EVS26
Los Angeles, California, May 6-9, 2012

The Norwegian Charging Station Database for Electromobility (NOBIL)

Hans Håvard Kvisle,
Project Manager NOBIL
Norsk Elbilforening (Norwegian Electric Vehicle Association), P.O. 9261, N-0134 Oslo, Norway, hans@elbil.no

Abstract

How did Norway get a highly developed database for charging stations, capable of real-time updates on availability, ready and free to be adopted by any country? A co-operation between Transnova, a governmental entity, and the association of EV-users to develop an open database which allows everyone to build services upon standardized data.

charging, infrastructure, data acquisition, communication, promotion

1 The Background

1.1 Charging infrastructure

In 2009 the investments started in a Norwegian nationwide network for public charging of electric vehicles. The governmental project Transnova had the main responsibility for the funding with their support of €6 million. This was a result of a quick decision, as a respons to the threatening financial crisis.

Beside the huge state support for chargers, the municipality of Oslo has been the largest participant and allocated €2 million for building 400 charging points in the years 2008-11.

Together with contributions from private initiatives and other municipalities, the investments were expected to result in around 2.500 new charging points during 2011.

At that time Norway had less than 200 public charging points. The infrastructure investments were looked to as the next effort to boost EV-sales.

1.2 Norwegian incitaments

During the last 20 years Norway has established a framework for stimulating use of EVs. This was not introduced as a master plan, but expanded year by year to facilitate the market.

Main incentives today:

- No purchase taxes (in Norway they are extremely high for ordinary cars)
- Exemption from 25% VAT when purchasing an EV
- Free toll roads (incl. congestion charge)
- Free municipal parking
- Free access to bus lanes

1.3 Situation for EVs in Norway

These radical incentives have contributed to a steady growth in use of EVs in Norway. Lack of available EVs in the market has been the limiting factor. During 2000-2010 the market was nearly only served by small Norwegian manufacturers and by the import of used EVs. Still, this has kept Norway as an exciting test lab for electromobility, which in the last years has developed to be a mature market for EVs.

In the end of 2011 we had 5.411 EVs in a population of 5 million. Both the amount of EVs and last year's sales are by far the highest in the world, related to population density. Sales estimates for 2012 points in the direction of yet another 3.000 EVs on Norwegian roads.

The large majority of the EV-buyers are private people spending their own money to exchange one of their ICE-cars with a non-polluting electric car.

Unashamedly enough we describe Norway as a world leader for EV-introduction and Oslo as the EV-capital of the world, with the highest EV-density you can find for a capital.

With this unique situation with thousands of real EV-users, we have had excellent conditions for testing out new measures to promote electromobility. One of these is the charging station database NOBIL, which has given us considerable experience.

1.4 Key players in the development

1.4.1 Transnova

A state entity established in order to cut greenhouse gas emissions from transport. Supports research and test projects and funding EV-infrastructure. Transnova is today a unit within The Norwegian Public Roads Administration.

1.4.2 Norsk Elbilforening (The EV-association)

Founded in 1995 and organizes the majority of EV-users in Norway - with more than 3.000 members. Originally an organization composed of members with commercial interests, but has transformed itself into a consumer association promoting and facilitating use of chargeable vehicles. The association works in close co-operation with the authorities and the EV-business, and manages and participates in several projects.

2 The Challenges

Just as for all the other initiatives for stimulating EVs in Norway, again there was no master plan behind the establishment of the network of charging stations. It was a short timeline from decision to implementation. Locations of charging stations were based on first to ask, first to be served. To use a positive term, we can define it as market-driven.

This is the life of “early-movers”. We cannot solve every detail in our plans, and we know we in any case have to adjust our activities along the time line. Like for everyone following after us in the unpredictable development of the EV-market. We enjoy the risks and the opportunities of being in front of the development internationally.

The sudden development of an infrastructure required actions. There were several challenges:

- Choose the appropriate quality of the infrastructure inside a tight timeline, giving the highest user value in return of investments.
- Aquire knowledge and create an overview of the locations and attributes for the charging stations.
- Create attractiveness of the infrastructure for stimulating more people to drive electric.
- Disseminate knowledge and promote the charging network.
- Use these first efforts to stimulate other entities to contribute with own investments in additional infrastructure.

3 Principles

The EV-association reacted to the situation and gave their advices for standardization of the charging points. It also proposed to develop a charging station database to secure a good overview of the infrastructure. But even more important, having this database as a basic tool for promotion of the charging possibilities.

A well-organized database, including selecting and implementing information about the most important attributes for the charging stations, would solve several of the challenges.

From the start some basic principles were laid down for the work with the charging station database NOBIL:

- The database should have a public ownership to secure it will include data from all owners of charging infrastructure without discrimination.
- The information should include key data which fulfill the needs of information for

EV-users. For this reason, EV-users should be included in the development and make the database usable and attractive.

- Prioritize a high level of quality for the data, with a thorough verification process, instead of prioritizing registration speed. A database has to be trustable.
- Draw a clear boundary between the database in itself and the services built upon the data which will be provided from the database. The services/ applications were assumed to be commercially interesting. However, in an early phase they could be given funding to kick-start the activities and increase the value and awareness of the database.
- The data should be freely available for anyone aiming to create useful tools for owners of chargeable vehicles, to maximize the promotion effect and dissemination of the knowledge.

4 Development

Assignment of building the database was given to the EV-association which gathered relevant competence and user input from the society of EV-users. The working group had a wide and deep knowledge of electromobility and modern internet- and communication tools, with internal resources for programming.

In the first half of 2010 the technical solution was developed and the database was launched 7th June 2010 by the Minister of Transport and Communications.

4.1 Technical solution

The EV-association considered it necessary to avoid any barriers for others to continue the development if Transnova decided to change supplier. For this reason open source programming tools were chosen.

The database is SQL-based with use of PostgreSQL and the extra modul PostGIS for geographical queries.

Through a web-based userinterface the typing of data was easy accessible for all participants. Included were tools automatically finding city for zip codes, municipalities and regions. Google Maps is an integrated tool in the database.

Integrated are search and reporting tools filtring on multiple parameters for generating all kinds of selections of charging stations, delivered as csv-files for further refining.

4.2 Content

A crucial aspect in the development work was to define the types of information necessary to include in the database. Making it too complicated would limit participation from charging stations owner. This had to be balanced with the needs of the EV-users and planners.

Basically we defined a charging station as the geographical location in itself, and charging points as the number of reserved places for EVs with dedicated outlet for charging, minimum 220V/16A.

In summary, the following fields were included:

- Address
- Zip code & City
- Name
- Municipality & Region
- Owner, possible with owner's ID for the charging station
- Number of charging points
- Payment
- Time limit
- Charging capacity
- Access to the connector
- Availability
- Type of location
- Any public funding
- Text fields for describing how to find locations and helpful user comments
- Contac tinfo to owner/operator
- Text field internal comments (source)
- Uploading of photo

4.3 Distribution of data

The data is available for everyone through an API (Application Programming Interface). You have to register as an API-user to receive a unique API-key and thereby accept the conditions under Creative Commons 3.0 Unported License.

All changes in the database are immediately updated in the API. Caching is included to handle high traffic except the mapping which Google manage.

By using http call you can ask the service to return charging station data based on map references, either rectangular or radius, regions/counties, municipalities or specifically for a charging station.

Included is an URL for each charging station, presenting all the details.

5 Data collection

Transnova hired the EV-association to collect and register the data. Several sources were examined and used:

- At websites forms for reporting new, or changes of existing, charging stations.
- All receivers of public funding for charging stations were required to provide us data. It covered around 70% of the total amount of charging stations.
- Larger operators were given access to the database for maintaining their own infrastructure.
- Requests to hotels, shopping centers, parking companies, municipalities, energy companies and more.
- Extensive use of the network of EV-drivers to excite them to contribute.

The reaction was a fantastic response, and a proof of Norway as a living lab for electromobility. Nearly daily input was given on new stations, adjusted info, photos and more. The quality of the database is maintained and secured through crowdsourcing among the growing amount of EV-users.

6 Promotion and services

6.1 Promotion

A charging station database is not just a practical tool, but also a useful tool for convincing people. NOBIL has been promoted in several channels for strengthening everyone's commitment to EVs. Target groups are:

- The politicians need to be inspired by seeing results of their decisions to promote EVs.
- EV-users need it is a tool.
- The public in general for tempting more people to be EV-users.
- Potential infrastructure builders to get more charging stations built.

All the time NOBIL has intensively promoted all the services using the data. A database in itself is not visible, the services are. They are the key to get enough enthusiasm and effort in the participation of collecting and verifying data.

Continuously through the project we have created articles with news and information about the infrastructure, based on info from NOBIL.

6.2 Services

Initially the project secured visible services through supporting the first providers:

- Internet
- Cell phones
- Files for GPS-navigators

This has been followed up by technical support to newcomers, with a result of having several services on internet showing the way to the charging stations and different applications both for iPhone and Android.

After a while we were “discovered” by the providers of digital map solutions. In the electric cars with the most advanced navigation solutions, NOBIL data is implemented in the digital maps as the POI for charging stations. For others we deliver files to integrate in their standard navigation. Hence, all new cars entering the Norwegian market can have access to trustable charging station data in their in-car navigation.

7 Resources and funding

The costs of developing a high quality charging station database is a fraction of the total costs of the infrastructure. The gain and effect of it is thus relatively much higher than the costs.

Approximate €90.000 is spent on technical development, which consists of about 1/3 of the total costs of the project. The rest is invested in pilot services, and mainly on data collection, maintenance and promotion of the database.

The activities in Norway have been funded by Transnova, securing their ownership to programming tools and all the data.

Transnova has decided to continue the co-operation with the EV-association for at least two more years, with an option for a further two years.

8 Continuous development

The world is changing – NOBIL too!

8.1 Country independent

After the success in Norway it quite immediately was decided to expand the activities to new countries. Transnova offered to make a new version of NOBIL which allows other countries to use the programming tool and build national databases.

Interestingly enough this led to a project called EVR MAP. A program under The Nordic Council of Ministers funds the realization of a Nordic charging station database, including collection of initial data in the other Nordic countries and establishment of sustainable maintenance and administration for the future.

The result so far will be a database including charging stations from 5 countries, with their own language, zip codes, municipality codes etc., where service providers can connect to one API for receiving standardized data.

8.2 NOBIL Intelligent Module (NIM)

The charging infrastructure in Norway has been quite simple without monitoring and communication. Based on an expectation of a change, and demands from other Nordic countries, NOBIL has been prepared for managing real time information. In general this makes the infrastructure more attractive.

Especially for the fast growing network of speed chargers (CHAdeMO-solution) in Norway, real time availability information is critical. During 2011-12 the state support of establishing charging stations has changed from slow to fast charging. Transnova will during a year provide significant financial support to more than 50 speed charger stations, in sum about €1,25 millon. One requirement for everyone receiving this financial support, is delivery of real time data from the fast chargers to NOBIL.

We consider the development of a NIM-functionality will encourage owners to update their existing slow charging stations with communication units, and thereby increase the value of them.

NIM is a function facilitating interactivity between the database NOBIL and communicative charging stations or back-end systems. The infrastructure pushes data over http according to a defined XML which is attempted standardized to other open protocols. NIM is a gatekeeper, only updating the database with significant events.

EV-users can through the service providers receive information of status and availability. NIM can, dependening on the charging infrastructure operator, receive info about energy usage, charging time and more for generating a database of using patterns for infrastructure.

NIM can open a channel between the EV-users and the infrastructure owners, for reservation and payment. However, NIM and NOBIL is not instrumental in operations, or involved in the business activities or processes of the infrastructure owner, only collecting and reporting data.

8.3 Expansion of the content

The real time functionalities demanded a new data set and architecture. Data will be both on the charging station and point level. Added to this we get more variation in charging and connector solutions – more complex charging stations.

We used this opportunity with new challenges, to benchmark the database with the needs of professional users, like providers of digital maps. Combining their requirements with our knowledge of the EV-users' needs, we now consider NOBIL very well covering what we can expect of demands next years.

New attributes include:

- Vehicle type
- Opening time
- Real time information
- Connector type
- Charge mode
- Payment method
- Fixed cable
- Reservable
- Manufacturer

8.4 Interface to other databases

The last feature we add to NOBIL is APIs between NOBIL and external databases owned by operators. Instead of manually updating NOBIL we will have APIs connecting the databases, and

under secure conditions having automatical updates of NOBIL, whenever the operators make changes in their datasets.

8.5 Where will it ends?

We believe easy accessible and trustworthy information about the charging infrastructure is crucial for the success of the introduction of EVs. To achieve this, all players have to combine their good efforts. Co-operation is necessary for developing an emerging market. The governmental involvement in Norway, through Transnova, has inspired other actors to contribute.

In March 2012 Norway has 3.187 charging points at 946 charging stations and growing steadily. In addition, more than 70 fast chargers will be included by the autumn this year.

We will not be surprised if more countries follow after the joining of five Nordic countries in NOBIL. If we can bring our experiences to others and be an inspiration, it is added value to our project. Standardization of data and data streams will be a key to simplify the work for others and make the information easily accessible.

Being pioneers and building a large infrastructure like in Norway, will necessarily involve some mistakes. But having the complete overview, and being able to communicate it widely, is definitely not a mistake. It improves the attraction and use of the infrastructure, and thereby increasing the use of EVs. We have to follow up this with new improvements in NOBIL and continue our best practices. We think NOBIL is a brilliant example, and a solution ready to implement for others.

Author

Hans Håvard Kvisle
Project Manager, Norsk Elbilforening (Norwegian Electric Vehicle Association) and editor of elbil.no. Leads the development of the charging station database NOBIL. Background from EV-business (manufacturing, engineering and sales) and communication technology.