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Daily Observations

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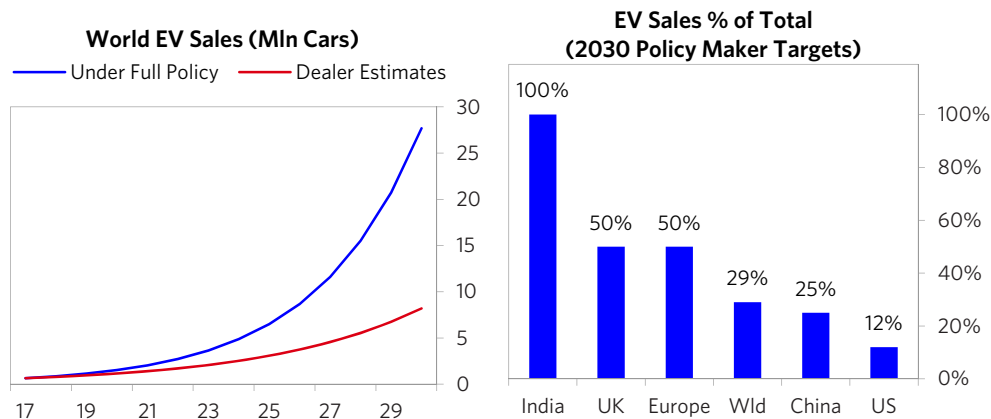
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The Macro Implications of the Push Toward Electric Vehicles

The global push toward electric vehicles illustrates how technology can radically reshape entrenched industries (sectoral winners and losers), geopolitics (regional winners and losers), productivity, economic growth, and of course demand for extractive commodities (particularly oil). Today's *Observations* looks at the implications for growth and oil demand. Globally, policy is changing quickly toward encouraged/forced adoption. In countries where pollution is a major problem and existing auto production is modest (so the lost wealth from disruption is smaller), the policy goals are becoming particularly aggressive. This disruption is different than many other kinds of technological disruption going on today due to the need for significant capital expenditures that will have large implications for growth and profits. Additionally, given low global interest rates, policies that encourage higher private investment without directly impacting government deficits are naturally desirable. The bottom line is that if aggressive adoption targets are hit it will be notable for global growth, and over the medium term it will of course be quite bearish for oil.

Ambitions range from China wanting a quarter of all car sales to be electric by 2030 to India expressing a desire to completely switch to EVs by that date. While these targets are ambitious, unlikely to be fully hit, and the path forward remains uncertain, we think it is helpful to pencil out the potential macro implications from this move, as the impacts will be nontrivial if the world even partially goes down this path. Global investments in production facilities, charging stations, and expansion and upgrading of grid infrastructure could exceed a trillion dollars if the policy makers are to hit their lofty targets. The impact on growth from these investments will depend on their pace and timing. Assuming the countries move toward a steady pace of investments over many years, full adherence to policy maker targets (shown below) will be a small one-time boost to global growth of 20bps. A country like India (which would need massive improvements in its existing infrastructure to support the 7 million electric vehicles that will likely be sold in 2030) would get a growth boost of 90bps, while China would see around a 25bps boost. In terms of demand, since the transportation sector accounts for the lion's share of oil demand, an accelerated transition to electric vehicles will materially impact oil demand growth, and we could see oil demand peaking within a decade if policy makers hit their goal. This of course has important implications for the global economy, asset markets, and geopolitics depending on how the different stakeholders respond to this change.

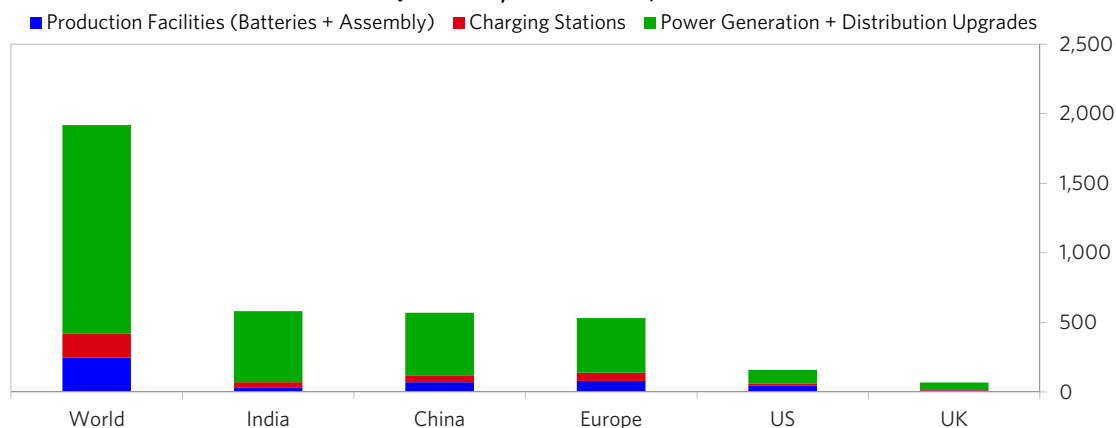


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Meeting Electric Vehicle Targets Will Require Massive Investments in New Infrastructure

Below we show our rough sizing of the investments needed to hit the aggressive policy maker targets for EV sales in 2030. We estimate cumulative global investments on the order of \$2 trillion by 2030, in large part driven by the massive investments needed in power generation and distribution systems to be able to support EVs well. For example, despite a relatively smaller car fleet, investments in India could exceed \$550 billion, given that they are starting from a lower (75-80%) electrification level and will need significant upgrades to existing power systems to support the 7 million EVs entering the market every year. China and Europe, which have also made a strong push toward EV adoption, will need investments of similar magnitude (~\$500 billion) to hit their targets. Again, this is our attempt to size what it would take to hit the policy maker targets, not a claim that this will happen.

Total Investments Required Through 2030 to Meet EV Policy Targets (Bln USD, Cumulative)



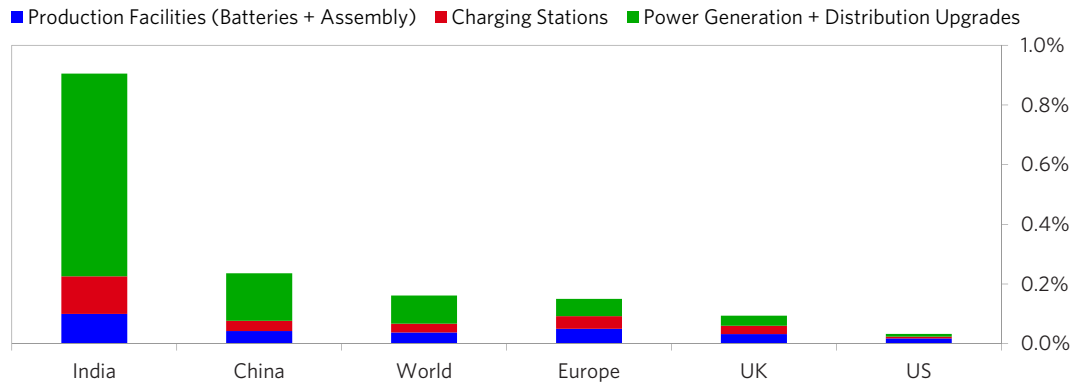
Notes:

- (1) Investments needed for production facilities is estimated by taking the current cost to produce batteries and EV assembly plants and assuming reasonable cost deflation as production volumes increase and technology continues to improve
- (2) Cost for charging stations based on current average cars per charging station ratio in developed world and costs to make charging plants
- (3) Very rough analysis of where the major countries stand in terms of their power generation and distribution infrastructure vs what's needed to get them across the line
- (4) We also assume (depending on the country) some % of the cars will be imported vs produced domestically

And This Will Have Important Implications for Economic Growth

The next chart shows our rough sizing of the impact the investments shown above would have on economic growth. These estimates try to capture the impact of additional investments above and beyond what would have otherwise occurred if policy makers did not target higher EV penetration rates. Assuming policy makers move toward a steady pace of investments over many years, the investments will be a small one-time boost to global growth of 20bps. India, which has the most aggressive targets and relatively weakest starting position, could register a sizable boost to growth of 90bps. Even a partial move toward these targets could matter for certain countries.

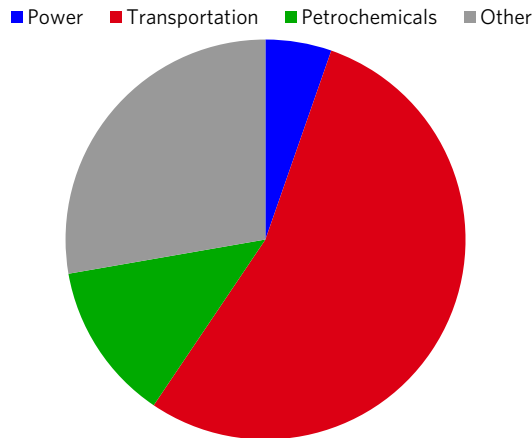
EV Investments' Impact on Growth from Hitting Policy Maker Targets (%GDP)



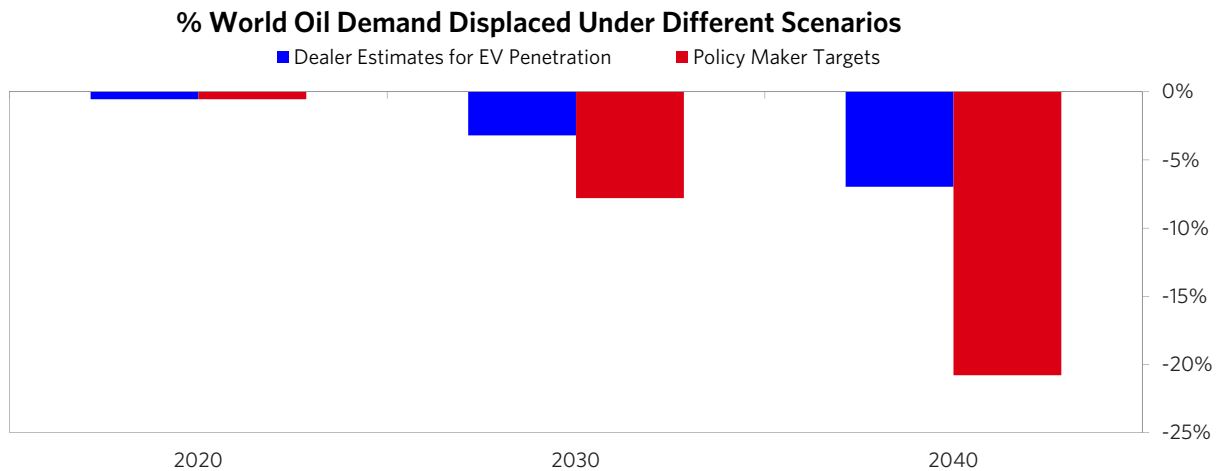
Impact on Oil Demand Could Be Sizable in the Medium Term

As shown below, the transportation sector accounts for the lion's share of global oil demand. Furthermore, the transportation sector will also account for most of the growth in oil demand. Because EVs will be powered by electricity generation from non-oil sources such as solar, wind, and natural gas, a rise in EV penetration would displace oil demand and the impact would grow with the size of the EV fleet.

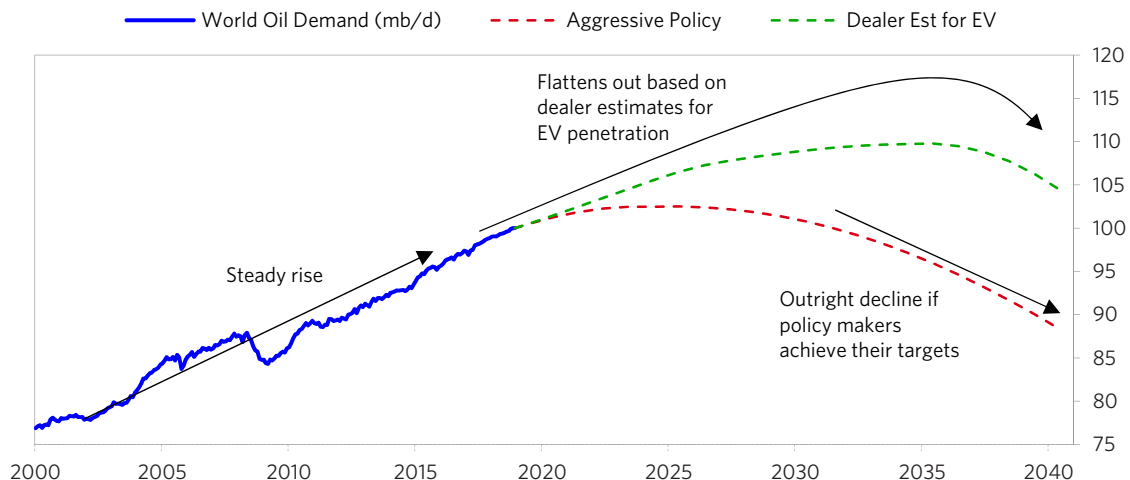
Share of World Oil Demand by Sector



The chart below shows our rough calculation of how much oil demand would be displaced under dealer baseline estimates for EV penetration and what would happen if policy makers are successful.



Based on this calculation, if policy makers hit their targets then EVs will displace enough oil demand to cause global oil demand to start contracting outright sometime around 2025. The red line below assumes oil demand for sectors other than transportation grows at trend and the only drag comes from the direct substitution of oil demand as gasoline-consuming cars are replaced by EVs. (This does not take into account other ways in which oil demand would be impacted—e.g., self-driving cars and ride-sharing, fewer aggregate miles driven per working adult as people work more from home, etc.)



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