

How much oil are electric vehicles displacing?

Aleksandra Rybczynska

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Executive summary

EV's influence on global gasoline and diesel consumption is small but increasing quickly. This short presentation aims to show BNEF's assessment of the fossil fuel displacement caused directly by EVs sold globally from 2011 to 2016.

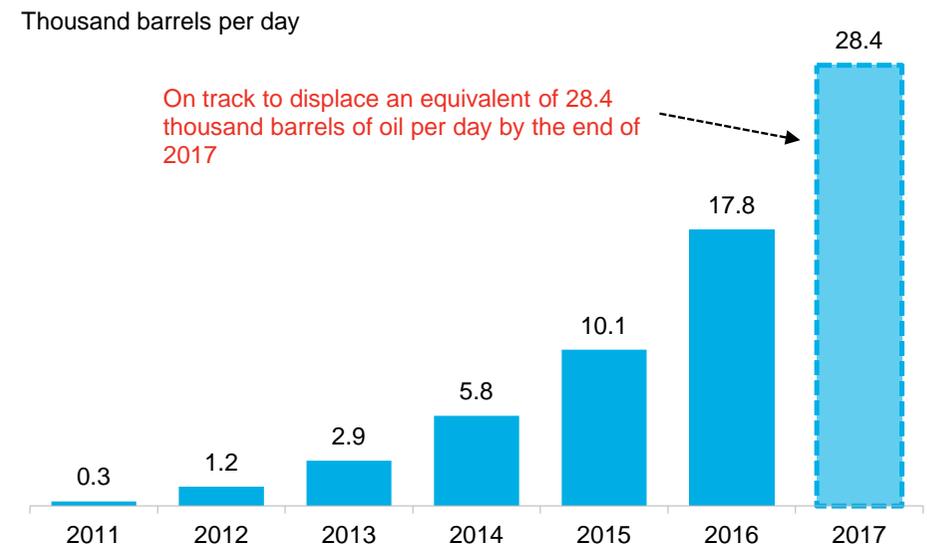
- Global sales of plug-in electric vehicles are growing quickly, up 55% in 2016 compared with 2015. Although still small, their influence on gasoline and diesel consumption volumes is steadily rising.
- Oil displacement values caused by EVs will vary regionally and will largely depend on the average miles travelled and the fuel economy of the ICE vehicles they are displacing in a given country. However, using global weighted average values of these two variables, EVs displaced 77% more oil in 2016 than in 2015.
- EVs are displacing 17.8 thousand barrels of oil per day as of the end of 2016. We expect global annual EV sales to increase further by 39% in 2017 and increase their fuel displacement values by 60% as BEVs are becoming more popular.

10,887 Global average annual vehicle miles driven

38.6 Weighted average global ICE car fuel economy in miles per gallon in 2016

3.4 TWh of electricity consumed by Evs in 2016

Fuel displaced by Evs on the road, 2011-17e



Source: Bloomberg New Energy Finance

Methodology

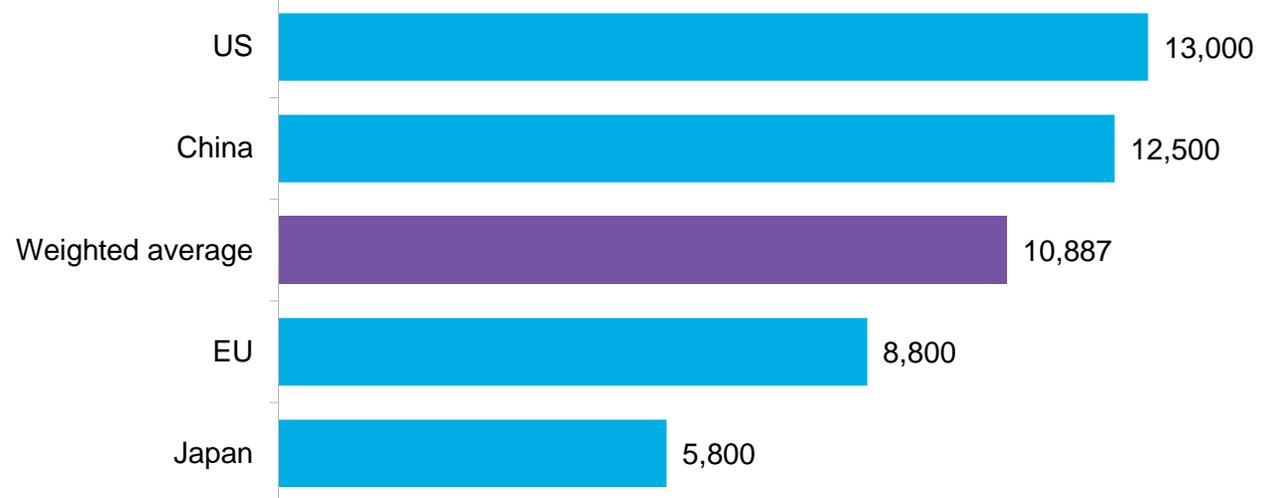
- This short presentation aims to show BNEF's assessment of the fuel displacement values caused directly by EVs sold globally from 2011 to 2016.
- BNEF looked at the issue from two different perspectives:
 - **Method 1:** Fuel displaced by EVs is calculated assuming that every electric vehicle on the road was bought instead of an internal combustion engine (ICE) vehicle, therefore displacing fuel that would otherwise be consumed by the respective ICE vehicle.
 - Method 1 represents the fuel that would have been consumed by these ICE vehicles expressed in barrels of oil per day. In order to calculate this, we used quarterly EV sales data, then combined this with regionally-weighted average ICE vehicle fuel economy ratings and regionally-weighted average BEV and PHEV miles driven to determine the displacement from ICE vehicles that were effectively 'taken off the road'.
 - Using this method, in 2016 EVs displaced an equivalent of 17.8 thousand barrels of oil per day globally, and are on track to potentially displace over 28.4 thousand barrels of oil per day at the end of 2017. Total global oil consumption is around 96m barrels of oil per day.
 - **Method 2:** Energy consumed by EVs is calculated as a function of their fuel consumption and miles travelled in each year. To do this we reviewed sales data, fuel economy ratings by model for combined driving cycle of all EV models sold –by quarter –since 2011, and the average pure electric miles travelled by BEV's and PHEVs in a year.
 - Method 2 result represents the electricity consumed by the cumulative number of EVs on the road in each given year.
 - Using this method, in 2016 EVs consumed 3.4 TWh of electricity globally. BNEF expects that in 2017, EVs will consume around 5.7 TWh.

Vehicle miles driven assumptions

- Poorly developed public transport infrastructure, longer journey distances and cheap gasoline mean that passenger cars in the US travel on average 13,000 miles a year –the highest from the analysed countries.
- In Japan average annual car miles travelled are the lowest, largely due to well developed public transport, shorter trips and ageing population.

Country	Average annual passenger car miles driven (miles)	Contribution towards global, cumulative EV sales, 2011-2016 (%)	Weighted average (miles)
Japan	5,800	8%	10,887
U.S.	13,000	33%	
E.U	8,800	33%	
China	12,500	26%	

Average annual passenger car miles driven

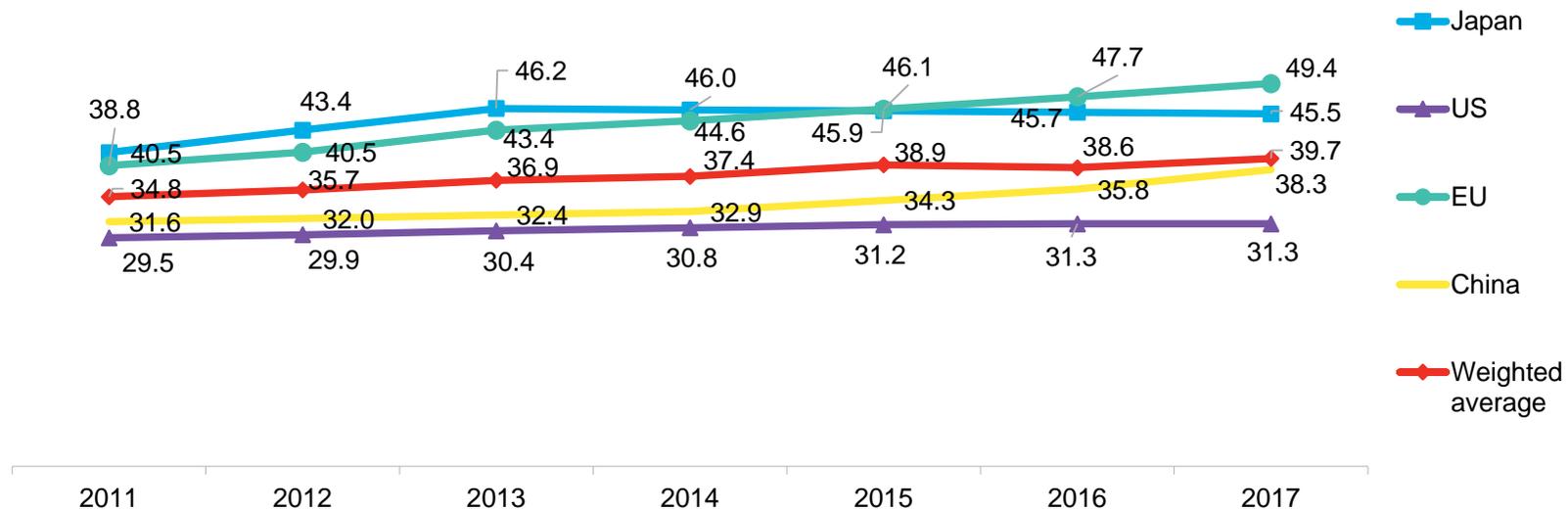


Source: Bloomberg New Energy Finance

ICE fuel economy assumptions (measured in miles per gallon)

Country	2011	2012	2013	2014	2015	2016	2017
Japan	40.5	43.4	46.2	46.0	45.9	45.5	45.5
U.S	29.5	29.9	30.4	30.8	31.3	31.3	31.3
EU	38.8	40.5	43.4	44.6	46.1	47.7	49.4
China	31.6	32.0	32.4	32.9	34.3	35.8	38.3
Weighted average	34.8	35.7	36.9	37.4	38.9	38.6	39.7

Miles per gallon



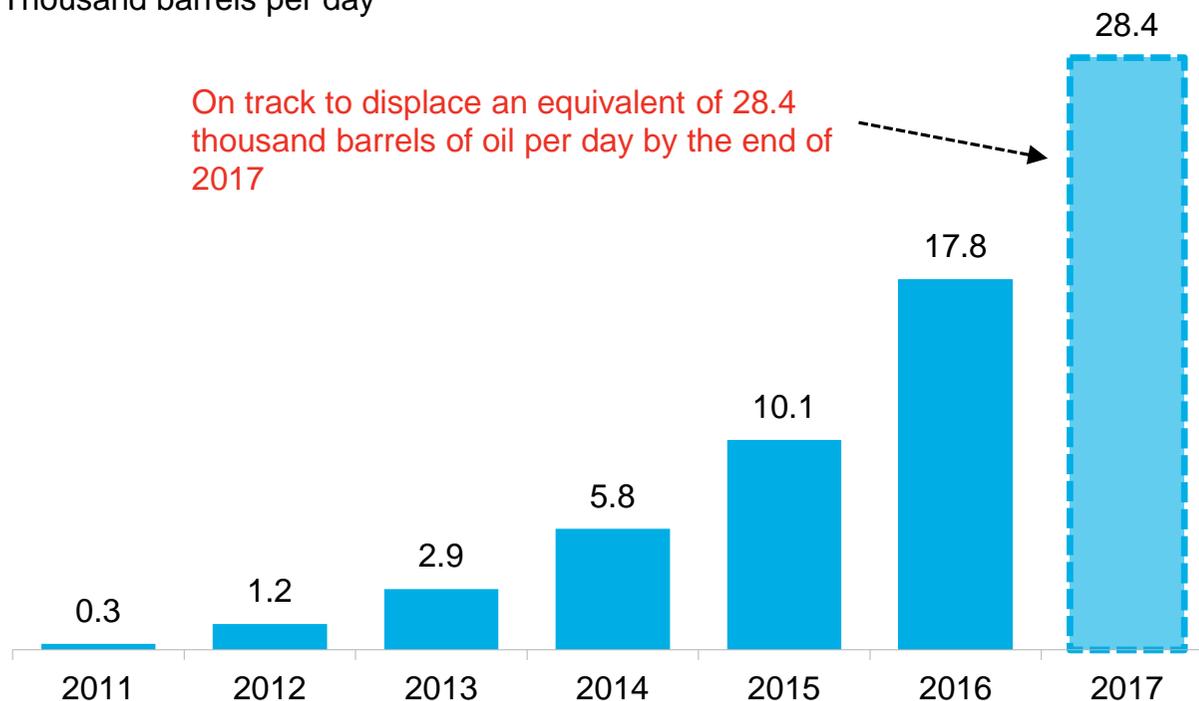
We have updated our fuel economy assumptions to be in line with countries' specific targets for new vehicles and normalised to the NEDC cycle through correlation. Therefore our weighted average value has changed compared to the 2015 fuel displacement analysis.

Source: Bloomberg New Energy Finance

Method 1: Fuel displaced by EVs on the road

If all BEVs and PHEVs currently on the road were bought instead of an average gasoline or diesel car.....

Thousand barrels per day

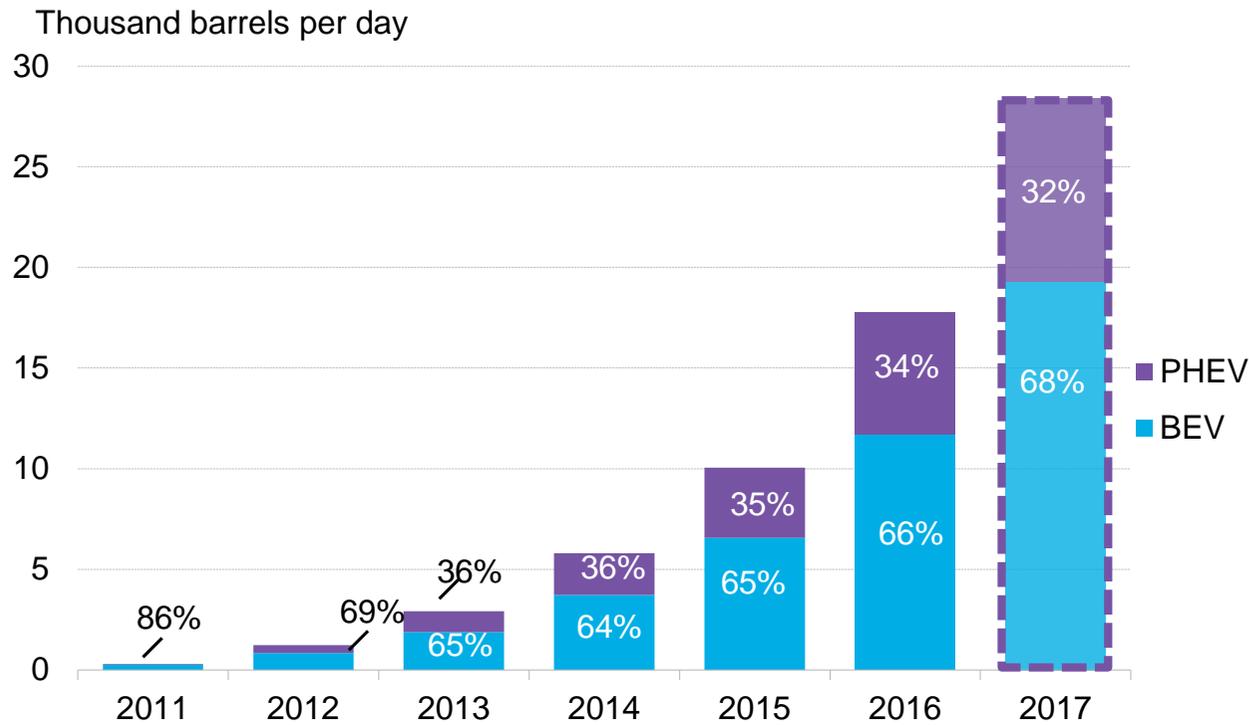


.... then EVs on the road today, are displacing an equivalent of 17.8 thousand barrels of oil per day

Average ICE miles travelled per quarter: 2,722, BEV -2,177, PHEV -1,361. We have updated the average fuel economy value in this report and therefore our fuel displacement values are slightly lower than previously. Our 2016 "forecasted" value has also changed as a result, from 18.2 thousand barrels of oil per day to 17.6 thousand barrels of oil displaced per day.

Source: Bloomberg New Energy Finance

BEV and PHEV contribution



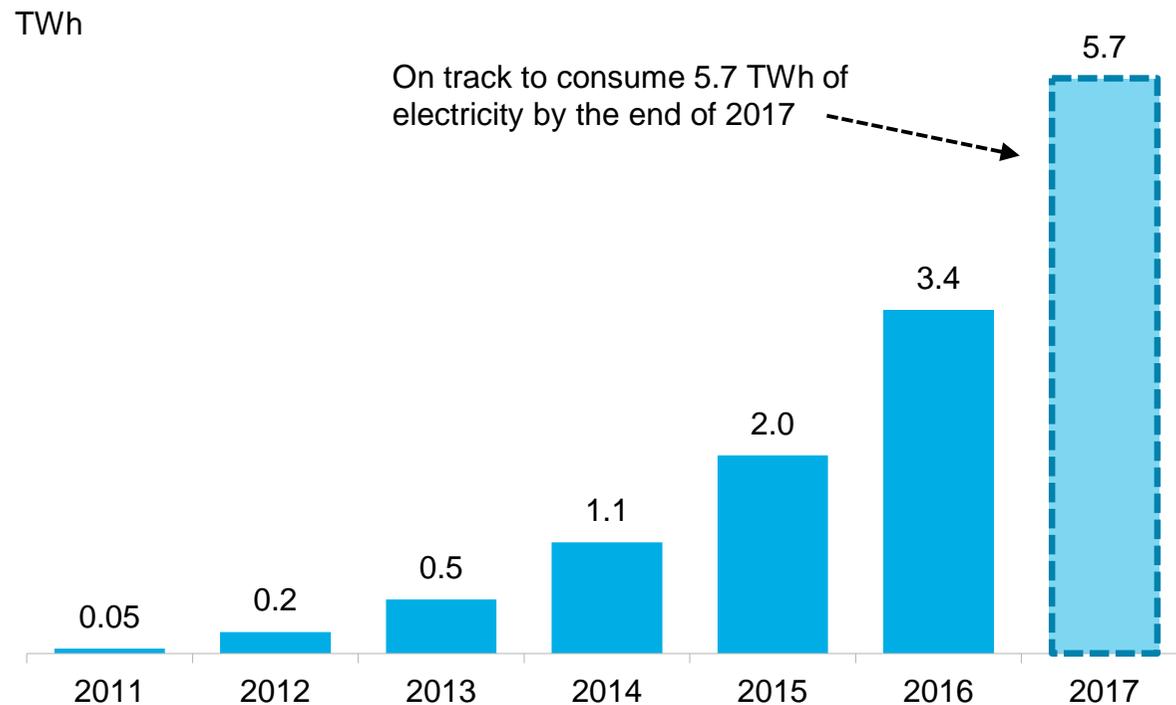
At end-2016 BEVs displaced roughly 11.7 thousand barrels of oil per day and PHEVs 6.1 thousand barrels of oil per day. BEVs could account for around 19.3 thousand barrels of oil displaced per day in 2017.

In the previous fuel displacement analysis we expected BEVs to contribute 65% to the total fuel displacement at end-2016, or roughly 11.4 thousand barrels per day.

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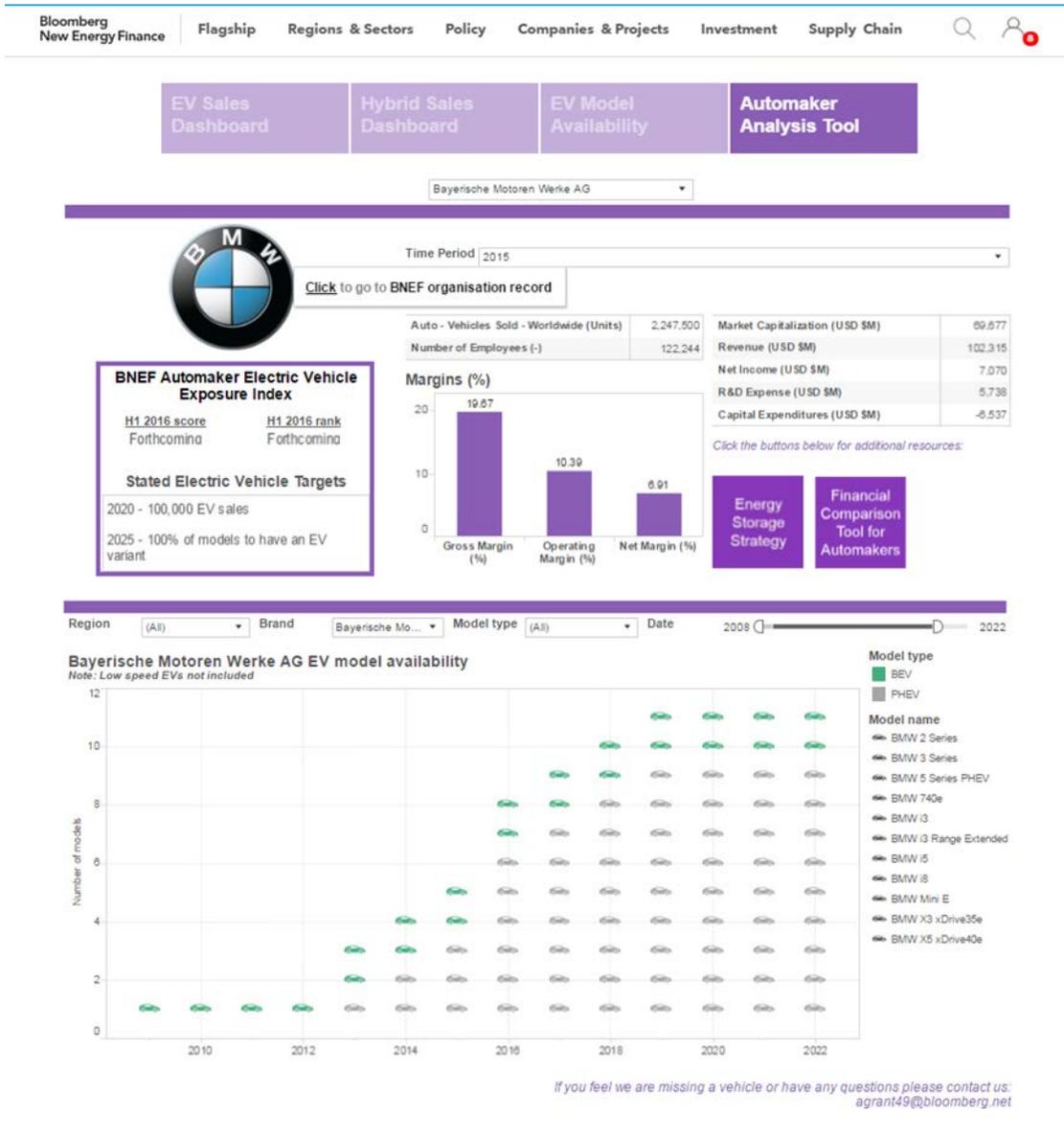
Source: Bloomberg New Energy Finance

Method 2: Electricity consumed by EVs on the road

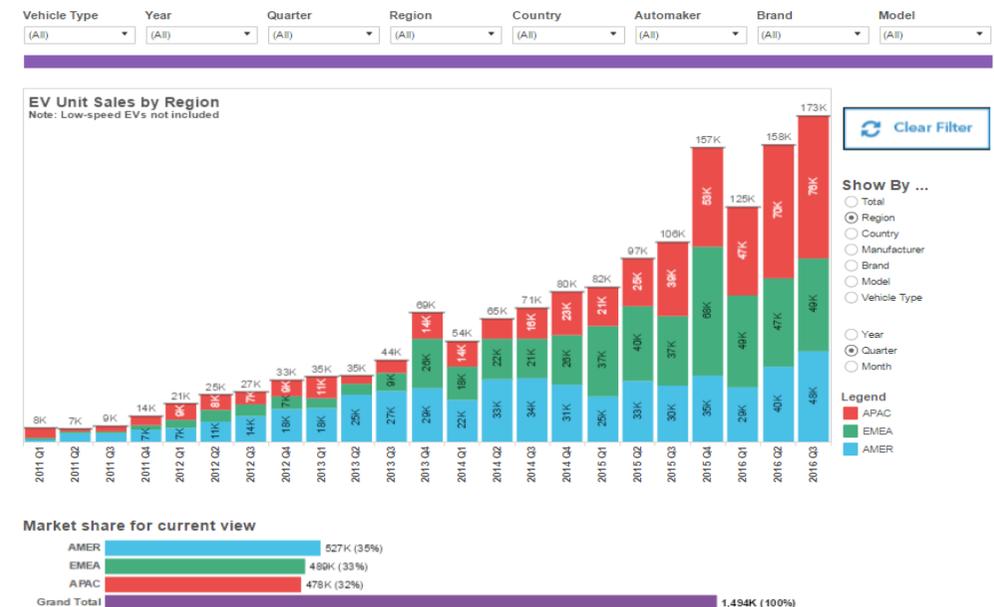


Based on EV models' fuel consumption values, BNEF estimates that EVs that on the road in 2016 used 3.4 TWh of electricity. For reference, this is equivalent to 1% of electricity consumed in the UK in 2015.

New BNEF tools: Electric vehicle data hub



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sales.bnef@bloomberg.net

about.bnef.com

@BloombergNEF

Aleksandra Rybczynska

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