

## Delta Research Brief

### **Are Utilities Charging Ahead with Electric Vehicles?**



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Utilities that lead the development of electric transportation will not only establish a strong early market position but will also stand to benefit from the array of storage applications that electric vehicles (EVs) can offer. This White Paper explores how EVs will affect European utility operations; looking at the challenges and opportunities EVs will present in the next decade and the engagement of utilities across Europe so far.

### GROWTH IN ELECTRIC VEHICLES BRINGS CHALLENGES TO UTILITIES – AND HUGE OPPORTUNITIES

Electric vehicles are here today. Pure battery electric vehicles (BEVs) are already on roads. Their battery capacities range from 10 to over 25 kWh and they can charge overnight or in as little as a few hours under fast charge applications (Table 1).

Currently these vehicles have negligible impact on utilities. But over the next few years, a growing number of car companies will introduce new BEVs and plug-in hybrid electric vehicles (PHEVs). Before 2020, we will see hundreds of thousands of electric vehicles being manufactured globally every year,

bringing both challenges and opportunities. Figure 1 highlights some of these key opportunities.

A critical challenge for utilities arises from the time of day when EVs will draw power from the grid. If this occurs during times of peak demand, utilities will face three challenges:

- **Network problems.** An increase in peak demand could mean grid upgrade will be required sooner than planned, especially where local policy drives EVs in areas where the grid is weak or constrained. Practical charging strategies will be needed to minimise charging at peak times.

**Table 1: A few manufacturers are selling BEVs across Europe already**

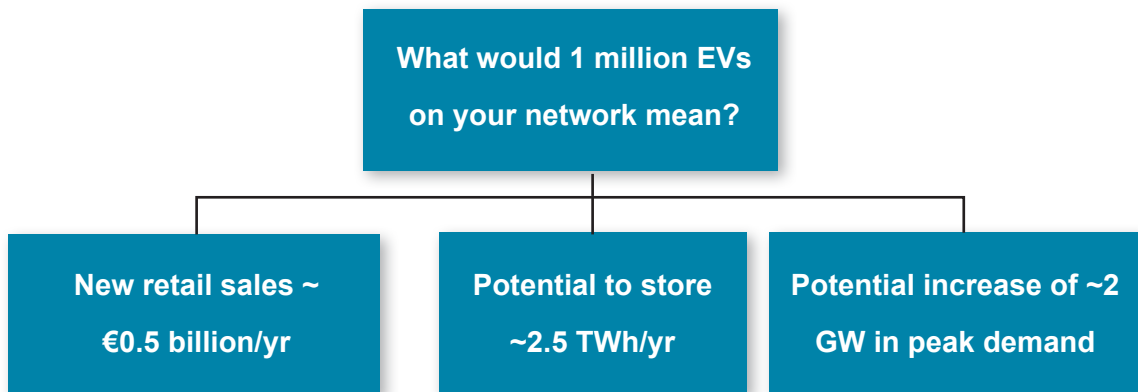
Manufacturer	Model	Battery capacity (kWh)	Charge time (hours)	Power drawn (kW)
Th!nk	Th!nk City	28	9.5 – 13	2.2 – 2.9
Reva Electric Car Company	G-Wiz i	10	8	1.3
NICE Car Company	MEGA City	10	8 – 10	1.0 – 1.3
Smith Electric Vehicles	Smith Ampere	24	8	3

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*BEVs on roads are drawing up to 3 kW of power over 8 hours, for a single charge.*

## Figure 1: What opportunities do EVs present to utilities?

New electricity sales and storage capacity will emerge as the electric vehicles market grows.



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- **Increased demand for peak power– or better utilisation of existing demand?** A full charge can almost double an average household’s daily demand for energy, potentially adding to peak demand if charging occurs during peak times. If increased demand can be met using excess generation (for example wind) at off peak times then the need to add new generation capacity can be avoided.
- **Charging infrastructure and customer billing.** When charging is not possible at home, charging posts will be required on streets. This will require costly investment and will be subject to strict safety measures. Also, communication technology between vehicles and the utility retailer is likely to be required so that vehicle owners are correctly billed.

Predicting the timing of these challenges is tough. Aggressive car manufacturer plans, local clusters of EVs in particular regions, and big pushes from certain cities could bring them forward. But the uncertainty surrounding car manufacturers’ plans and the current financial crisis may push the challenges further towards the horizon. Engaging with EVs in the coming years could open

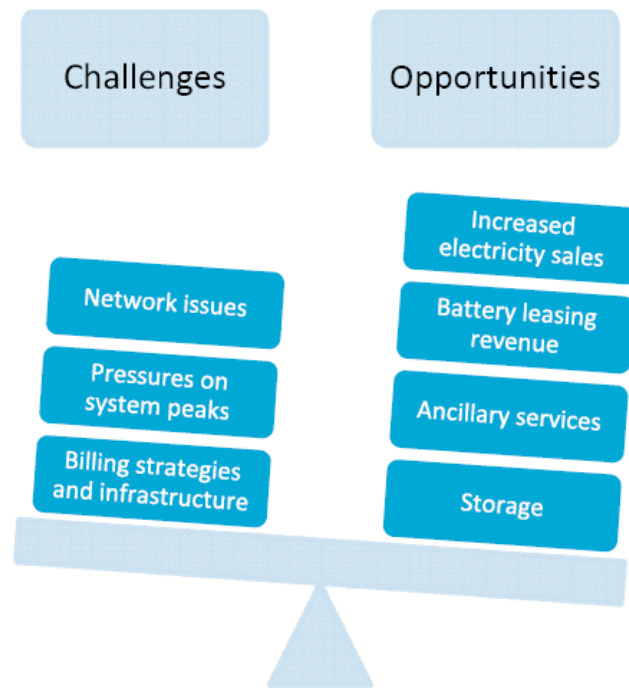
the door to the many economic benefits and opportunities that EVs offer, including:

- **Increased electricity sales:** EVs can potentially create a huge new market for utilities to serve.
- **Revenue from battery leasing:** Leasing batteries to customers will support EV uptake and will provide revenue over the battery lifetime.
- **Storage opportunities:** The batteries used in EVs provide many opportunities. These include:
  - Ancillary services from Vehicle to Grid (V2G) applications
  - Stationary storage using recycled batteries
  - Load smoothing by encouraging charging at night
  - Storage support for increasing the penetration of renewable energy

Being prepared for the arrival of EVs could see the opportunities outweighing any risk and financial threats (Figure 2).

**Figure 2: For electric utilities, early engagement will see the opportunities outweigh the challenges**

Careful preparation for EVs will reduce the impact on networks and generation, leading to increased sales as well as storage and demand management opportunities.



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The next few years provide valuable time in which to gain experience and position utility businesses to take advantage of the opportunities presented by the start of this potential revolution in the transport sector.

**POLICY SUPPORT FOR EVS IS ACCELERATING.**

Governments are beginning to support the uptake of electric vehicles, and will increasingly do so to de-carbonise transport, to lower emissions of local pollutants and to reduce oil imports.

EVs are already rising up the political agenda. Influential figures such as the EU Energy

Commissioner Andris Piebalgs and UK Prime Minister Gordon Brown have shown their support for electric vehicles (Figure 3).

Public awareness will increase as new EV models and incentives are introduced, stimulating demand and in turn stimulating increased production and lower prices.

Hard political incentives are already emerging – some of these are illustrated in Figure 4. And we expect incentives to be rolled out more strongly as the market for EVs develops.

### Figure 3: Andris Piebalgs at Eurelectric and Gordon Brown at Downing Street, both testing the Th!nk City

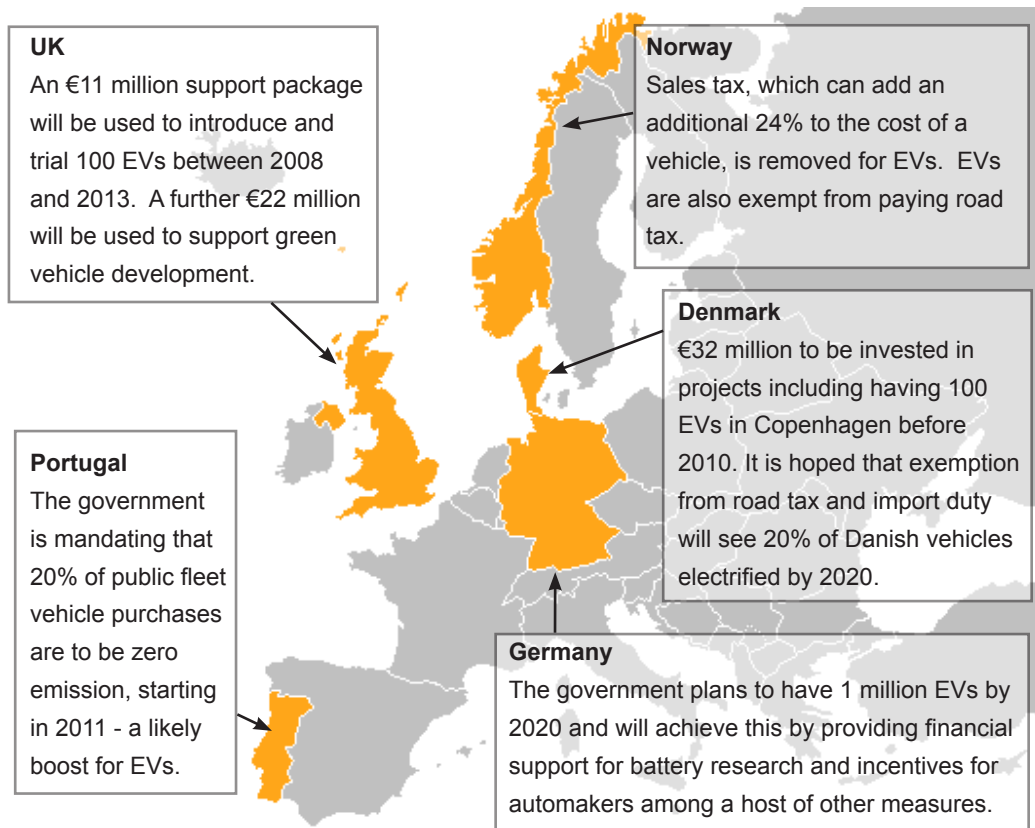
Key leaders are publicly showing their support for EVs and are already beginning to implement policy measures to drive EV growth



Eurelectric, Th!nk, 2008

### Figure 4: European countries are starting to encourage EV growth

Different incentives are being introduced and targets set as countries across Europe compete to become leaders in electric transportation.



Delta Energy & Environment, 2009

**SOME EUROPEAN UTILITIES ARE LEADING THE ELECTRIC VEHICLES RACE**

Some European utilities are getting fully involved (Table 2), hoping to capture the early market, while others are standing on the side lines. Uncertainty over the timing of EV market growth means watching the development of EVs for a few years will give clarity on the best strategies to adopt and avoid going down blind avenues. But, moving earlier could allow utilities to best position themselves to benefit from the opportunities and navigate the threats.

Most utilities recognise that substantial uptake of electric vehicles is a strong possibility. But with battery costs still being the fundamental obstacle preventing the take-off of electric vehicles, thus limiting EV availability, not all utilities are ready

One question we need to ask is: **how are European utilities preparing themselves for the emergence of electrically powered vehicles?**

to throw their hats into the EV ring. For some, passive observation is a more attractive option than being on the leading – or perhaps bleeding edge of developments. But many European utilities are pushing ahead with EV engagement today.

Activities common to several utilities include:

- **Trialling electric vehicles in company fleets**
- **Monitoring developments in battery**

**Table 2: Utility activities surrounding EVs vary widely.**

Utility initiatives	Example of leaders
Installation of charging infrastructure	EDP, RWE, DONG
Exploring charging and billing strategies and testing communication technologies	Endesa, E.ON UK
Discussing standardisation options for charging points	Essent, Nuon
Battery leasing options - developing financial and technical feasibility models for owning and leasing batteries	Essent
Conducting high level research on vehicle to grid opportunities	EDP, SSE
Setting up projects with trade associations and local governments to promote electric vehicles	E.ON UK, SSE
Partnering with auto manufacturers to get EVs into fleets for testing recharging requirements	Iberdrola, EDF

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*Most utilities are now engaging with EVs but only a few look set to dominate the early market by actively getting involved.*

technology and exploring storage opportunities

- **Partnerships, collaboration and discussions with auto and infrastructure manufacturers to gain EV insights.**

The following examples illustrate some of the leading initiatives being undertaken by utilities:

- **A consulting branch of E.ON UK is focusing on smart charging technology, with the aim of developing a strategy to prepare for electric transportation.**
- **RWE set up the e-Mobility Berlin project introducing 500 charging posts and 100 EVs to Berlin. Similarly, EDP has installed infrastructure in Lisbon. The priority of these projects is to better understand customer behaviour and the grid impact of EVs.**
- **Essent is fine tuning models that will determine the technical and economic feasibility of battery leasing strategies.**
- **Better Place, an independent EV-focussed company has partnered with DONG, and is taking responsibility for introducing charging infrastructure and managing the charging of EVs on DONG's network.**
- **EDF and Toyota have developed and tested an innovative charging and invoicing system, equipped in test vehicles in France.**

### THE NEXT FEW YEARS PROVIDES THE TIME FOR UTILITIES TO LAY SUCCESSFUL EV FOUNDATIONS

Hundreds of thousands or more electric vehicles will be on European roads around the middle of the next decade. This gives utilities the time today to gain experience and put the best strategies in place to

maximise the benefits of EVs to their business, as well as mitigating the threats.

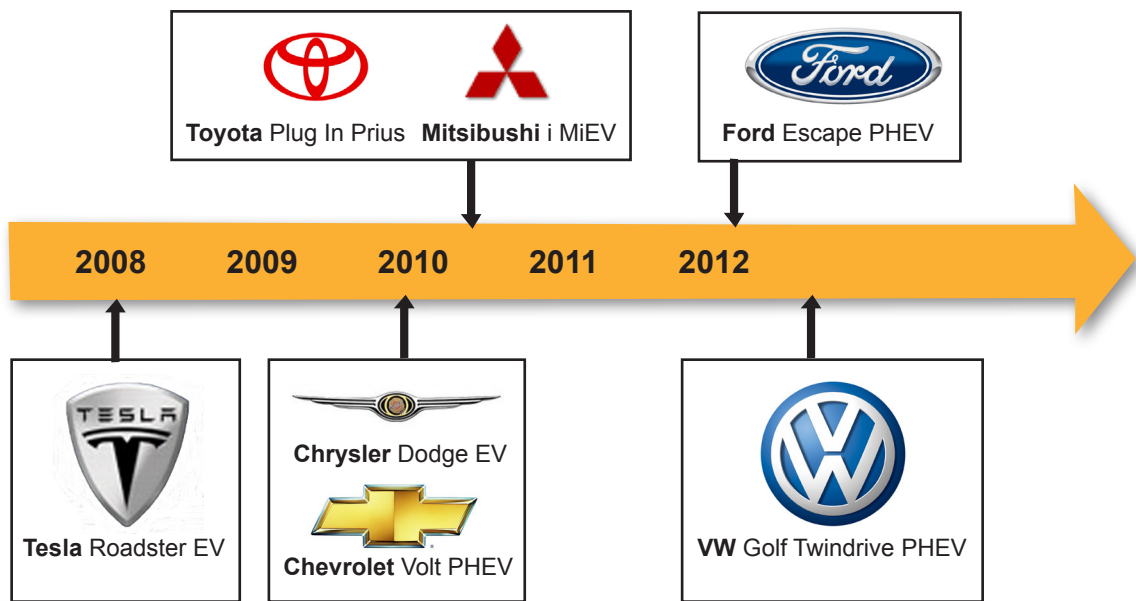
Early action may be needed as:

- **Battery technology improvements and car company plans (Figure 5) make it difficult to predict when electric vehicles will be produced in volumes that will impact utilities – action today enables utilities to respond nimbly to EV developments.**
- **While it may take several years for EVs to occupy a large proportion of the global vehicle fleet, local policy can cause clusters of vehicles to be deployed in regions with a weak grid, causing significant impacts within only a few years. Utilities can learn how to shift charging away from times of peak system demand.**
- **A period of learning will be needed to understand the full interaction of EVs with networks, and how customers will react to utility charging strategies.**
- **Utilities can learn how to take full advantage of the storage and revenue opportunities that EVs bring, positioning themselves as EV leaders and reaping benefits from increased revenue sales and policy maker recognition.**

Electric vehicles have come and gone in the past. But today may provide the perfect storm for electric transportation to take off. Batteries are improving rapidly in terms of cost and performance. EV's environmental benefits are pushing them up the policy making agenda as concerns over bio-fuels mount and fuel cells and the hydrogen era remain as elusive as ever. The success of the Toyota Prius has demonstrated at least some consumer demand. And the automobile industry is in a frenzy to develop new EV models.

**Figure 5. Auto manufacturers are racing to deliver EV models to gain a share of the market.**

This figure shows a selection of manufacturers planning to introduce new EV and phev models over the next few years. The involvement of industry leaders is clear.



In our view this makes it highly likely that, by 2020, EVs will make up a significant proportion of the global vehicle fleet. How significant, and when in the next decade EVs take off is far from clear. But what is clear is both the size of the opportunity for the electric utility industry, and also the threats.

Given the uncertainty in timing and significance of EV growth, passive observation is a low cost option – and to some a low risk, easy route forward. But early action to engage with EVs and explore the benefits and threats is pulling many major European utilities into the EV arena. In our view, this may end up being the least risky option to take.

*Delta Energy and Environment launches its Electric Vehicles Service in February 2009, providing in-depth research and analysis to help utilities make informed decisions regarding their EV strategy.*

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