

One common question about EVs is "where will we get all the electricity to charge them?" So I did some poking around for facts:

The annual electricity used by the USA for all purposes: 4 trillion kWh, or 4 thousand billion kWh. I would use exponents but only eggheads appreciate them.

There are 2.5 million EVs on US roads today; 1% of the 250 million vehicles in the US.

Each EV uses an annual average of 4 thousand kWh, based on 10,000 miles driven and 0.4 kWh/mile (I have sources, some even respectable, for all these numbers). For perspective the average house uses 10 thousand kWh/yr.

So the total electricity used by all the EVs today is 10 billion kWh annually. That is 0.25% of all the electricity used by the US. That's probably less than is used by all the kitchen toasters in the country. I haven't done the math on that, and any other nerd is welcome to try. In any case it's trivial...now.

If the number of EVs quadruples (which could happen in a few years) then the EVs will comprise 1% of the country's electricity usage. Still not much.

When the number of EVs reaches 10% of the fleet (that would be 25 million, ten times the present number), then they will consume 100 billion kWh. Now we're talking some big numbers, right? Well, it's only 2.5% of the total used for all purposes. Still not tearing-our-hair-out time.

OK, how about when EVs are half of the fleet? That's 125 million of them, and they will suck up 11% of all the electricity we use (now that the EV usage is getting significant in comparison to today's total, we have to add its 0.5 trillion kWh to the 4 trillion we started with, so $0.5/4.5 = 11\%$). That's not to be sneezed at. But we probably have 20+ years before we reach this point. And in the interim the grid gets better, and we expect that there will be lots more solar and wind and who-knows-what to charge the EVs and toast our bread. And EVs will be even more efficient (Google regenerative braking, for one). And, as a nice extra, we already are thinking of using EV batteries to support the grid; no reason to have all that energy just sitting around most of the time.

There will be lots of engineering, and lots of politics and lots of nervous consumers (really, folks, "range anxiety" is a mental problem, not a technical one). But the transition to an all-EV fleet will happen. Our kids will see it.

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Update Aug 2023: the USA electricity usage was 3.5T kWh in 2000, and 4T kWh in 2022. At this rate it will be 4.5T in 2044. If all the 250 million cars were EVs that would add 1 T for a total of 5.5T, an increase of 1.5T, or 38%, from today.