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Introduction to Cenex

- ‘Not for Profit’ Consultancy and Research Organisation
  - 10 years accelerating the shift to a low carbon economy
  - Passionate (but objective) about low carbon transport innovation
  - Track record of successful projects for electric vehicles, hydrogen and bio-methane
  - Work across networks through collaboration and partnership working

- Clients include;

- Support to clients via;
  - Project development, techno-market due diligence, public affairs, projects management, research support, data analysis and reporting, the UK’s largest low carbon vehicle event (www.cenex-lcv.co.uk)
Cenex Approach to Low Carbon Vehicles and Energy for Transport

Identify opportunities and barriers to uptake

Work collaboratively to realise required understanding via:
- CR&D
- Technology Trials
- Market seeding projects
- Supply chain development

Provide advice and support to accelerate market adoption
Why Low Carbon (Low Emission) Vehicles

• Low Carbon
  • Sustainability (climate change, economic competitiveness)
  • Energy (security, diversity)

• Air Pollution Impact
  • Health
  • Environment
  • Economy

• Government Policy
  • “Stick and carrot” policy framework for motor industry
    - European regulation
    - Local city policies
    - Innovation policy framework supporting supply chain capability development
Pathways to Low Emission Vehicles

For passenger cars three alternative energy pathways are actively promoted by interested parties. All of which can deliver < 50g/km CO$_2$ for passenger cars

- Internal Combustion Engine (+ Plug In + Bio-fuels)
- Advanced Electric Vehicles
- Hydrogen Fuel Cells

Near Zero and Zero Tailpipe Emissions

Natural gas\Bio-methane main ‘other’ alternative fuel for road haulage

**CSFs:** Electrified powertrain, ability to leverage renewable energy sources, zero emissions at tailpipe
Energy for Transport – Central Issues

• Where energy comes from
  • How it is generated and stored
  • How it is transported to point of use
  • How economically and environmentally sustainable energy generation and supply is

• Energy use
  • How vehicles are refuelled
  • Economics of use
    • CAPEX, OPEX and TCO

• Energy system alignment
  • Co-investment support
  • Impact on and response from competitive energy sources
Methane as a transport fuel

- Gas supply is primarily an alternative fuel for truck or bus fleets
  - Dedicated or dual-fuel option
  - Infrastructure at depot (buses, RCVs >> trucks) or publically accessible station for shared customer use (trucks, vans)
  - Location very important for business case
  - Station assets are expensive in CAPEX and OPEX - economies in scale in sizing and use
  - Extensive planning phase requirements including utilities (gas, electricity, water)
  - Gas distribution pipelines not aligned or necessarily right-sized to meet vehicle refuelling location requirements (so typically gas road transported – in Liquefied form)
  - Stations require storage and compression – 3-phase industrial electrical requirement
  - DNO engagement typical to any new industrial process install

**CSF: Gas requires planned and managed investments inc. engagement with utilities**
Electric Avenue

Electricity as a transport fuel

- Electricity is an alternative for passenger cars, taxis, vans, bikes and city buses
  - Pathway to transport decarbonisation via decarbonisation of electricity
  - Strong policy drivers at EU, National and local level
  - New distributed refuelling (recharging) infrastructure developing to support EV uptake
    - Multiple stakeholders co-investing to different business cases
    - Home, workplace, public (destination) locations, transport corridor locations
    - 3kW AC to 120 kW DC – all from low voltage network
  - Private motorists and businesses keen to leverage lower taxation costs of energy used and vehicle ownership (TCO savings)
  - DNO engagement typical for public and most workplace installations. Notification on domestic installations

CSF: Electricity requires distributed charge point infrastructure added to grid
......... with case by case DNO considerations
Electric Avenue

Electrification of City Transport - Amsterdam

Traffic emission free by 2025
Solar PV to 80,000 buildings by 2020
From 1000 to 4000 Charge Points by 2018
Charging Patterns in Amsterdam

Network user diversity – examples drawn from;
>380,000 charging sessions
>10,000 card holders

**CSF: Potential for demand management via smart charging aided by diversity**

Examples of Initiatives for Smart Charging

moet je watt

Charger linked to smart meter – help charge and use other household appliances simultaneously without overloading the grid.

Dutch alternative to Tesla Powerwall Battery back up from 1.7kW to 230kW

The New Motion smart charging pilot lets Dutch drivers choose clean electrons

Posted May 29, 2015 by Charles Morris & filed under Newswire, The Infrastructure.

A pilot program in the Netherlands will give EV drivers the option of scheduling charging to take advantage of lower nighttime rates, and also to choose among different energy suppliers.

“Flexible Charging Rates” is a joint project of network operator Enexis, energy suppliers Green Choice and NieuweStroom, and service providers The New Motion and Greenflux. It involves 50 participating EV drivers, and will run till November 2015.

Participants will be able to choose the times of their charging sessions, and also to opt for electricity generated from renewable sources.

It’s all part of a larger pilot called “Slim Charging Brabant,” in which the province of Brabant will develop a network of public charge points, connected by a smart network called Slim Net that will manage power demand to avoid overloading the power network.

Sources
issuu.com/amsterdamsmartcity/docs/smart_stories
www.hybrid.energy
An Amsterdam Smart City V2X
Local energy grid becomes better balanced by the local loading and unloading of EVs.

Features
New Open Mobility Services Platform, open protocols, decision engines
Innovative new hardware and operating software for bi-directional fast loading for V2X

Business model Investigation
Pool2G
Carsharing2G
AllEVs2G + others

Technology Demonstration
V2H (2014) Nieuw-West Living Lab
V2C (2016) Ameersterdam

Source: http://amsterdamsmartcity.com/projects/detail/id/72/slug/vehicle2grid
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**CSFs: Infrastructure supports range and roaming as first priority – time to prepare for smart charging**
De-risking UK EV Charging Infrastructure Deployment for Use

• Case-by-case decision making on installations and DNO local grid reinforcement

• Demand side management of charge points

• V2G

Research Projects
- Low Carbon London
- Electric Avenue
- EFES
- CVEI
- Other projects

CSF: Learning from research projects will help create evidence base to validate business cases for smart charging

Sources: BBC, Polar, Ricardo
Electric Avenue


Development of three key technologies:
- Virtual Power Plant (VPP)
- Vehicle-to-Grid (V2G) Unit
- Vehicle-to-Grid Gateway

Other work within the project includes;
- Stakeholder analysis
- Scenario feasibility evaluation
- Business case exploration
Use case examples

- Fleet operations from a central depot
- Train/airport commuter parking/business park workplace
- Domestic/residential

Worldwide revenue from V2G will grow from less than $900,000 annually in 2013, to over $190m by 2022

Source: www.navigantresearch.com/research/vehicle-to-grid-technologies
ETI Consumer Vehicle and Energy Integration (CVEI) Project

Will look at managing charging via consumer questionnaire ahead of a planned large scale consumer trial

Source: http://www.eti.co.uk/project/consumer-vehicles-and-energy-integration-cvei/
Conclusions

• Energy for transport
  – Low carbon de-risking about removing dependence on fossil fuels through leveraging renewables aided by electrified powertrains
  – Electricity as a fuel brings more diversity than other alternatives

• Why Electric Vehicles?
  – Government’s want them to meet policy aims
  – Cities want them to replace diesels to improve air quality
  – Fleets and Private Motorists interested in them for lower cost motoring

• De-risking Electric Vehicles
  – EV market development requires infrastructure roll out
  – EV infrastructure roll out will lead to case-by-case stresses on local low voltage distribution networks
  – Options – alternative CP locations, DNO investment, demand management and V2G
  – Smart charging demand management opportunities via charge point networks
  – V2G key building block for smart cities
  – Learning from research projects key to helping understanding required to de-risk investment in smart charging solutions
Thank you for listening

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