EVS30 Symposium Stuttgart, Germany, October 9 - 11, 2017

STONE-AGED REGULATION HINDERS THE ROLL-OUT OF EV:
Tax barriers against Smart Charging

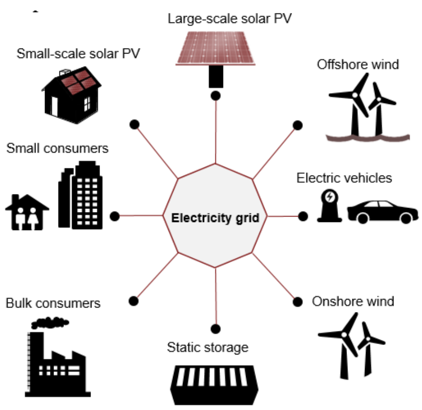
Baerte de Brey1
[1]*ElaadNL, Baerte.de.Brey@elaad.nl*

Abstract
The Netherlands is one of the leaders in the field of e-mobility. In 2015, the Dutch share in electric vehicles ("EVs") in use worldwide was ~8% (of the approximate 1.2 million vehicles in total). Growth of e-mobility leads to an increasing availability of storage capacity in the grid. This increasing storage capacity can be deployed for "Smart Charging". The smart deployment of this storage capacity is particularly relevant to grid operators. Key principles of Smart Charging are: (1) free access to renewable - local - energy (provider chosen by EV driver rather than by charging point owner), (2) optimising local grid load (prevents extra grid investments) and (3) facilitates grid flexibility (storage of temporary excess of energy generated in a decentralised manner). ElaadNL strongly supports an open market for electric vehicles, where OEM's, energy providers and new charging station operators can entrepreneur on a level playing field. Supporting an open market via open and royalty free standards for smart charging also means that the government should not interfere with unreasonable energy taxes. Our study[1] has shown that the various tax barriers hinder the realisation of these principles and thus flexibility services from storage capacity (EV or static storage).

---

1 Electric Vehicles and solar: A need for flexibility arises

The increased use of electric vehicles (EVs) leads to higher peak power demand by small consumers and leads to new demand from public charging stations connected to the low-voltage grid.



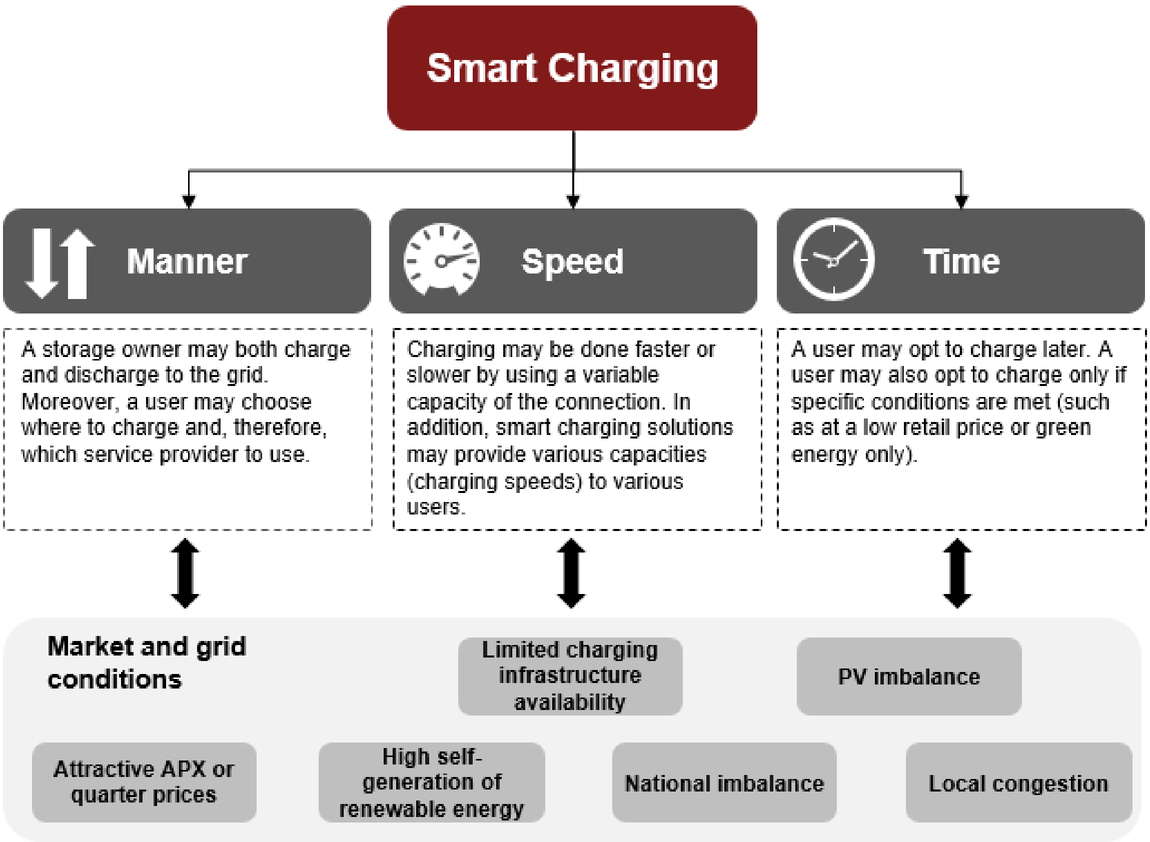
[1] Stichting ElaadNL, fiscal barriers voor smart charging, January 2017

Besides the expansion of e-mobility, the rise of renewable energy will lead to increased pressure on our electricity grid. Renewable energy generation is volatile and depends on the availability of wind and sunshine. As a consequence, generation cannot be controlled as well as generation of conventional power. This complicates alignment of power supply and demand. Although power supply was often aligned to demand in the past in order to maintain the balance in the grid, the future requires access to flexibility on the demand side. Such flexibility of demand can be achieved by adjusting electricity consumption or by deploying electricity storage. This requires a high level of digitisation of the interactions that take place between players on the grid. "Smart Charging" may contribute to providing flexibility.

2 The benefit of Smart Charging

We define Smart Charging[2] as adapting the manner, speed and time of charging and discharging to the situation of the customer, the market and the grid. By varying these three components a storage owner may adapt to the situation of the customer, market and grid at that time and, consequently, adapt to the market demand - and grid demand. The precondition for the success of Smart Charging is to create a financial incentive that encourages the storage owner to adapt to market demand and, as such, to optimise its own business case. This may provide solutions for congestion and imbalances in the electricity grid. In the future, such situations will occur more frequently due to the expansion of renewable electricity, which may be generated in a decentralised manner.

Schematic overview of Smart Charging



---

[2] According to [CCE2012] and [EUEL2015], the definition of smart charging is rather technical for politicians or customers: "when charging an EV can be externally controlled (i.e. "altered by external events"), "allowing for adaptive charging habits, providing the EV with the ability to integrate into the whole power system in a grid- and user-friendly way. Smart charging must facilitate the security (reliability) of supply while meeting the mobility constraints and requirements of the user."

3 Smart charging and the taxation framework

Dutch regulation[3] does not provide a clear definition of the terms “supply” and “user”. As such, it is unclear whether, and if so, in what link of the Smart Charging chain an ET-taxable supply of electricity is effected and how the ET due must be calculated (whether netting is allowed). A relevant criterion for supply subject to ET and VAT is to determine by whose intervention the power to dispose of the electricity as owner is transferred to the user. The civil-law concept of supply cannot be used[4]. For the research on smart charging and taxation four issues where identified:

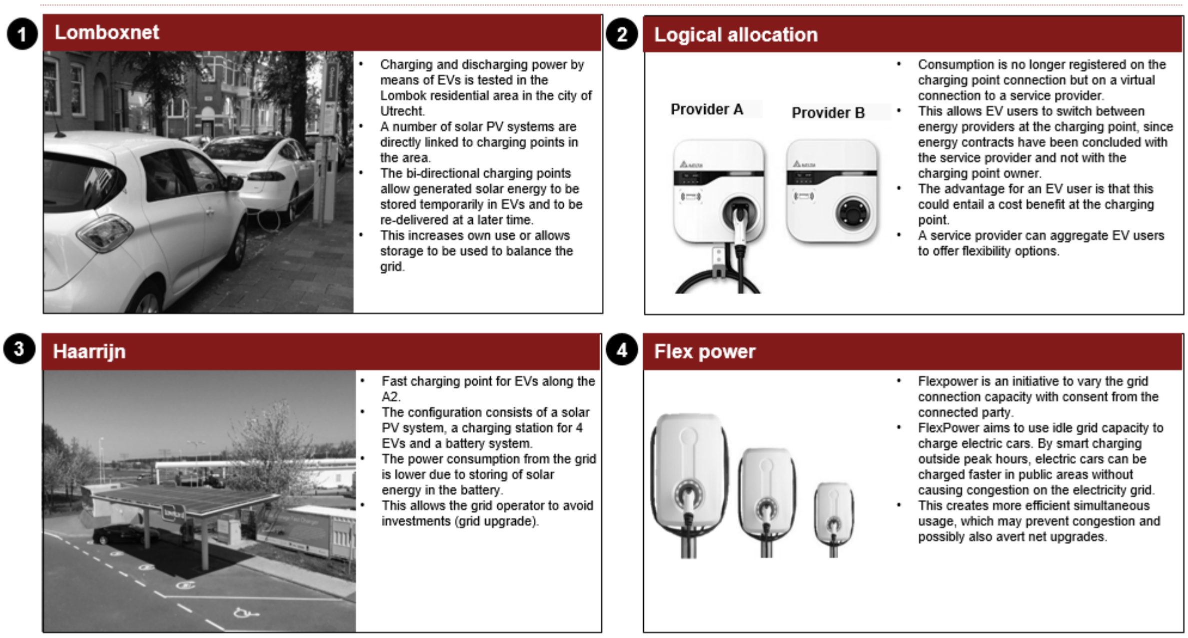
> Does smart charging qualify as supply?
> The supply of electricity to a user, whether or not by means of a connection, is subject to the levy of ET. Up to 1-1-2015, supply by means of a connection was required as a condition to levy ET. After 1-1-2015, any supply to a user became subject to levy of ET. As such, the distinction between supply “before” and “after” the meter is no longer relevant to identify an ET-taxable supply. The party that supplies the user must pay ET due on the basis of tax declaration. Supply of goods/services against compensation by a company is subject to the levy of VAT. The company that makes VAT taxable supplies must file VAT returns and pay the VAT to the Dutch tax authorities.
>
> Between what parties is supply effected?
> It is relevant to determine whether, and if so, in what link of the Smart Charging chain ET and VAT are taxable based on the present legislation framework.
>
> How does Smart Charging relate to netting?
> When a user has fed electricity into the distribution grid by means of a small consumer connection[5], ET will be levied on the credit balance of the electricity supplied by means of the connection minus the electricity fed by means of the connection (“netting”).
>
> How does Smart Charging relate to the self-generated power exemption?
> ET will be levied based on the consumption of self-generated electricity. However, this does not apply to consumption of electricity that the user has generated by means of renewable energy sources (“self-generated power exemption”).

4 Four field tests

Smart Charging is put into practice in different Dutch pilot projects. All these Dutch smart charging initiatives form together the “living lab smart charging”, which is coordinated by ElaadNL[6]. Our analysis is

[3] The Environmental Taxes Act (Wet belastingen op milieugrondslag, “Wbm”)
[4] The Hague Court of Appeal, 2 May 2014, BK-13/00718
[5] 31c paragraphs 1 and 2 of the Electricity Act -Elektriciteitswet1998
[6] www.livinglabsmartcharging.nl

based on four pilot projects.



4.1. Lomboxnet

Lombok is a small residential area in one of the four biggest cities of the Netherlands, Utrecht. The testbed in Lombok has charging points before and behind the meter. Furthermore, this testbed is used for vehicle-2-grid tests[7].

4.1.1. Overview of private charging point behind the meter

In this case the charging point is connected to a household connection behind the meter. The roof of the house is equipped with a solar PV system that generates power and that is linked directly to the charging stations, so EVs can be charged with solar power, if and when available. Use of EVs to store self-generated power to be used for own consumption at a later time or to be fed back into the grid. We assume that a third party's/shared EV will always leave with more kWh than it had upon arrival. The charging station is used for charging/discharging:

- One's own EV
- A third-party EV
- A shared EV (of which the owner is the same as the owner of the solar panels)

One's own car

In principle, charging one's own car behind the meter qualifies as an activity subject to ET. However, this situation is exempt from the levy of ET based on the self-generated power exemption, since the private car is owned by a person that both generates and consumes the solar power. In this case, we do not identify a tax barrier from the perspective of ET and VAT. Netting is not an incentive for storing self-generated energy, for instance by means of one's own EV[8].

A third-party car

Charging a “third-party car” behind the meter is subject to levy of ET and VAT, since this constitutes supply of electricity against compensation to a user. In principle, no VAT is to be levied if supply is effected without compensation. Vehicle-2-grid or discharging by the EV to the grid (read: “the

---

[7] Electric vehicles can -besides being deployed as a means of transport -be deployed to facilitate storage and discharge to the grid (vehicle to grid). EVs may be charged with grid power or with self-generated power from renewable sources. EVs may also be used as a buffer by storing energy temporarily and feeding it back to a later time, e.g. to a household.

[8] https://www.rijksoverheid.nl/binaries/rijksoverheid/documenten/rapporten/2016/12/15/de-historische-impact-van-salderen/de-historische-impact-van-salderen.pdf.

generator/supplier") does not -in principle -qualify as a taxable event in respect of ET, since electricity is not supplied to a user, but rather to an onward supplier within the meaning of Article 50 paragraph 4 WBM[9]. This situation differs, since the driver of the EV cannot be assumed to be a consumer, or small consumer, within the meaning of Article 50 paragraph 2 WBM, that has self-generated electricity from a renewable source and has fed it into the distribution grid. The tax barrier is this: ET is due on all kWh that are charged into the EV by means of the private charging point. If a kWh is first charged into an EV and then discharged into the grid, this entails -in principle -that ET is levied twice at the time when the generator/supplier would use this kWh once again to supply to another consumer. A practical example: whether or not to net at the charging point

- An EV driver arrived at the charging point with 15kWh and left with 20kWh.
- The charging point caters for bi-directional charging, at which 5 kWh is discharged back during the charging time.
- Without netting at the charging point, the EV driver will pay ET on 10kWh.
- With netting, the EV driver will pay ET on 5kWh.
- If the electricity discharged by the EV back into the grid is supplied by the energy provider to another person ("a consumer"), this would once again qualify as a taxable event in respect of ET. In that case, the supplier will charge ET on the same 5 kWh.
- If netting is impossible in this situation, ET will be levied twice on these 5 kWh, whereas it will only be consumed once.

A second tax barrier is that if the EV driver is compensated for providing his/her EV, the EV driver may qualify as a VAT taxable person (compare to solar panel owners). This may lead to VAT liabilities and an administrative burden for the EV driver (including partial input VAT recovery, billing requirement and requirement to file a VAT return).

Shared car

The elaboration is the same as "one's own car" when the generator and the owner of the car are the same person and is similar to a "third-party car" when the generator and the owner of the car are not the same person.

4.1.2. Overview of public charging point before the meter

In this set up the charging point is connected before the meter in a public area. The generator (solar panels on the roof of a house or school) generates solar power and is part of a closed distribution system. The generator of the solar power on the roof of the school has a contract with the provider (CPO or eSMP) to supply power by means of a public charging point. The provider settles with the EV driver (whether or not through a lease company). The charging point is connected to one's own EV, a third party EV and a shared EV (of which the owner is the same as the solar panel owner). The EV can be used for storage and discharge to the grid. In a situation of excess solar energy, this solar energy (of one or more solar PV systems in an area) may temporarily be stored in electric cars that are connected to the grid by means of public charging points in the area. If there is no longer an excess of solar energy, this energy can be discharged into the grid, which means that the owners of the solar PV systems have their solar power returned to them.

The tax analysis for Lomboxnet/public charging point is the same -in principle -as that of the Lomboxnet/private charging point. However, for charging electric vehicles of third parties by means of a system with an individual connection, the same rate applies to the first tax band as in the second tax band in the period 2017-2020. A zero rate applies to ODE[10]. Based on the present state of legislation and regulations, the generator of solar power is liable for ET at the lowered rate on the kWh that are supplied to the provider by means of the public charging point. The tax barrier is that differing ET approach to private and public charging points. Furthermore, it is unclear whether the power generation exemption applies when "one's own car" or "shared car" that is owned by the generator of solar power is charged by means of

[9] The netting article of Article 50 paragraph 2 WBM was introduced for the situation in which a consumer, or small consumer, would feed electricity generated from renewable sources into the distribution grid.

[10] Storage of sustainable energy ("Opslag Duurzame Energy")

a public charging point. This gives the tax barrier that the power generation exemption may not apply to charging one's own car or a shared car that is owned by the generator by means of a public charging point.

4.2. Overview of logical allocation

In the test “logical allocation” measurements of consumption of electricity on charging stations will not be registered at the physical connection but at a virtual connection. A service provider (eMSP) has one contract with a supplier for all its customers. This allows the customer freedom of choice at the charging stations because they can use various service providers (with various energy supplier contracts) to charge an EV. Small consumers will be aggregated in order to deploy flexibility on APX and imbalanced market.

This test identified one hindrance for the out-roll of smart charging. Presently, the levy of ET and clustering of electricity connections is linked to the connection of an immovable property which is located in the Netherlands[11]. Based on the above, the supply of electricity by the supplier to the service provider will in principle be designated as the ET-taxable supply.

4.3. Overview of Haarrijn

Haarrijn is a fast charging station alongside the A2, the busiest highway in the Netherlands (five lanes in both directions). The station has a configuration that consists of a solar PV system, a battery system and a public fast charging point. Solar power is generated by means of the solar roof and this solar power is stored in the battery system. When an EV charges at Haarrijn, an EV will be provided with solar power from the battery system. If no solar power is available in the battery system, the charging station switches to power consumption from the grid.

In this test it is unclear to what extent public charging points qualify as charging systems to which the lower taxrate applies, as these are possibly part of a larger immovable property and thus might not qualify as an independent connection. In case operators of (fast) charging points such as Haarrijn, Allego and Fastned, the consequences are relatively limited, as these have already been subjected to ET-taxation in the third tax band. This has a limited impact on Smart Charging as such, although there is presently no level playing field for all charging points with public access.

4.4 Overview of Flexpower

In order to gain experience with flexible loading, ElaadNL has launched a test that allows participants to load high-power electric vehicles (Renault Zoe, Tesla Model S, BMW i3, Nissan Leaf, Tesla Roadster) outside the peak hours (outside 17:00-19:00). Almost all day, the car is loaded faster than normal. The peak is loaded with less power. Plug-in hybrids also participate in the test. In the final phase of the research, we look at how electric cars can be loaded at the times when the most supply is for renewable current from sun and wind (and current prices are low). The purpose of FlexPower is to gain experience with flexible loading on charging stations in the public space of EVnetNL. The possibilities of using flexible loading to load at best times for the user and for the net is investigated.

4.5 Identified tax barriers for smart charging

In the four projects some tax barriers against smart charging are identified:

1. The lack of netting for charged and discharged kWh in case of bi-directional charging leads to unintended double energy taxation (“EB”)

2. No adequate EB incentive for efficient use of locally generated renewable energy in combination with Smart Charging

3. No level playing field between public and private charging points; as a consequence, the incentive for Smart Charging, if any, varies considerably from site to site

4. Netting scheme does not provide incentive for optimising own use by means of Smart Charging

5. Consumption cannot be clustered, either physically or virtually; this complicates free choice of energy provider and causes additional administrative burden

[11] Article 47 paragraph 1f Wbm

6. VAT liability for EV drivers upon receiving compensation for providing an EV for bi-directional charging

5 Tips for tax: New regulation for smart charging

Fortunately, there are possible solutions for breaking these tax barriers. Some short-term possible solutions. For example, storage may be interpreted as a service in respect of EB in case of bi-directional charging. As such, EB would only be due on net amount of charged kWh by power provider. This may provide a solution for multiple EB taxation in situations with and without netting scheme. Clarification of netting article should be done: to the extent that netting applies in the context of Smart Charging that uses storage. As such, EB will only be due on the net balance consumed. It is the government to provide clarity on VAT approach of EV drivers and virtual netting. All these solutions can be fixed on a short term in the regulatory frame.

Besides short-term solutions also long-term adjustments are needed. One of the possible solutions for a slightly longer term includes introduction of a fixed (lower) rate, for charging EVs with renewable energy, in which the service provider can be designated as the taxable subject and the EV driver as user. This will create a more level playing field for charging electric vehicles by means of public and private charging stations. Consequently, the level of the rate will no longer depend on the site of charging. This rate may be applied to offer incentives at peak power demand hours and also provides government with better options for control and insight.

6 Specific for the Netherlands?

ElaadNL strongly supports an open market for electric vehicles, where OEM's, energy providers and new charging station operators can entrepreneur on a level playing field. Supporting an open market via open and royalty free standards for smart charging also means that the government should not interfere with unreasonable energy taxes.

The question is if these issues are specific to the Netherlands or are founds in one way or another across the EU and or other regions of the world. It is a common fact that regulations always follow societal transitions with a certain pace. First technical innovations have to mature, secondly the market has to adopt and use smart charging, and at last the regulatory framework has to be revised for hindrances or omissions. This will be the case in any democratic country with an open market model. This chapter will highlight two examples of countries with perverse governmental incentives to keep the traditional business model of fossil fuels for traditional vehicles in place.

6.1. The United States of America

There is little literature on energy tax and smart charging in the United States of America (US). Most governmental incentives have a focus on purchasing cars. There is a federal tax credit for EV purchases offers buyers up to $7,500 toward the cost of a new vehicle. California also provides vouchers up to $45,000 for EV fleet purchases, and rebates up to $2,500 for individual EV purchases, subject to programme funding limits[12]. Retail buyers in at least 13 states can get some cost relief in the form of tax credits, rebates, reduced vehicle taxes or registration fees for buying a qualified alternative-fuel or electric-drive vehicle[13].

From utility side also incentives are given. For example, the Californian energy supplier Pacific Gas & Electric provides EV owners the option of taking a tiered residential rate or a special time of use rate, based on whether or not they have a separately metered charging station. Southern California Edison offers flat-rate, time-of-use (TOU) pricing for separately-metered charging stations. In the city of San Diego specifically, which has a fleet of 3,300 EVs in use and 400 public charging stations, the TOU tariffs

[12] https://www.fueleconomy.gov/feg/taxevb.shtml

13 Plug In America, an advocacy group, has an interactive U.S. map that shows current plug-in car incentives in each state. The U.S. Energy Department also has an interactive chart of state incentives.

provided by the local energy supplier have caused more than 80 percent of electric vehicle charging to be scheduled between midnight and 5 a.m., a test quite similar to “FlexPower” in the Netherlands.

6.2. China

China is expected to become the world's biggest electric car market this year, with sales estimated at 220,000 to 250,000 vehicles, based on the Chinese Association of Automobile Manufacturers surpassing the US6. The market is growing quickly because of generous subsidies and incentive programmes (including tax incentives and exemptions from restrictions designed to reduce traffic congestion). These policies are part of a drive to put 5 million new energy vehicles (NEVs) on Chinese roads by 20207. The country is also implementing a small number of demand response pilot programmes which will pave the way to more policy reforms in the short-term. In March 2015, the government also introduced power sector reforms addressing issues that will affect demand response: pricing reforms, ancillary services markets, and the opening up of wholesale electricity markets. However, no link between the charging of EVs by demand response, or one step further, by smart charging can be found (yet). Therefor it is logical that no hindering regulations, such as tax barriers have come across.

6.3. Japan

Demand response as an overall strategy has been making Japanese grids more efficient by giving incentives to consumers to modify their power consumption during times of peak usage8. Japan has introduced the LEAF to Home system which is part of a larger Vehicle to Home (V2H) initiative to expand the use of electric vehicles in both emergencies and to support the overall electrical grid operation during daily use based on Direct Current (DC). The new system is being tested for demand response capability and involves several Nissan This test is quite similar to Lomboxnet (see 4.1.1.)[14]. Unfortunately, no reference in English literature can be found on the regulatory framework concerning this test, and the tax- and financial implications of smart charging.

6.4. Norway

In 2015 Norway achieved its goal of reaching 50,000 zero emission vehicles by 2018. Among the existing incentives, all-electric cars are exempt in Norway from all non-recurring vehicle fees, including purchase taxes, which are extremely high for ordinary cars, and 25% VAT on purchase, together making electric car purchase price competitive with conventional cars. Electric vehicles are also exempt from the annual road tax, all public parking fees, and toll payments, as well as being able to use bus lanes. These incentives are in effect until the end of 2017[15].

6.5. Germany

In a fundamental study the think tank Agora Energiewende16 has examined in the tax and levy system for the German energy market. This study shows that energy prices are very different according to energy sources. For instance the governmental surcharges (taxes, charges and levies) per kilowatt hour for electricity are in Germany at 18.7 cent on average. That makes 75-80 percent of the price components for most consumers (households) while other energy carriers are charged much less. In the case of petrol it is only 7.3 cents/kWh, for diesel 4.7 cents/kWh, for natural gas 2.2 cents/kWh and for heating oil only 0.2 cents/kWh. The trend behind these numbers is the same for the Netherlands17. It is thus hardly surprising that electricity (which is becoming increasingly decarbonized by the expansion of renewable energies and thus more climate-friendly) is much more expensive in comparison to other energy carriers and its use in other sectors of the energy industry like transport and heat is less common. In other words, imbalance of the energy price benefits climate-damaging energy carriers. Unfortunately, this piece of Agora research did not have a specific focus on electric vehicles, nor did it have a focus on the smart charging of these vehicles. It might be that the outcome of such research will show an even more ineffective and disrupting

[14] In Lomboxnet described in paragraph 4.1.2. the test is done based on Alternating Current (AC)
[15] https://en.wikipedia.org/wiki/Plug-in_electric_vehicles_in_Norway
16 https://www.agora-energiewende.de/en/projekte/-agothem-/Projekt/projektdetail/152/
17 http://read.pwc.nl/i/667915-een-gelijk-speelveld-voor-elektrisch-rijden

view of the government’s role in relation with e-mobility and energy taxes.

6.2 Spain

In the wake of the 2008 financial crisis, the Spanish government drastically cut its subsidies for solar power and capped future increases in capacity at 500 MW per year. In 2010, the Spanish government went further, retroactively cutting subsidies for existing solar projects. Until recently, Spain had a very general self-consumption policy framework that applied to both grid-connected and off-grid systems. However, in 2015, Spain's Council of Ministers approved a new self-consumption law that it taxes self-consumption PV installations even for the electricity they produce for their own use and don’t feed into the grid18. Spain's PV sector calls the new law a 'sun tax’. With only 0,3% market share of EVs on a 22,5 million car market in total, and only about 1800 charging stations19, the forecast on a strategy of the Spanish government to smart charge electric vehicles, for example of excess of solar energy, is not very promising.

7 Conclusion

Where ever on the globe, there are plans for an out roll of EVs. The charging of these EVs will have an impact on the grid. As most grid operators –from China State grid to Dutch DSO Stedin- have a public interest, it is also logic the regulator has to apply new rules for smart charging. These regulations shouldn’t only be about technical issues. They should also be about innovation, open markets, open standards and proper price incentives from the government. At this moment EVs are mostly associated with subsidies. However, this brief study shows tax might play a vital role in a successful implementation. Point is that in several countries stone-aged regulations hinder the roll-out of EV, especially tax barriers.
Further (European?) study is required to give concrete form and elaboration to these possible solutions, for instance into the question what an efficient level of EB rate is for EVs as users in respect to other consumers. Is an incentive for optimising peak consumption an option? What is the impact of a change to electrification of our national/European fleet on government revenues? Who owns the data needed for tax collection? And finally, what is the impact on position of grid operators and other stakeholders due to amended systems, mitigation of costs of grid upgrades?

[18] http://www.renewableenergyworld.com/articles/2015/10/spain-approves-sun-tax-discriminates-against-solar-pv.html
[19] http://www.eafo.eu/content/spain#summary

Authors Baerte de Brey is the Chief International Officer within ElaadNL. Responsible for analyzing the long-term effect of electric mobility on the electricity grids, Baerte helps building a sustainable business case around this transition. This includes V2G, storage and customer behavior research. Baerte graduated from Leiden University in 2001 with a law degree and received an MBA from Nyenrode Business University in 2006. As an expert for the European Commission he reviews collective European programs concerning EV interoperability and smart charging