FACILITATING ELECTRIC VEHICLE UPTAKE

LEPT STUDY TOUR
AMSTERDAM, ARNHEM, ROTTERDAM
12-14 MAY 2019

LONDON COUNCILS

LEPT LONDON EUROPEAN PARTNERSHIP FOR TRANSPORT

BACKGROUND

ORGANISING THE STUDY TOUR

The London European Partnership for Transport (LEPT) has sat within the London Councils Transport and Mobility team since 2006. LEPT's function is to coordinate, disseminate and help promote the sustainable transport and mobility agenda for London and London boroughs in Europe.

LEPT works with the 33 London boroughs and TfL to build upon European knowledge and best practice, helping cities to work together to deliver specific transport policies and initiatives, and providing better value to London.

In the context of a wider strategy to deliver cleaner air and reduce the impact of road transport on Londoners' health, one of London Councils' pledges to Londoners is the upscaling of infrastructures dedicated to electric vehicles (EVs), to facilitate their uptake. As part of its mission to support boroughs in delivering this pledge and the Mayor's Transport Strategy, LEPT organised a study tour in May 2019 to allow borough officers to travel to the Netherlands to understand the factors that led the country's cities to be among the world leaders in providing EV infrastructure.

Eight funded positions were available for borough officers working on electric vehicles to join. Representatives from seven boroughs and one sub-regional partnership joined the tour as well as two officers from LEPT and an officer that worked closely on EV charging infrastructure from the London Councils Transport Policy team (Appendix 1).

LONDON BOROUGHS

London's air pollution is shortening lives and improving air quality in the city is a priority for the London boroughs. One of the ways they are doing this is through supporting members of the public and businesses to move to cleaner and more sustainable forms of transport, such as electric vehicles. The London boroughs are leading the way in the UK on electric vehicle (EV) charging infrastructure and are committed to playing an active role in ensuring that there is an efficient and effective network of charging infrastructure across the capital. This can be seen by the number of EV charging points that have been installed over the last few years, both standard and rapid, and the number of EV charging points planned in the near future - for example as part of the Go Ultra Low City Scheme (GULCS). Boroughs all over London are also introducing emissions-based parking controls, which prioritise the use of EVs and other Ultra Low Emission Vehicles (ULEVs).

THE NETHERLANDS

The Dutch government launched its EV strategy in 2009, and ten years later the Netherlands has approximatively 32,000 public charging points, used by the 152,000 registered zero emission vehicles, one point per five cars (not including private charging points). EVs accounted for 5.4% of newly registered vehicles in 2018, a number expected to grow to 10% in 2025. 80% of the country's charging points are located in urban areas, and cities have led the way in developing strategies to implement charging points, as part of a wider clean air agenda.

THE NETHERLANDS AND LONDON: SHARED CHALLENGES

As densely populated areas, the Netherlands and London share similarities in terms of limited road space, lack of off-street parking for residents and the need to conserve historic areas with limited scope for invasive infrastructure. Similarly, they both have national strategies with a strong emphasis on urban areas. Although the EV market in the Netherlands is more mature than the British one, there are now more than 12,000 EVs registered in London, over ten times as many as in 2012, so it is rapidly increasing.

During this two-day study tour (Appendix 2), eight borough officers visited three Dutch cities examining the approach in each to facilitating EV uptake: Amsterdam, Arnhem and Rotterdam.

AMSTERDAM

The city's 2019 Clean Air Action Plan states that Amsterdam shall be emission free by 2030. Amsterdam has been installing EV charging points (EVCPs) since 2009, with a priority for on-streets points as 80% of residents have no access to off-street parking. As of the end of 2018, the city had installed 2,773 public charging points (among which 17 are rapids) across 1,364 stations. The city also has electric buses using overhead charging.

In Amsterdam, officers from boroughs and Amsterdam exchanged views on zero-emission city strategies, the importance of data-driven decisions and the electrification of taxi fleets. A visit to the clean taxi rank at the central station was organised, followed by a presentation from researchers at the Amsterdam University of Applied Sciences (HvA) on data usage.

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Above: The group at the Amsterdam central station clean taxi rank

ARNHEM

Arnhem has prepared for the rise in zero emission vehicles by establishing a strategic plan with charging infrastructure manufacturer Allego and consultancy firm EV-Consult. The city also uses electric trolley buses.

In Arnhem, the group met with representatives from the municipality and visited one of the locations from the Interreg CleanMobilEnergy project, and Dutch firm Allego's headquarters in the city's industrial estate. Representatives from consultancy EV-Consult were also present.

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Above: OV-fiets free-floating bikes near an electric charging station in Rotterdam

ROTTERDAM

Rotterdam's zero-emission city strategy includes mobility, focusing on car volume control and modal shift. The city has been installing EVCPs since 2009, introducing a public-tendering model in 2012. As of May 2019, they have installed a total of 1,916 public charging points.

The visit to Rotterdam provided a chance for the group to discuss EV charging with officers from the city and visit a smart charging pilot location with 10 charging points. Representatives from two collective learning organisations, Elaad and NKL, also joined to present their work.

FOCUS: ZERO EMISSION VEHICLES

Zero emission vehicles (ZEVs) cover a variety of means of transportation that do not emit flue gas while they are in operation. For cars, that can be a battery electric vehicle, or a fuel cell vehicle powered by hydrogen. Plug-in hybrid electric vehicles (PHEV) can sometimes be categorised as ZEVs but do still partially rely on internal combustion engines.

Type of electric vehicle chargers

- 3.7 kW Slow
- 7-22 kW Fast
- 43-50 kW Rapid
- 150 kW Ultra-Rapid

FOCUS: ARRANGEMENTS WITH PROVIDERS

Arnhem: 10-year concession with a unique provider
Arnhem has put in place a concession model, with shared income and a contract duration of 10 years. The current operator is Allego.

Rotterdam: 5-year tender with a unique provider
The city launched its first tender in 2012, and points were then installed based solely on resident requests. The second tender was attributed for the 2016-2021 period to French firm Engie. Rotterdam requires the operator to share the data they use and receive with HvA University. The university then integrates it into their open data platform[2]. The city is currently developing its future call for tenders.

Amsterdam: 6-year tender
In 2009, the city launched its first tender for 100 charging stations. The latest was won in 2015 by Vattenfall. They oversee installation, permits and billing. The city is preparing to launch a tender for 15,000 stations, for which they will look for two or more operators to reduce the risk of delivery failure.

Overall, the general feeling is that the market will be increasingly ready to provide the infrastructure and they envisage a future where operators would fund points on their own, a scenario in which they would still be in control but would ensure that demand is still being equally fulfilled.

INSTALLING EV CHARGING POINTS IN THE PUBLIC REALM - COOPERATION MODELS

NKL, a national learning platform to facilitate EV uptake
NKL was established as a five-year public-private partnership to speed up the EV market in the country. It is an online platform with resources on best practices and organises events with key stakeholders. It also offers monitoring tools and a portal for citizens to request EV charging points (EVCPs), 'Laadpaalnodig'[2].

Amsterdam: A demand-driven approach led by the municipality
Amsterdam's strategy is a mix of two main factors:

- Any EV owner can request a charging point through a website[3] powered by Nuon, a company owned by Vattenfall who currently operates EVCPs in the city.
- A data-driven analysis from the university of the city, HvA, which enables the city to act if they observe that a charging point's usage is increasing rapidly (in those areas, if demand for one point is noted, three points will be installed).

In addition, the city is also installing charging points in all public car parks and has installed rapid charging for taxis. The 17 that are currently installed are used 60% of the time by taxis, and Amsterdam is planning to add a further 45 by the end of 2019. In spite of the majority of rapids being used by taxis, the municipality has chosen to let any EV driver use them.

Rotterdam: Cooperation between stakeholders at the heart of the strategy
In Rotterdam, infrastructure is being rolled out according to three factors: citizen demand, data analysis and strategic mapping:

- Any EV owner can request a charging point through Laadpaalnodig, a portal built by NKL, EV-Consult and Rotterdam, and that can be used by other municipalities. Engie, Rotterdam's current contractor, takes care of choosing the right spot for the demanded EVCP using data analysis (using their own data on current use of stations). They install those charging points close to the resident's home, but never in front of their house.
- Rollout is also decided according to the use of and user distance from current stations.
- To anticipate charging needs, the city has commissioned EV-Consult to produce a model on EVCP demand in 2020, 2025 and 2030: Spark City, strategic maps that predict future demand.

In addition, the city is also installing charging points in car parks and working on the tendering of petrol stations to convert them into rapid charging hubs.

Arnhem: A strategy co-developed and deployed by a provider
In Arnhem, two key elements determine the location of charging infrastructure. The first one is citizen requests via a portal hosted by Dutch company Allego[4], and the second strategic planning on EVCP demand, undertaken by consultancy EV-Consult. It includes three key elements:

- Identification of target groups (taxis, residents, visitors) and model charging needs to create an EV forecast map
- Identification of appropriate charging solution (street plug, fast, lamp post, hubs)
- Strategic planning (considering charging demand, urban planning and electricity grid)

SMART CHARGING STATIONS AND ENERGY OPTIMISATION - TRIALS & REFLECTIONS

Smart charging plaza in Arnhem
The group visited the location of the charging plaza in central Arnhem (see pic below right). A single box containing the central unit controls the charging of 16 points. The parking spaces are reserved for the use of electric cars. The control panel allows for smart charging by balancing the phase and the load to ensure that demand does not outstrip supply and put pressure on the grid.

Flexpower Amsterdam
Since March 2017, this flexible charging scheme has been in place to optimise energy use[5]. Charging speeds are adjusted according to the general level of electricity demand in the city, ranging from 2 to 22kW. Following successful trials, the city is planning to retrofit 500 charging stations in 2019 to enable this mode.

Smart charging pilot in Rotterdam
In this pilot initiated in 2018, Rotterdam and HvA are looking at the effect of a hub with 10 charging points on the usage of the surrounding stations (see pic below left). The second phase will be a smart charging trial, with an ability to charge from 2 to 33kW. When installing, the municipality organised a contest for residents to come up with the best name in order to increase public acceptance (the chosen name was 'Veerkraft', or boat power, in reference to the close-by harbour).

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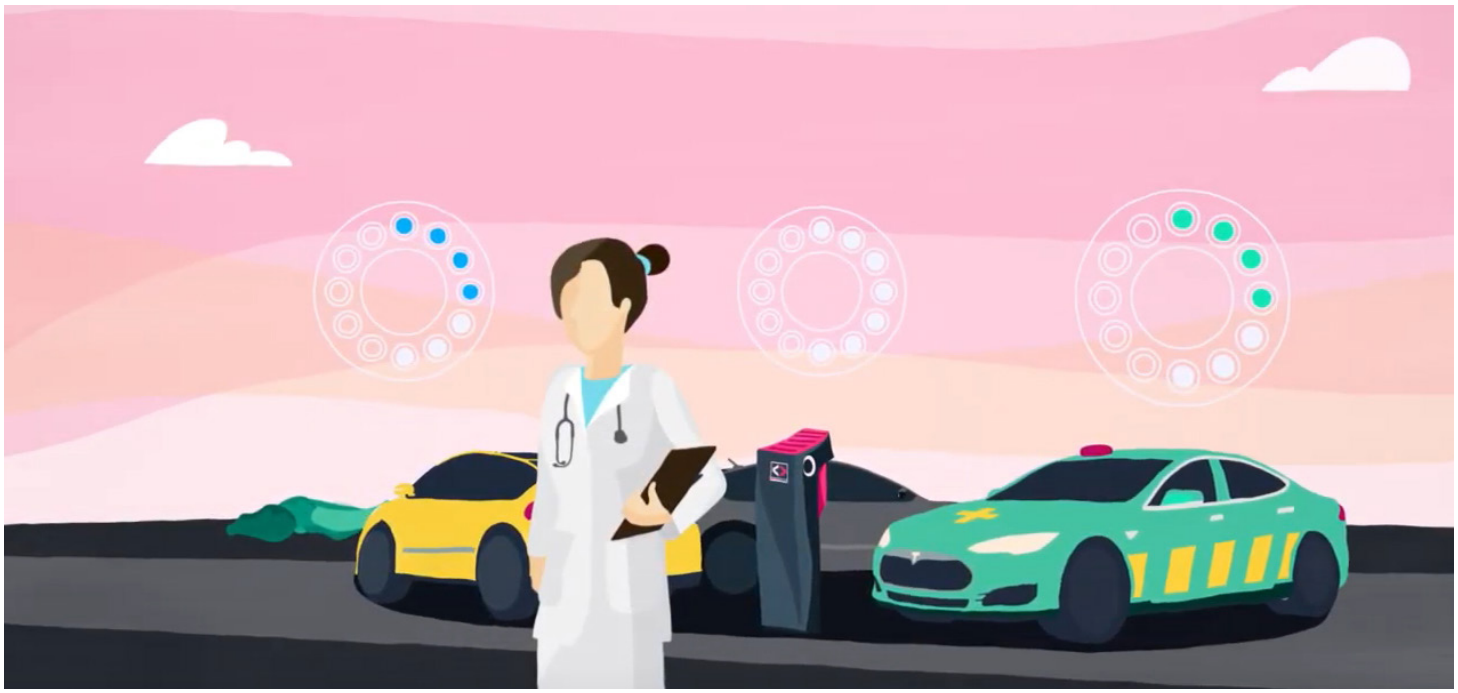
FOCUS: THE IMPACT OF SMART CHARGING STATIONS

Flexible distribution of power in a smart charging station means that an algorithm decides on the repartition of energy between plugged cars according to the available level of electricity, number of cars or other factors. In order to think about those other possible factors and their level of acceptance, the Incredible Machine, a design firm, came up with a prototype charging station that made visible the levels of available energy and possible repartition choices made by the algorithm (see online video presentation)[6]. As they interact with the station, participants are invited to reflect upon the fairness of the choices made: e.g. should a doctor or a person with reduced mobility's car be charged faster than another person? Should a car club user get priority?



FUTURE PROOFING EVCPS

Interoperability
One of the main challenges of the EV market is interoperability, be it between type of chargers or access to services. In the Netherlands, an agreement on interoperability between service providers exists, with a contactless card based on subscription. Some cities have gone further, like Amsterdam, where the tender requires the providers to allow customers to pay directly using any bank card. The Dutch national government is currently looking at passing a law on interoperability, the ability to pay with bank card and pricing transparency.

Residential developments parking requirements
The EU Energy performance of buildings directive (revised on 19 April 2018) states that all newly built residential developments must include capacity for at least 10% plug-in vehicles by 2025. The Netherlands plan to impose that limit from 2020 onwards. The city of Amsterdam has decided to strengthen those guidelines and requires developers to prepare for a potential scaling up at 100% of electric mobility for residents. If they are unable to provide parking spaces within the development boundaries, they can come up with different solutions, such as installing a unique shared-mobility hub.

Cyber security: protecting critical infrastructure
ElaadNL, an institute created by Dutch grid operators, and the European Network for Cyber Security created a guide[8] for local governments to use when ordering public charging points, to make sure charging is safe and secure. The three main steps it recommends authorities to require from manufacturers are:

- Adding security to all communications (encryption, OCPP protocol, unique ID with valid certificates for all vehicles).
- Adding security to the charge point, which is in public space and can be accessed by anyone
- Future proofing the charging infrastructure: providing enough memory for updating firmware (stations from eight years ago for example).

Using data to optimize electric vehicle infrastructure deployment
The group met Robert van der Hoed, researcher at the HvA Urban Technology Research Institute, who provided some insights into data use. The institution offers a performance evaluation platform which is fed by data from EVCP in cities (RFID, address, connection time, charged volume etc.). The raw data is cleansed by the team and used in two ways:

- Published into a front-end public dashboard: EV Data[8].
- Gathered in a decision support tool for public authorities: R-Shiny. That tool offers more precise information on charging point performance, peak usage time etc.

HvA has developed a strategy to assist EVCP roll-out, looking at:

- Occupancy rate of existing points.
- Charging profiles per users.
- Agent-based models evaluating the impact of different scenarios on profiles.
- Charging infra-vulnerability: cost and impact of service failure.

The team has studied the scope for optimisation of the length of charging sessions:

- Looking at the plug-in time: 36% last less than 4 hours, 4% go over 24 hours and less than 1% over 48 hours. There is currently no plan to limit charging sessions as the figures show relatively high turnover.
- Estimating the number of sessions that could be postponed to a more convenient time for the grid: 75%.

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Above: Rotterdam's Veerkraft smart charging pilot

Understanding efficiency of nudges in EV driving: Electric City trial in Rotterdam

Rotterdam collaborated with German car manufacturer BMW to find out if nudging hybrid drivers could help them switch to electric driving in city centres. The results were positive, with trial population driving for 93% of their kilometres inside the centre on electric power, but the sample was limited as only 30 people took part in the study, mostly middle aged and male. For that category of population, gamification and rewards can help increase electric mode use.

OTHER FORMS OF ELECTRIC MOBILITY

Amsterdam's electric taxi strategy

The Dutch city has approximatively 6,500 taxis, of which 1,000 are electric. Diesel taxis pre-dating 2008 are forbidden to enter the city centre or currently face a €95 fee, which will soon be increased to €200 (the system is ANPR enforced). In order to increase the number of clean taxis and support all taxis to be emission free by 2025, Amsterdam is putting in place clean taxi ranks. The first one is located at the central station, a multimodal hub with buses, metro and river services. Among 22 waiting spots, four are reserved for electric taxis, and one in three taxis called is electric, thus getting fare priority. Taxi drivers can also request infrastructure at their homes. In terms of subsidies, €5,000 are available to buy a new clean taxi (with minimum two-year usage and 8000km driven in the city per year). Taxis also get a specific parking licence.

The HvA has studied the behaviour of taxi drivers among other EV drivers. They charge more often, with a peak at midday, don't plan ahead for charging sessions and use rapid chargers more (60% are used by them). They appreciate charging near transport hubs where demand is high (train station, airport). They are also very price conscious.

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Above: An electric taxi plugged in at the Amsterdam central station clean taxi rank

Charging boats using solar and wind electricity

The group visited the location of one of the Interreg North-West Europe CleanMobilEnergy project in Arnhem[9]. The scheme began in November 2018 and is still under development. A solar panel field and four wind-powered turbines will be installed to provide clean energy for river cruise ships in the Arnhem industrial harbour. The clean energy sources are not yet installed, but the ships mooring in the port already have to plug-in to an installed shore generator connected to the public electricity grid and are not allowed to use their traditional diesel generators. A total of 16 connections are available, and a reduction of over 900 tonnes of CO_2 has already been achieved in the first phase of the trial.

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Above: The Interreg CleanMobilEnergy project in Arnhem

The Dutch zero emission logistics approach

In 2015, Dutch cities, companies and other stakeholders signed the Green Deal Zero Emission City Distribution (GDZES), which aims at zero emission city logistics by 2025. In Rotterdam, pilots were put in place to experiment with the possible range of fully electric lorries. The city now has two fully electric garbage trucks with 100 km range. They are collaborating with the Eindhoven technical university on a range study for HGVs. The city has also put in place a fleet recognition scheme with rewards for businesses, Ecostars. In Amsterdam, similar trials and experiments are being undertaken. One of the main challenges is battery range and grid capacity to provide high amounts of energy at the same time. The manufacture of suitable models is also proving challenging; however, some companies are choosing to build and design their own vehicles (Deutsche Post for example).

Various approaches to electric buses

In 2015, the 12 Dutch provinces and two metropolitan areas signed an agreement to have a zero-emission bus fleet by 2030. Electric buses pose issues in terms of cost, invasive on street infrastructure and interoperability, as for the moment multiple options can be found:

- Electric up pantograph, chosen by the Rotterdam public transport operator for its 55 first buses
- Electric down pantograph
- Electric trolley buses, already developed in Arnhem
- Plug-in electric battery
- Induction electric charging
- Hydrogen buses

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Above: Electric trolley buses at Arnhem's central station

MAIN TAKEAWAYS

Key role of data: collection and analysis of data is necessary to understand demand, efficiency of installed charging points, and understand future needs.

Increase collaboration between all sectors: the Dutch example is one of collaboration between local authorities and companies, with the public always setting the agenda and establishing its precise needs.

Explore resources offered by universities: Dutch local authorities share their data with universities, who have the knowledge to exploit it, and experiment with pilots led by researchers.

Public awareness and communications: There is a need to build public consensus around electric vehicles, for that early consultation with stakeholders is necessary and inclusion of the general public in the process key (citizen led portals).

Some of the shared challenges faced by the cities we visited were:

- How best to respond to citizens' needs
- Clean energy: ensuring EVs are fuelled by clean power
- Influencing private behaviour
- Linking demand and supply for super-fast chargers.

Above: Free floating bikes in Rotterdam

ACKNOWLEDGEMENTS

All of the participants of the study tour would like to thank the organisations that made it possible:

City of Amsterdam https://www.amsterdam.nl/en/
City of Arnhem https://www.arnhem.nl/Inwoners/english
City of Rotterdam https://www.rotterdam.nl/english/city-government/
CleanMobilEnergy Interreg project http://www.nweurope.eu/projects/project-search/cleanmobilenergy-clean-mobility-and-energy-for-cities/
HvA http://www.amsterdamuas.com/
ElaadNL https://www.elaad.nl/
NKL https://www.nklnederland.com/
Allego https://www.allego.eu/
Polis https://www.polisnetwork.eu/
WestTrans http://www.westtrans.org/

And a special note of thanks to Gabriela Barrera from Polis and our contacts in the cities: Hulya Oudeman-Kul; Jaap Burger and Peter Swart.

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Above: Amsterdam Amstel train station

APPENDIX 1: LIST OF PARTICIPANTS

Claudia	Stuerck	LB Brent	Principal transport planner
Peter	McDonald	LB Croydon	Travel & transport planning officer
Dominic	Millen	LB Enfield	Group leader, traffic and transportation
Daniel	McCrory	LB Hammersmith and Fulham	Project engineer / traffic orders officer
Zahrah	Ali	LB Haringey	Electric vehicle officer
Nick	Harvey	LB Lewisham	Transport planner
Alex	Oyebade	LB Southwark	Team leader transport planning
Andrew	Luck	London Councils - LEPT	Transport manager
Owain	Mortimer	London Councils	GULCS officer
Héloïse	Thibault	London Councils - LEPT	European projects and communication officer
Emily	Shovlar	WestTrans	Senior WestTrans coordinator

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APPENDIX 2: PROGRAMME & PRESENTATIONS

Morning 13 May: Amsterdam

- 09:15-11:00 Exchange on electric city policies - electrification of taxis and the general strategy on zero-emission and charging infrastructure - Amsterdam and London perspectives
- 11:00-12:00 Visit of the taxi rank and charging hub at Amsterdam Centraal (by metro)
- 12:00 – 13:00 Presentation on vehicle to grid integration - Robert van den Hoed, Professor of Energy and Innovation at University of Amsterdam)

Afternoon 13 May: Arnhem

- 14:59 Arrival in Arnhem
- 15:15 Visit of the CleanMobilEnergy Interreg North-West Europe project location
- 15:30-18:00 Visit of the IPKW industrial estate: innovations regarding charging of all kinds of vehicles and batteries

Morning 14 May: Rotterdam

- 09:00-09:30 Overview of energy and mobility transition - Arjan Oranje, program manager zero emission mobility, Rotterdam
- 09:30 – 10:00 Development of charging infrastructure - John Akkerhuis, advisor mobility, Rotterdam
- 10:00 – 10:30 Strategic policy development - Hulya Oudeman-Kul, advisor mobility, Rotterdam
- 10:30 – 11:00 Walk to the Charging hub at Veerhaven
- 11:00 – 11:45 Site visit charging hub
- 12:30 – 13:00 Electric City Drive pilot project - Quirijn Oudshoorn, advisor mobility, Rotterdam
- 13:00 – 13:30 Electric city bus infrastructure rollout - Frank ten Wolde, advisor mobility, Rotterdam
- 13:45 – 14:15 New building directive / logistics - Jeroen Kroonen, project manager, NKL
- 14:15 – 15:00 Transparent Charging Station, Cybersecurity and Smart Charging - Eric van Kaathoven, senior communication advisor, ElaadNL and Marcel Schouwenaar, designer transparent charging station

ENDNOTES

1. https://www.evdata.nl/ (in Dutch)

2. https://www.laadpaalnodig.nl/ (in Dutch)

3. https://www.nuon.nl/producten/elektrisch-rijden/openbare-laadpaal/laadpaal-amsterdam/ (in Dutch)

4. http://openbaarladen.nl/ (in Dutch)

5. The pilot is run as part of the SEEV4-City Interreg project: https://northsearegion.eu/seev4-city/

6. Introducing the transparent charging station – Elaad NL https://www.youtube.com/watch?v=M32bzsBswAk

7. https://encs.eu/wp-content/uploads/2017/10/EV-Charging-Systems-Security-Requirements.pdf

8. https://www.evdata.nl/ (in Dutch)

9. http://www.nweurope.eu/projects/project-search/cleanmobilenergy-clean-mobility-and-energy-for-cities/

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