

THE RAPID DEVELOPMENT OF ELECTRIC VEHICLES, ITS IMPACT ON THE POWER GRID AND THE ENVIRONMENT, AND HOW TO DEAL WITH IT

While we are looking for our sustainable future the two major trends are starting to appear – the increasing demand for renewable sources of energy to power our home and a popularization of electric vehicles (EV) to transport us elsewhere. But what does this mean in terms of the electric power grid?

For a first look it sounds rather normal and self-sufficient. We have large volumes of new electricity generation and a lot of new electricity consumers, ideal balanced situation, right? But considering that the bigger part of this generation are solar power stations that work during the day and most of EVs will charge during the night it seems already disturbing. Thereby we'll have a lot of unwanted generation at the one part of the day and a big demand for it at another, what is critical for our energy system (critical enough to force us to burn even more coal or gas just to cope these “green” changes).

So what can (and should) we do? First thing that comes to mind is as simple as this: charge your EV at day! Locally optimized controls and high home charging can strain the grid while shifting to uncontrolled, daytime charging can reduce storage requirements, excess non-fossil fuel generation and emissions. But for that we must create appropriate power infrastructure that will be capable to charge your EV while you are working, shopping or just relaxing in a park. Careful planning of charging station placement could lessen or eliminate the need for new power plants too. And as a bonus it will even allow us to use regular EV as a portable power accumulation unit. Electric vehicle batteries alone could satisfy short-term grid storage demand by as early as 2030 making unprofitable accumulation stations unnecessary. That all could make our power grid more efficient and thus more ecological.

But talking about ecology, did you know that electric car of yours could be bigger pollutant than a car with a combustion engine? It all goes from a complicated manufacturing process which makes breath-taking quantity of emissions to let you drive your new EV without them. And while that's true, the bigger lifespan of an EV is, the better. We have two solutions for that problem: redesigning procurement incentive programs in a manner

that (re)distributes incentives towards the second-hand EV market and popularization of shared electric vehicles (SEV).

While the last are capable not to just increase average lifespan of a car, but to decrease the load on a transport network by minimizing the quantity of cars (or rather to say EVs manufactured) on a road. If one shared vehicle replaces ten individually owned vehicles and under an appropriate pricing strategy, it could decrease the carbon footprint by about 41% in 2050, PM_{2.5} emission by 56–64% and energy consumption by 53–61%. With the further introduction of vehicle electrification, the last two indexes can rise further to 76% and 74% respectively.

As a result, we can achieve rapid growth in electric transportation and get the most effective electric transportation system so that it will be not a burden but a benefit to both our environment and our power grid. We just need to make it right.