Innovation impact

What we have seen is the potential of these various innovations, and how they could provide value to various actors. However, there are still many uncertainties of what the effects will be on the world we live in. This is because the technology is still immature, there has never been any large-scale implementation and there is very limited information available on the safety and security effects on the public realm. So before decision makers can devise effective policies and implement successful plans, they will want to test possible options. Therefore, pilot projects or living labs can be initiated, but these can be expensive and take long. This may make you think. Wouldn't there be a smarter alternative to this? Well, computers and for example virtual reality, certainly have taken giant steps forward. So what if we benefit from this and test these innovations in virtual pilots? That would sure save us a lot of time and money.

These virtual pilots or simulations should be close to reality. So we need a realistic model in which we can simulate a future situation in a city. Only then we can take away these uncertainties and really understand their impact. This will then allow us to test and validate strategies and policies before we implement it.

The spark city model

Therefore, we have developed the SparkCity model. In this model, we focus on a certain neighbourhood and we start by taking its physical lay-out and spatial characteristics. Then for each resident and visitor we model their behaviour individually. These people are then called agents. We model if and when they buy a new car, how they use it to drive around and if and when they charge their vehicle. Furthermore, we can add more layers. An important one is the electricity grid. This means we include in the model how electricity cables and transformers are spread through the neighbourhood, and what the load is on each. We can also include future grid expansion plans.

This model can very accurately simulate many developments. For example how the growth of EVs in a certain area will take place. And how this would be different for specific EV incentive schemes. Another is to analyse the effect of different roll-out policies for charging infrastructure. These could differ for example in a focus on on-street charging vs. park-and-charge hubs at centralized parking areas. And what would be the consequence for the electricity grid? And how does this depend on the implementation of smart charging and vehicle-to-grid?

Changing mobility patterns

Besides different EV charging strategies, we can also dive deeper into the changing mobility patterns in a part of a city, and how this can be influenced by for example car sharing schemes. Through this we can see how this would reduce the need for public parking places, which would create more space for walkways, housing, green areas, etc. This can be used as input for a study that looks into the societal benefits of car sharing schemes for a city, now and in the future.

Energy system

Lastly Agent based modelling gives the possibility of this model to combine the transition to electric vehicles with other energy innovations such as solar panels. We can envision a neighbourhood in the not so distant future where many of the houses are equipped with rooftop solar panels and half of the vehicles are plug-in hybrids. What would the effect on the electricity grid be? And taking into account the driving patterns of the cars, could these cars be used to store locally produced solar energy during the day and feed it back to the grid in the evening? This can be of value to the grid operator, but also to a city that wants to increase their share of locally utilised renewable electricity. For home owners that also drive an EV it can be meaningful to be able to share self-produced solar power with neighbours. Thus creating stronger social cohesion and becoming more independent. This could be a glimpse into the sustainable energy future that we all want to be a part of.