Electrification-of-Transport:- Challenges and Opportunities

By
John Baker,
EA Technology Consulting,
United Kingdom

Tel. +44-151-339-4181 e:mail:john.baker@eatechnology.com

Presentation to CIRED 2009 Round Table on “New Business Potential for DSOs – Electric Vehicles,” Prague, Czech Republic, 11th June 2009
Presentation Structure

- Historical perspective
- Top level political drivers
- Electric vehicles for public highway applications
- Challenges
- Opportunities
- Conclusions
Historical Perspective

1898: Gaston de Chasseloup-Laubet claims the first official land speed record of 39 mph in a Jeantaud electric vehicle.

1899: Camille Jenatzy claims the first land speed record of in excess of 100 km/hour in an electric vehicle, La Jamais Contente.

Early 1900s: Ascendancy of internal combustion engine/EVs marginalised into limited number of niche market applications.
1973/74: OPEC oil price shocks/renewed interest in EVs, e.g.:-
- Enfield Electric Car
- Sodium Sulphur battery development

Early 1990s: Concerns in relation to inner urban air quality (smogs) in the LA Basin trigger development of LA301 hybrid, the predecessor to the Prius, launched by Toyota in the mid-1990s

Mid/late 1990s: Increasing interest in EVs, both in the UK and worldwide, triggered by their carbon savings potential and zero emissions performance

Present day: Advent of Plug-Hybrid Electric Vehicles (PHEVs)/accelerated market introduction via Governmental stimulus and incentive packages?
Top Level Political Drivers

- Displacement of petroleum fuels from the road transport energy supply chain
- Carbon savings potential
- Re-vitalisation of the auto industry
- Development of an electric demand base complementary to predicted large scale renewables penetrations (“intelligent electrification”)
- Future potential role in system balancing applications
Electric Vehicles for Public Highway Applications

2 x principal categories:-
Utility/public service/delivery/airport service vehicles
- fixed base/return to base operation
- deterministic route cycle
- low daily mileage
- charging infrastructure easily addressed
- well developed understanding of life cycle costs

Passenger cars
- mass market/public acceptability
- range/payload/performance balance
- provision of charging infrastructure (“chicken and egg”)
- ascendancy of plug-hybrids (PHEVs)
Challenges

i. Technical
- matching of supply and demand (system level/mass market)
- localised loadings on distribution networks
- changes in load profile
- impact of battery charging stations (e.g. harmonics)
- provision of charging infra-structure
- payment and metering mechanisms
- standards
- health & safety

ii. Market/Regulatory
- unbundled markets/broken value chains
- unconnected/non-coincidental market drivers (auto industry/utilty)
- transparency of cost recovery mechanisms
- apportionment of investment costs and revenue flows
Opportunities

• Development of a new electrical demand base, with significant carbon savings potential and primary energy security-of-supply benefits (G, S)

• Development (and/or management) of a distributed demand base, directly compatible with intermittent renewables developments (G, S)

• Availability of distributed demand (energy storage, and/or “V2G”) resource, which may be utilised to provide a variety of non-network solutions (NNSs), including provision of distribution system balancing service (D)

• Opportunity to develop and provide a major new regulated asset base (D)
Conclusions

• Combination of top level political drivers co-inciding to drive the development and mass market deployment of PHEVs;
• Range of technical and market/regulatory challenges, to be addressed;
• For the power utility sector as a whole, presents a major new electrical demand base;
• Opportunities for DSOs to exploit for provision of localised NNSs and balancing services; and
• Presents a major new regulated asset base opportunity