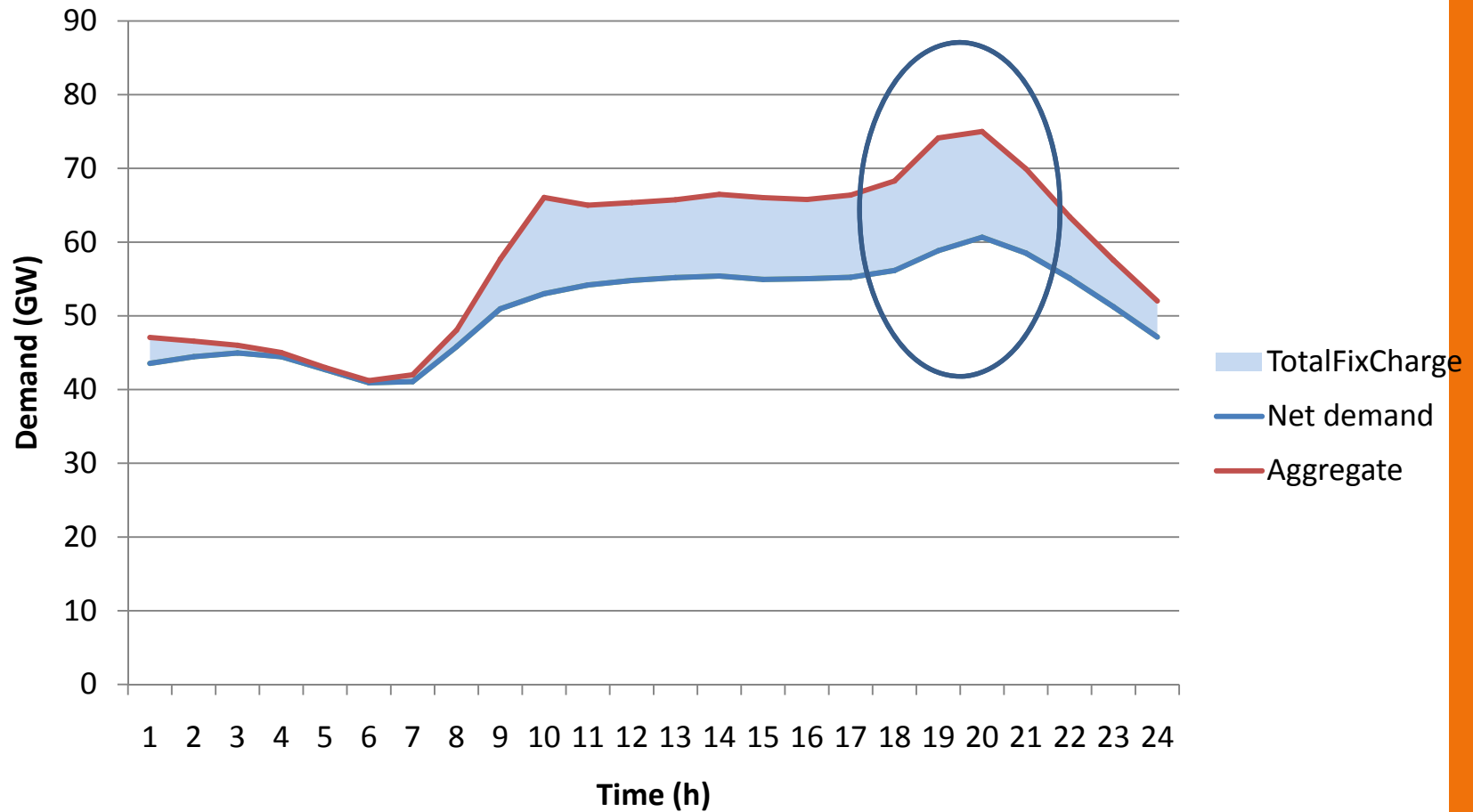
No. of vehicles (mil.)	34
Total (average) daily energy demand (GWh)	153
Average Energy/vehicle (kWh/veh.)	4.5
Daily distance (mil.km)	739 – 1262
Average daily distance (km/vehicle)	22 - 37
Energy consumption (kWh/km)	0.15

Business as usual

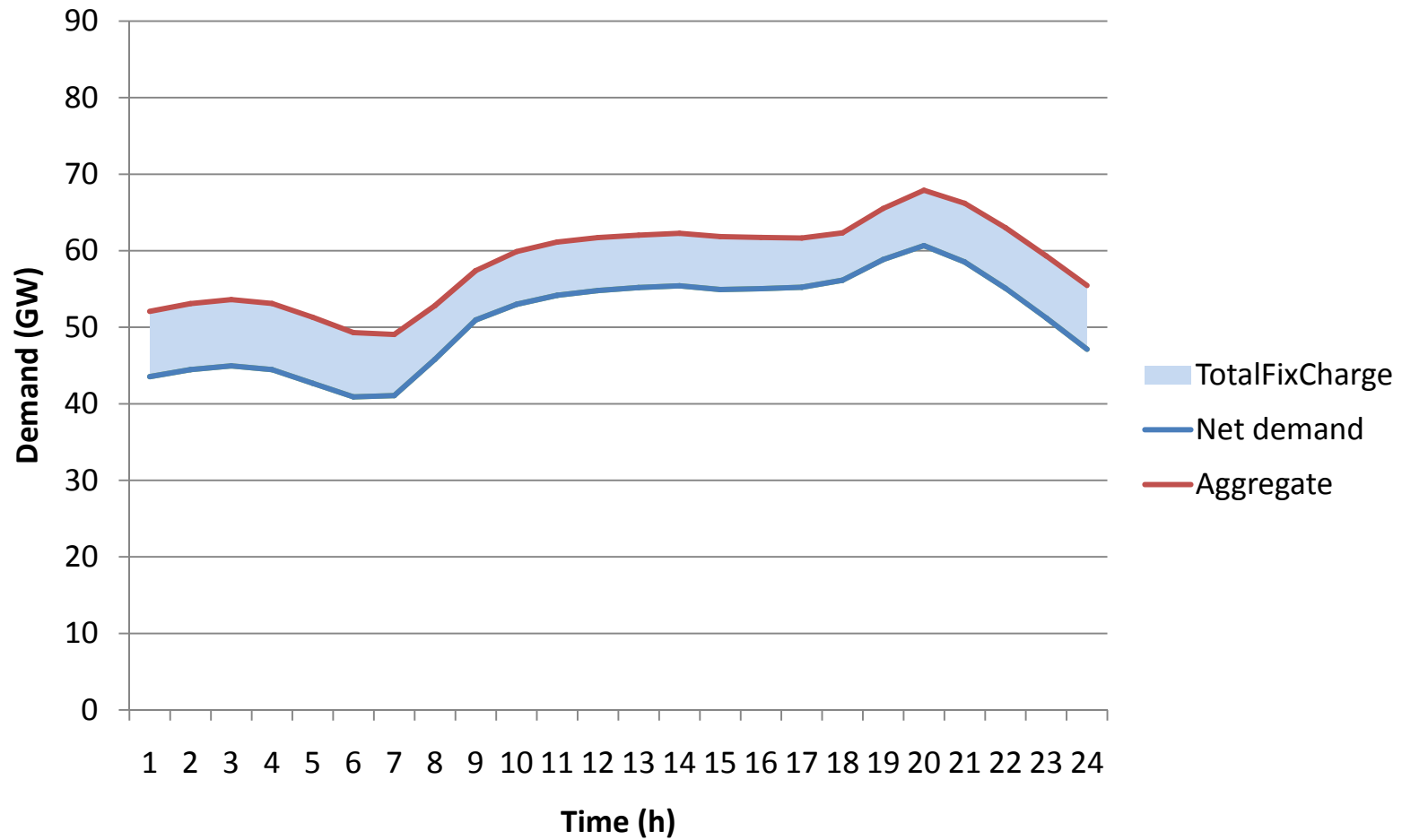
Uncontrolled Single Charging



Business as usual Charging after each journey

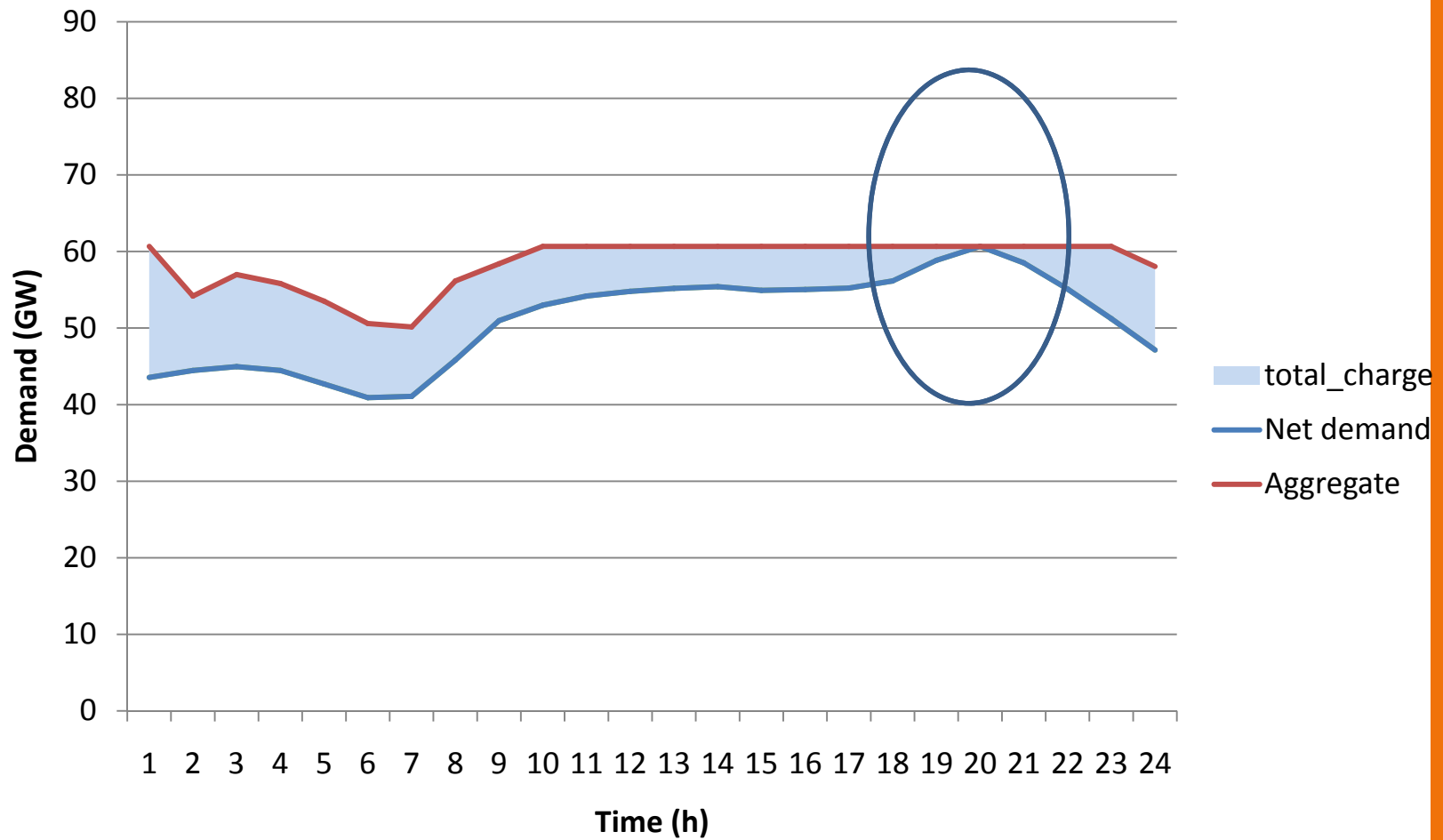


Minimum power continuous charging

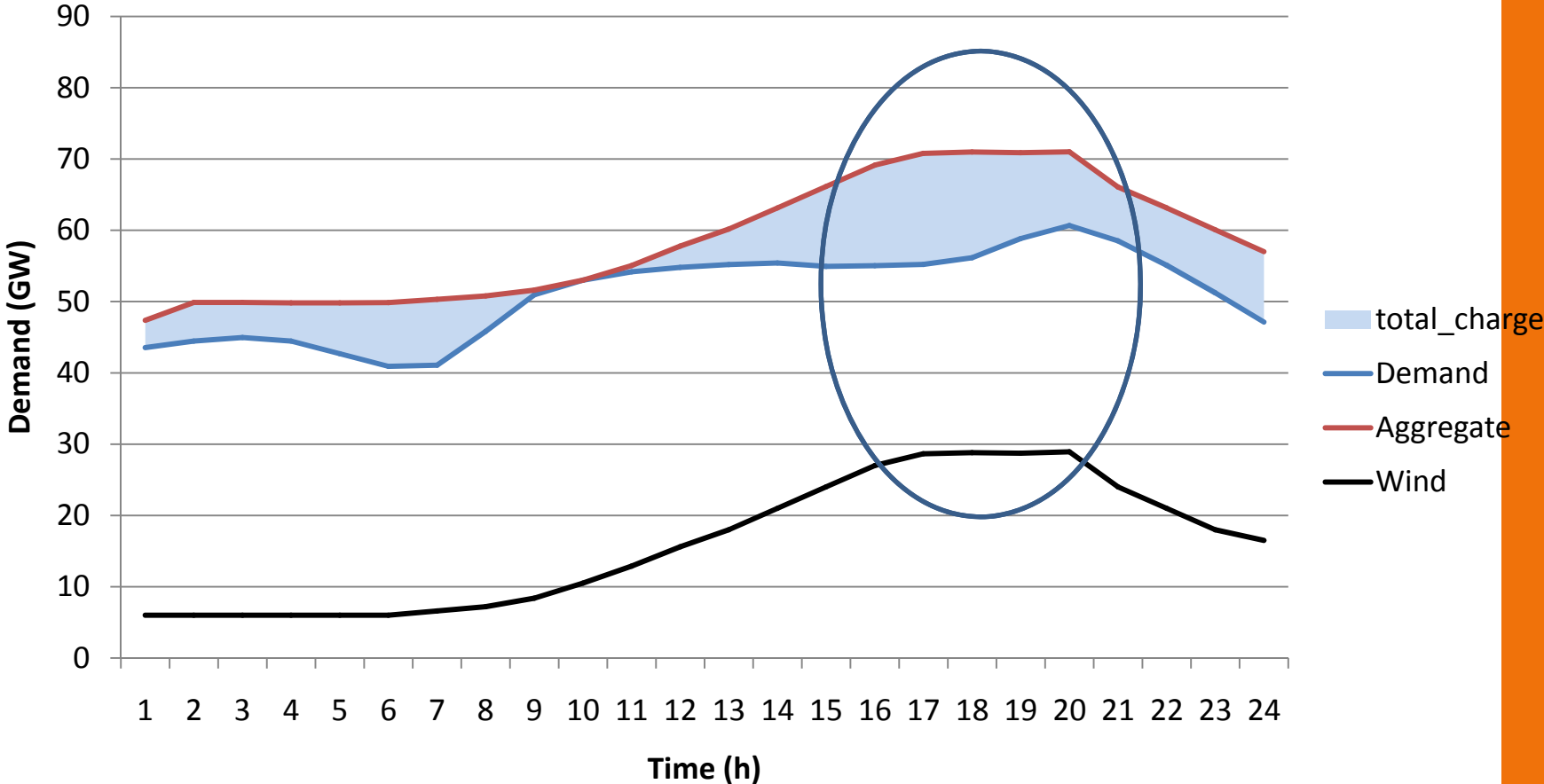


Smart Control

Minimum peak charging policy



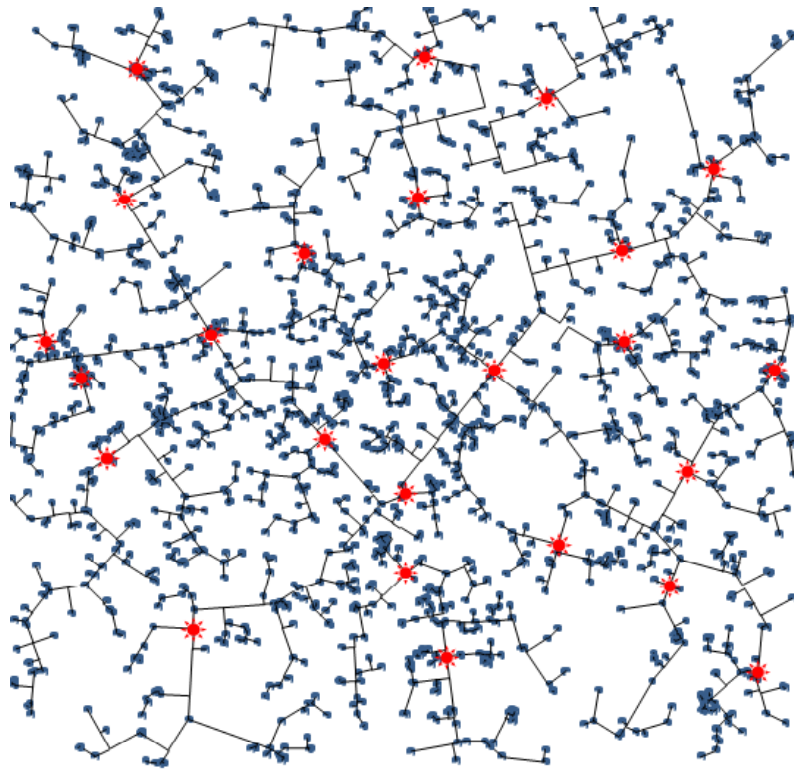
Optimal demand response to electricity prices



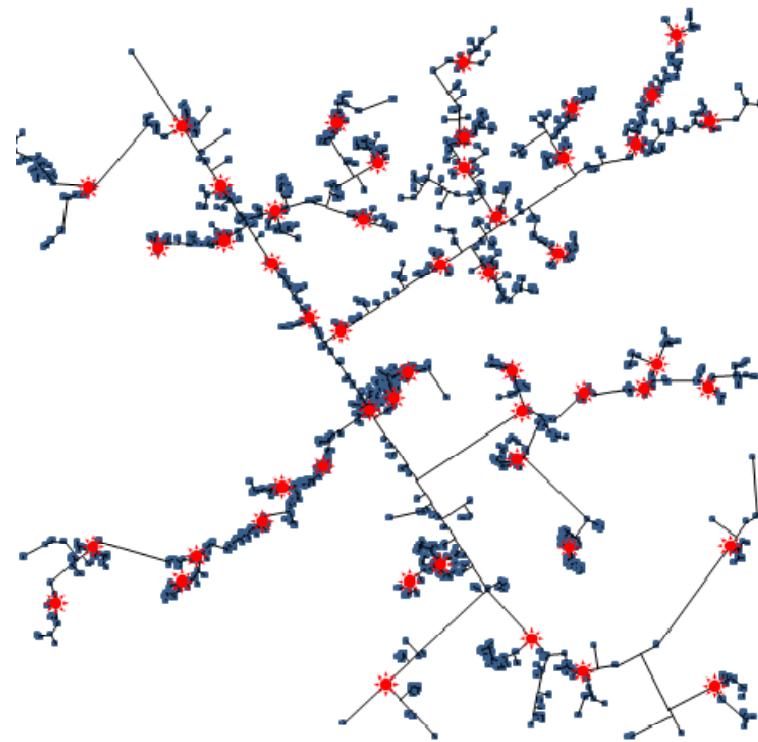
Network overloads, increased losses

	Base case	Min	Max
Peak demand	100%	150%	250%
Increase in Losses	-	15%	70%
Distribution reinforcement costs	-	60£/kW	250£/kW

Impact of EVs on LV distribution networks

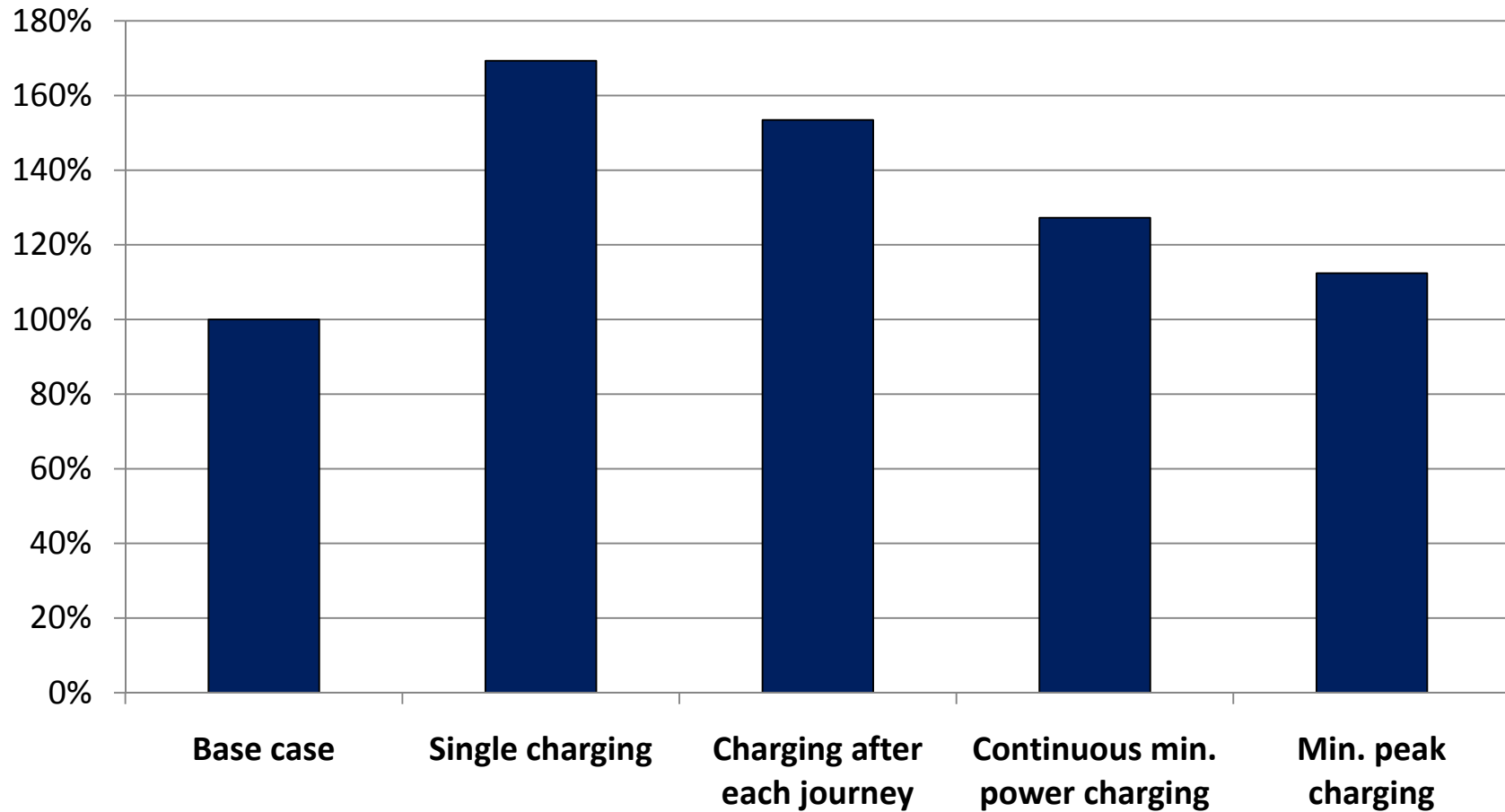


Urban

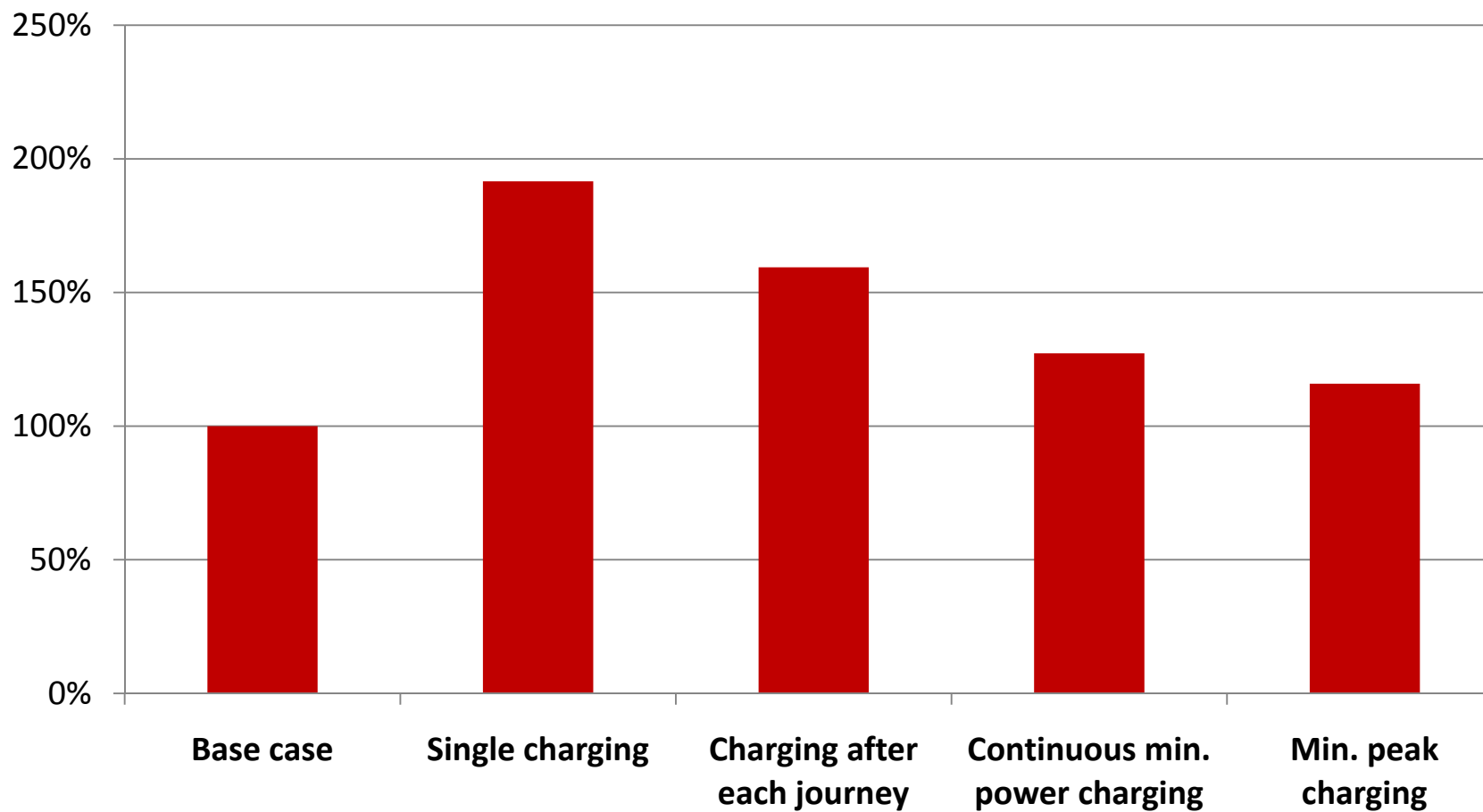


Rural

Urban LV network peak load



Rural LV network peak load



A few observations

- Developing a low carbon electricity system based on Business as Usual operation and development philosophy may be very costly.
- Integration of EVs may have a significant impact on capacity costs and may lead to a significant network reinforcement.
- Significant opportunity and benefits from smarter solutions.
- Interaction between energy suppliers and networks operators will need to increase significantly in future.

❖ EDF Energy Electric Vehicles Initiatives

❑ Partnership with Elektromotive:



- ❑ EDF Energy has already part funded and installed 50 Elektrobay charging posts in the UK (the majority in London)
- ❑ Looking to install a total of 250.



Rated Voltage	240 VAC
Rated Frequency	50-60Hz
Rated Input Current	20 Amps
Over Current Protection	UK Spec: 16 Amp Eaton Fuse Euro Spec: 20 Amp Eaton Fuse



❖ EDF Energy Electric Vehicles Initiatives

Technology Strategy Board
Driving Innovation

- ❑ TSB /Mercedes Smart Electric Vehicle trial:
 - ❑ 60 Mercedes Smart EVs in London and South East.
 - ❑ EDF Energy will provide smart metering and trial tariffs to explore customer recharging behaviour and the impact of incentives on off-peak charging.
 - ❑ Target: residential customers.



❖ EDF Energy Electric Vehicles Initiatives

Technology Strategy Board
Driving Innovation

❑ TSB /Toyota Plug-in Hybrid trial:

- ❑ 20 second generation PHV (latest Prius model)
- ❑ Evaluate the vehicles' performance in an urban environment, infrastructure requirements and driver behaviours and expectations.
- ❑ Target: major business customers (including TfL, the Met Police, Government Car Dispatch Agency, Sky and Sainsbury's).



❖ EDF Energy Electric Vehicles Initiatives

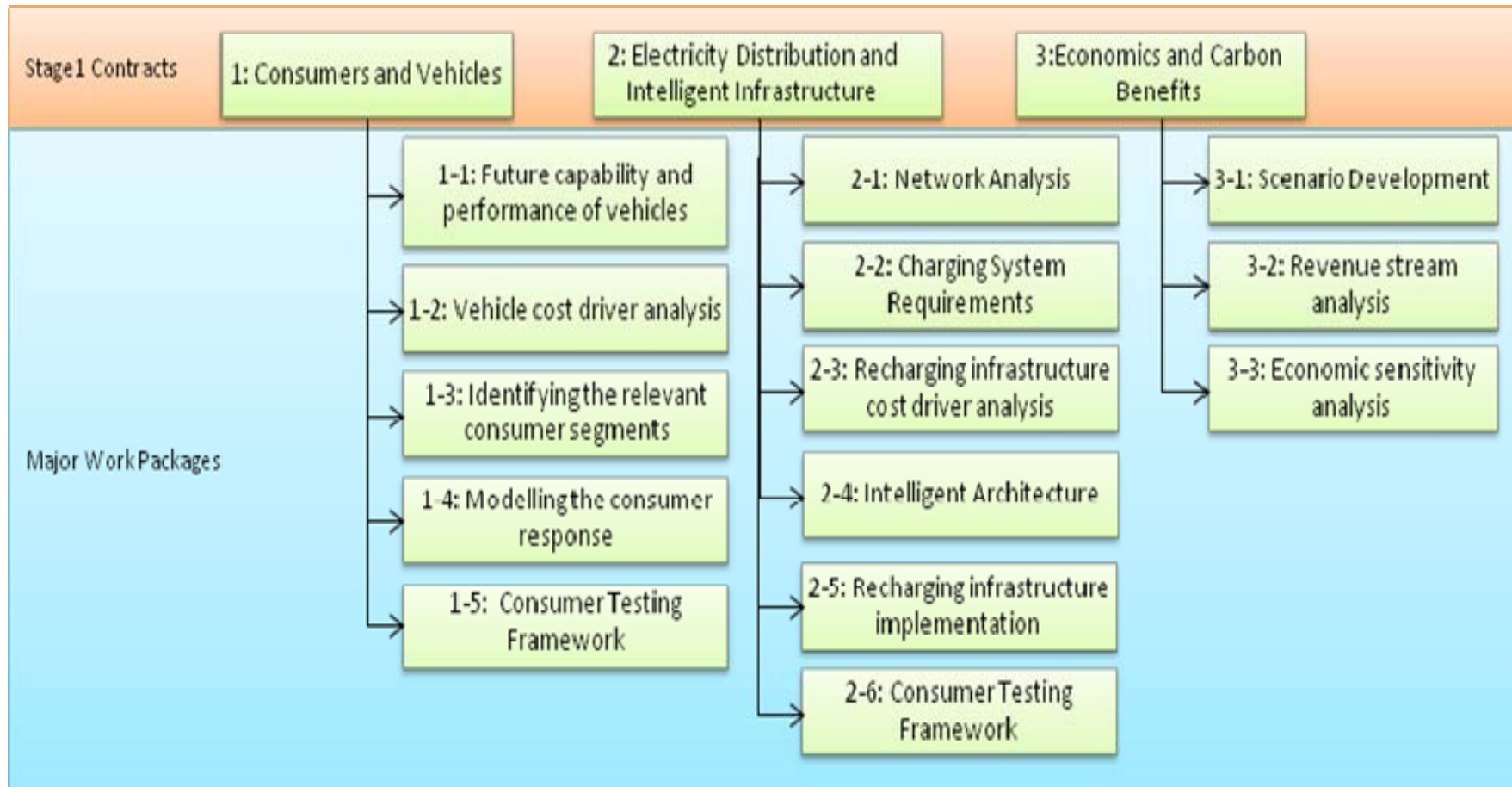
❑ Plug-in Vehicle Economics and Infrastructure Project.



The Energy Technologies Institute (ETI) will conduct an extensive evaluation of (1) consumers' attitudes towards plug-in vehicles and (2) the supporting infrastructure.

- ❑ Determine the potential size of the market and routes to self-sustaining mass market deployment of PHV.
- ❑ Establish cost effective infrastructure deployment and driver incentive strategies.
- ❑ To develop the infrastructure technology that will enable compatibility
- ❑ **Impact of PHV on distribution networks infrastructure**

❖ Plug-in Vehicle Economics and Infrastructure Project



❖ Conclusions



- ❑ Decarbonising transport is an essential part of building a low carbon future for Britain.
- ❑ We welcome the several initiatives currently in place to encourage development and uptake of ultra-low emission vehicles (including charging infrastructure).
- ❑ Smart charging is necessary - Smart meters to play a key role.
- ❑ EDF Energy has been one of the most active utilities in the UK in this area.

THANK YOU!

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