

The Promise of Policy

Case Studies on the Role of Policy in Electric Mobility

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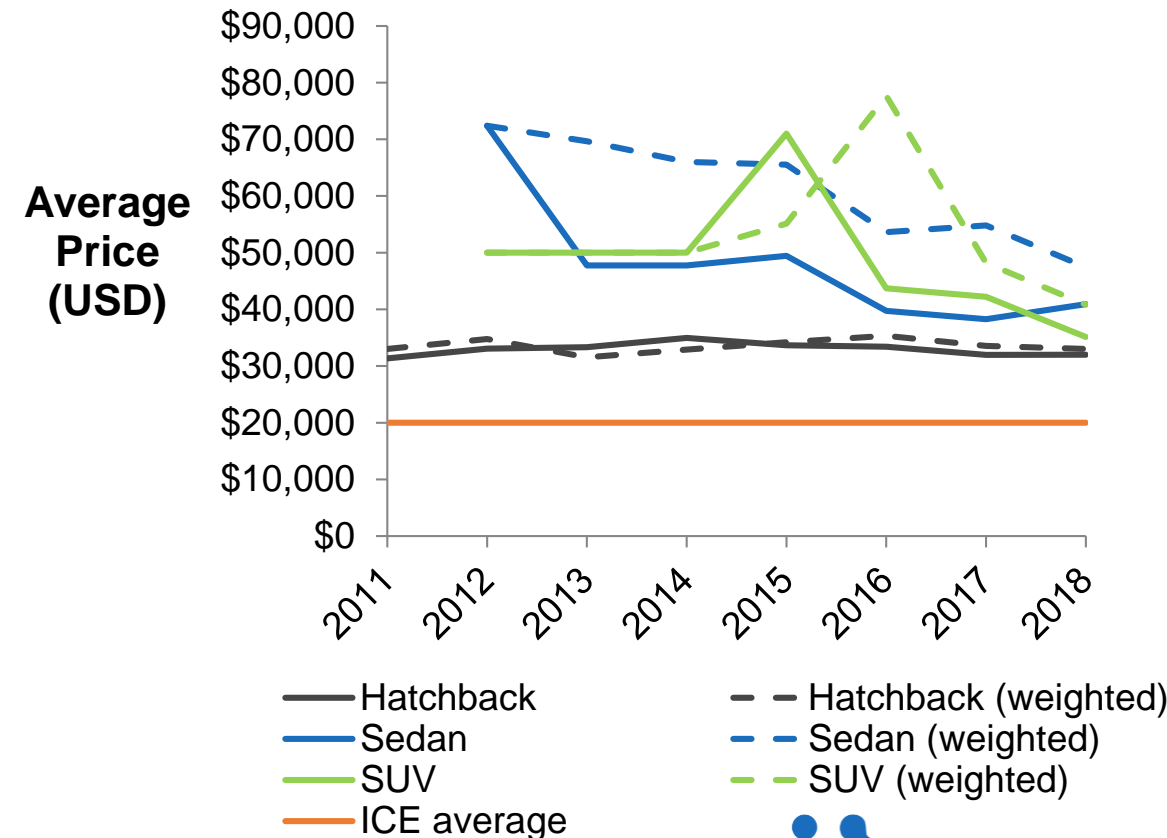
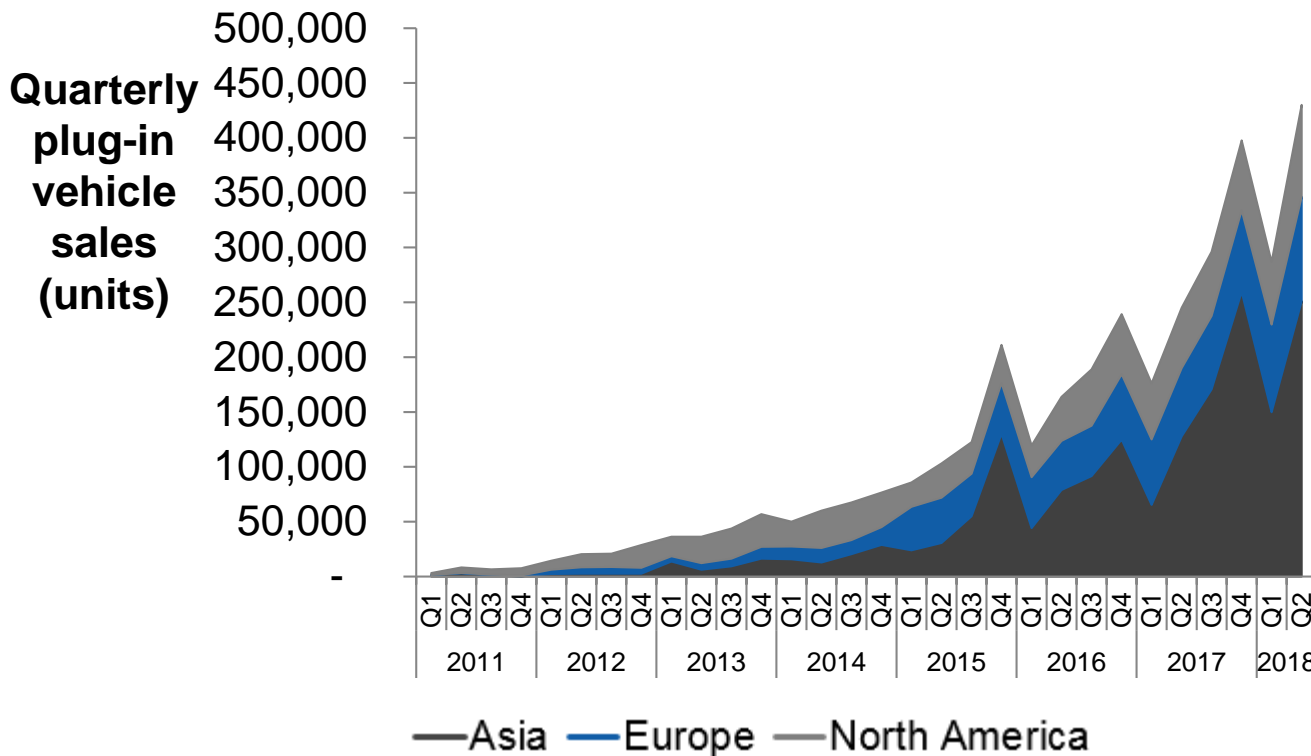
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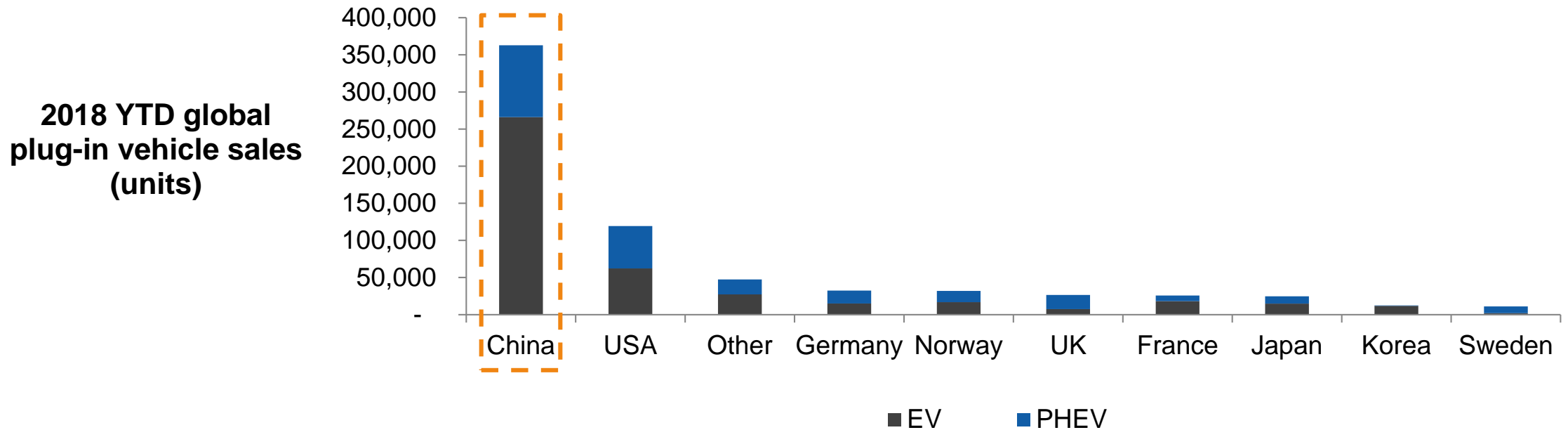
EVs are no longer a niche market, as falling costs and wider availability led to nearly 2% plug-in vehicle market penetration

Sales in North America and Europe have remained on a mostly linear and steady growth trajectory, but China's exponential growth led to Asia dominating the plug-in vehicle market.



Although collectively Europe competes with the U.S., China's plug-in vehicle sales have outpaced all others

China's low-cost EVs are resonating with consumers despite falling subsidies, and with an impending ZEV mandate in 2019 sales in China are expected to continue growing. Conversely, in the U.S., manufacturers like Tesla and GM are nearing their sales limit before subsidies are reduced and eventually eliminated, which could slow growth.



China grew EV sales with generous subsidies for plug-in vehicles, and is now using them to shape the market

China's subsidies are more generous than most

2017 subsidy program:

- 150-250km: ¥36,000
- >250km: ¥ 44,000

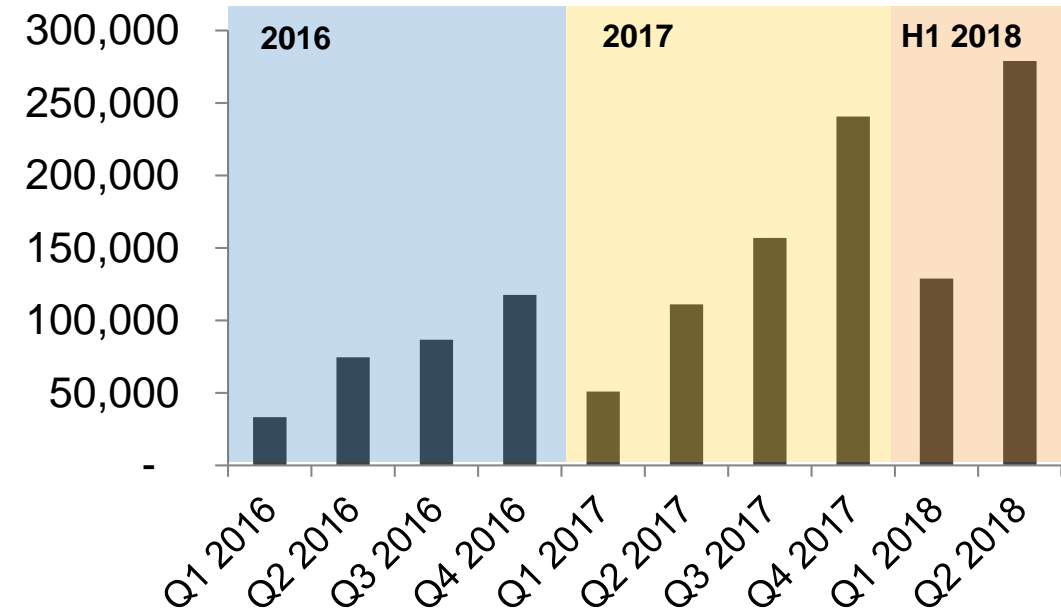
2018 (H1) subsidy program:

- 150-250km: ~ ¥ 25,000
- >250km: ~ ¥ 30,000

2018 (H2) subsidy program:

- 150-200km: ¥ 15,000 (58% drop from 2017)
- 200-250km: ¥ 24,000 (33% drop from 2017)
- 250-300km: ¥ 34,000 (23% drop from 2017)
- 300-400km: ¥ 45,000 (2% increase from 2017)
- >400km: ¥ 50,000 (15% increase from 2017)

Quarterly plug-in vehicle sales (units)



Chevy Bolt, NMC 622
Pack density: ~130 Wh/kg



Tesla Model 3, NCA
Pack density: ~160 Wh/kg

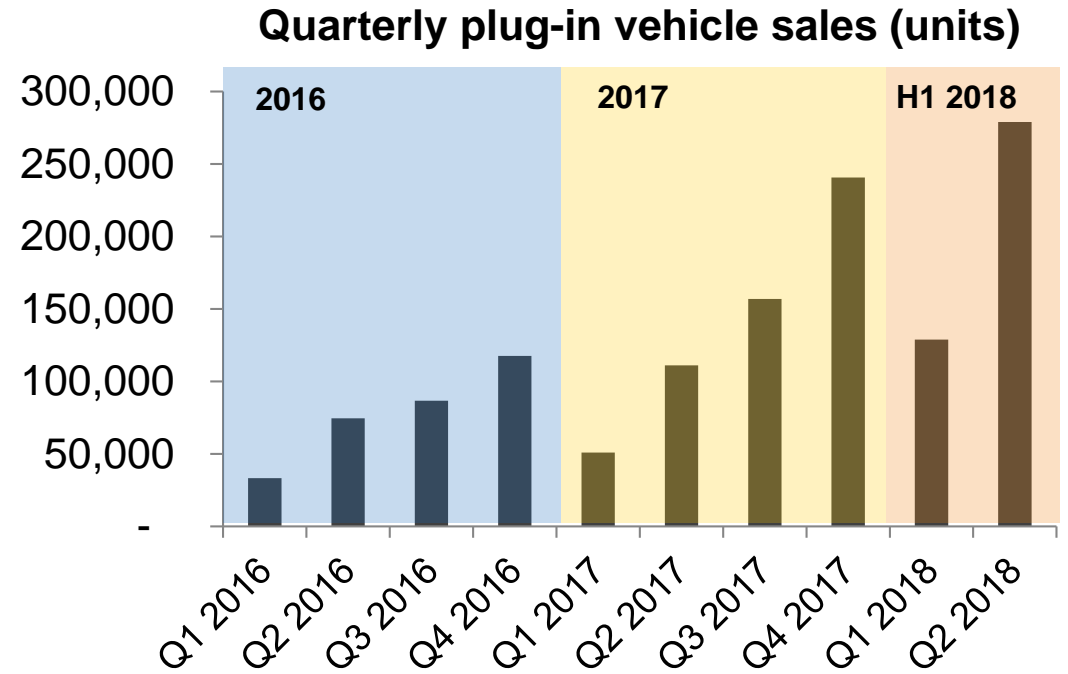
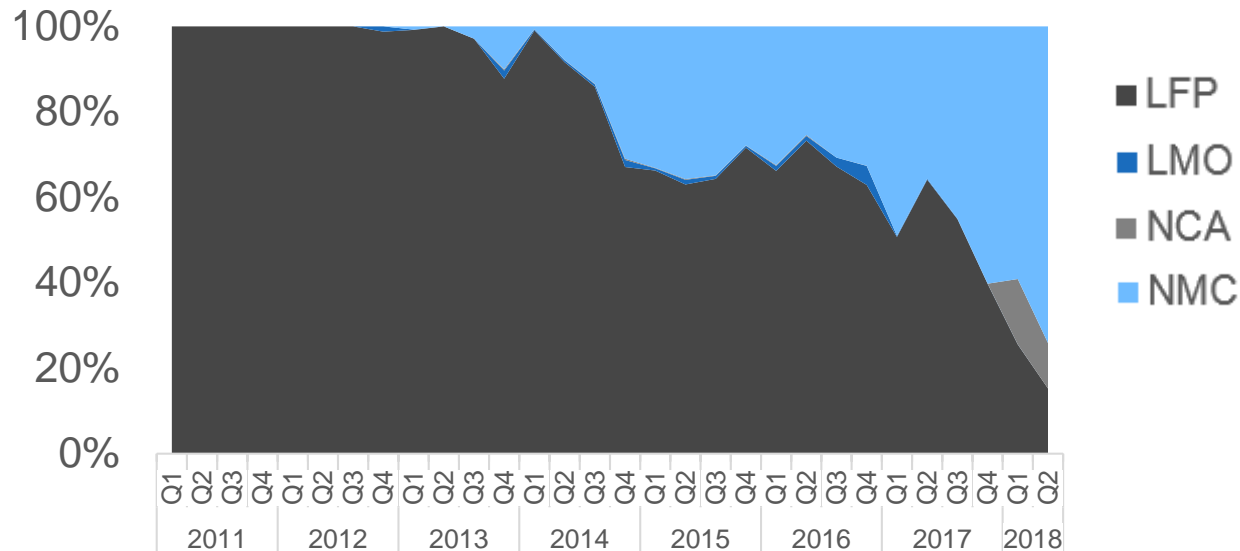


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China also enforces pack density requirements to ensure technological progress. In 2018, these pack density requirements are:

- 0% subsidy for <105 Wh/kg
- 60% for 105-120 Wh/kg
- 100% for 120-140 Wh/kg
- 120% for >140 Wh/kg

This has shifted China's key cathode material from LFP to NMC



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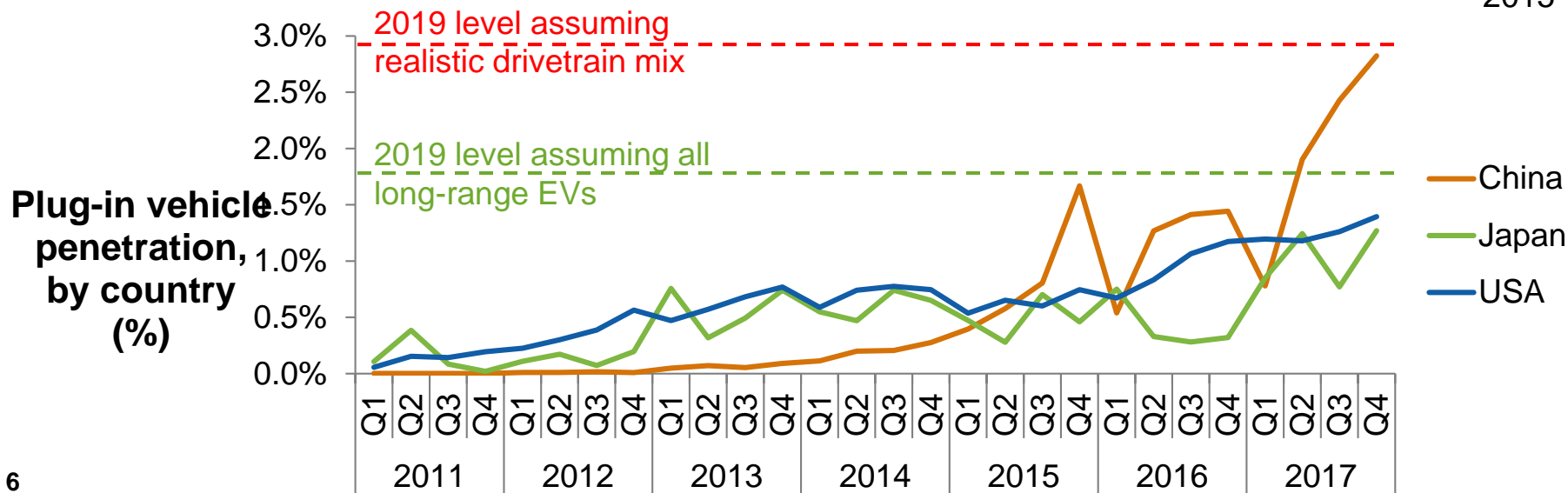
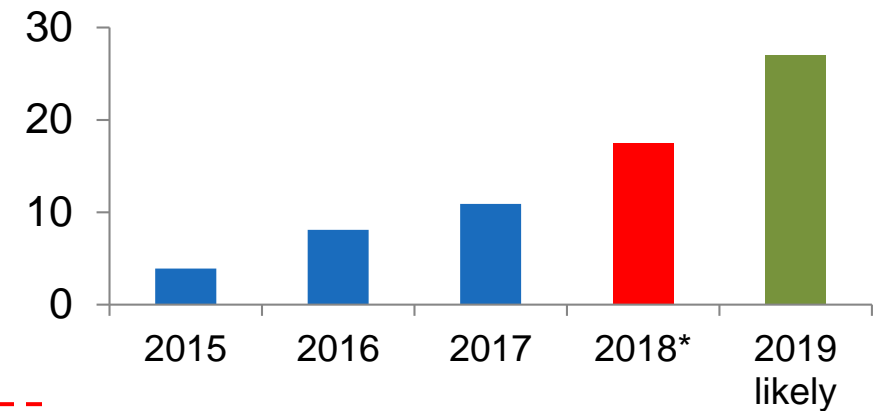


In 2019, China is creating a ZEV mandate to support sales while eliminating the subsidy scheme

In 2019 10% of vehicle sales credits must come from “new energy vehicles.” Credits earned are based on range:

- FCEV: 4-5 credits depending on range
- EV (>350 km): 5 credits
- EV (<350 km): based on range, 2-4 credits
- PHEV: 2 credits

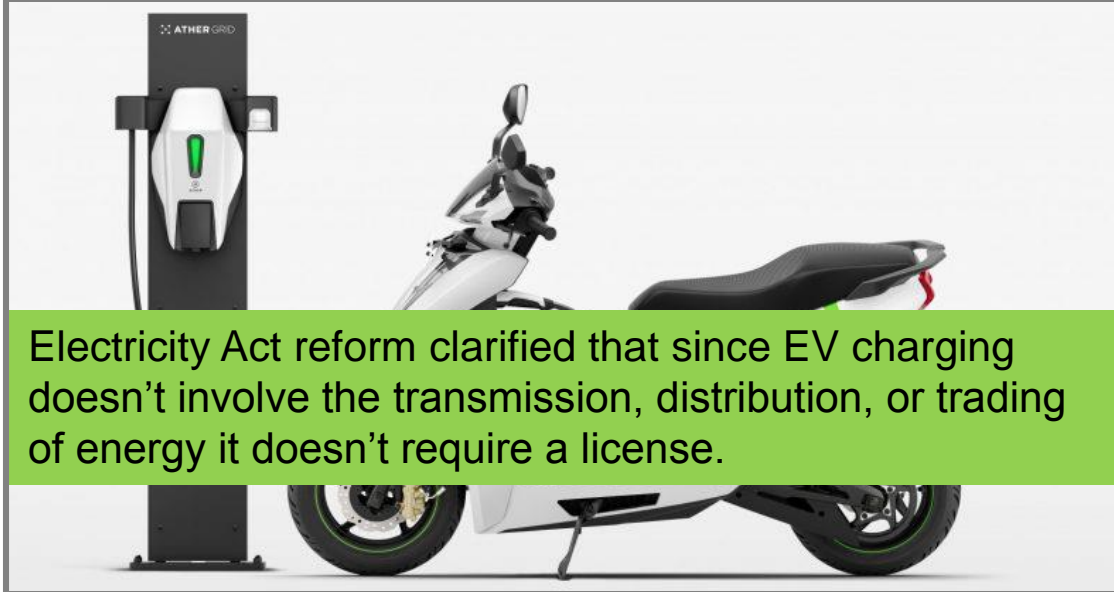
Li-ion battery demand from passenger vehicles (GWh)



India's lack of regulatory clarity has seen it fall behind its peers in EV development

In 2016, prime minister Modi announced a target of only EVs new cars in 2030. Few automakers have invested in EV production to date, while lingering regulatory uncertainty prohibited infrastructure development.

Ather got around charging limitations by offering it for free to all EV owners, leading to higher upfront costs.



Electricity Act reform clarified that since EV charging doesn't involve the transmission, distribution, or trading of energy it doesn't require a license.

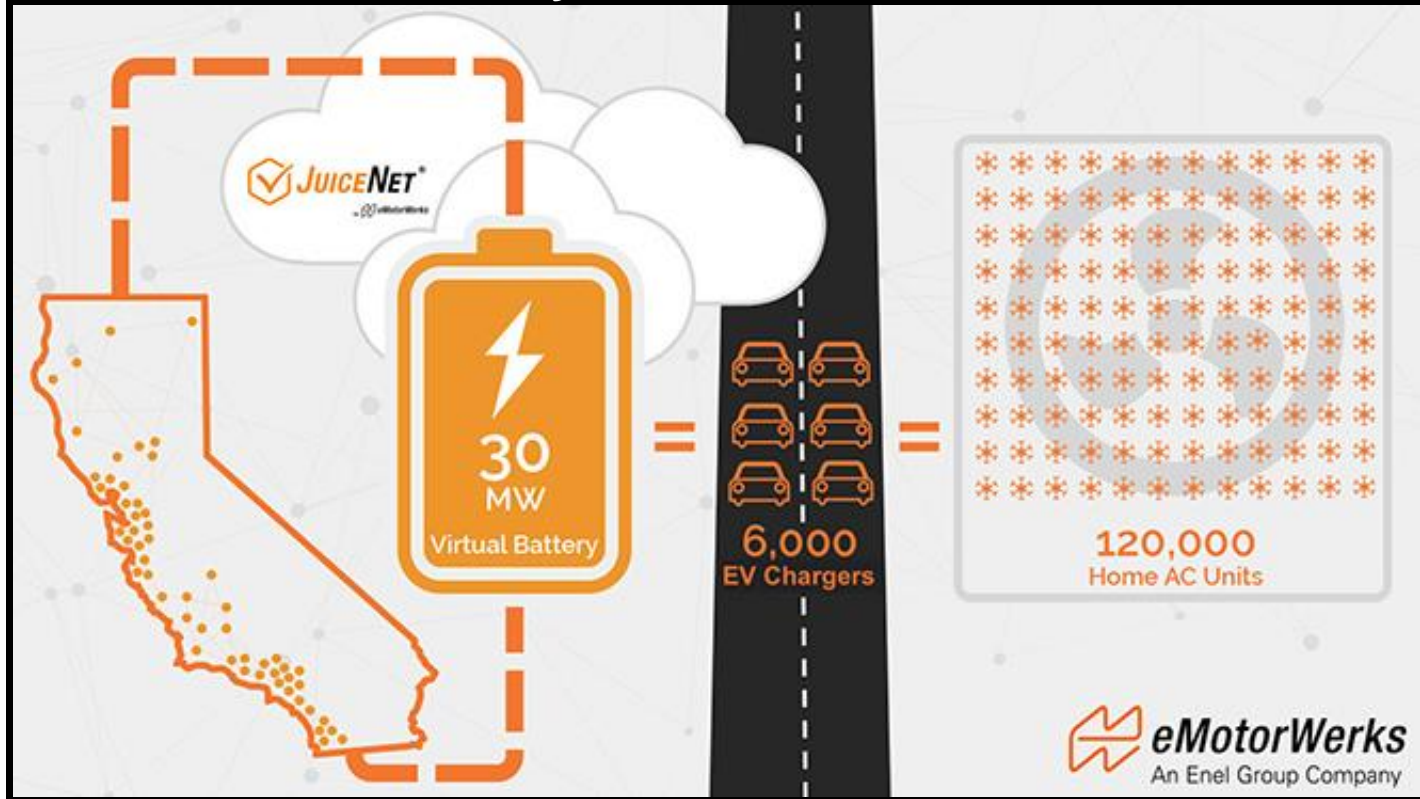
Prime Minister Modi announced revised EV targets recently – 15% of all vehicles in the next five years – but failed to address specific policy goals.



Automakers privately expressed frustration at a lack of clear policy, and cited this as a reason for a lack of investment.

Regulatory clarity and certainty removes barriers to innovation

As part of its parent company Enel, eMotorWerks bid EV chargers as a 30 MW virtual power plant to participate in CAISO's wholesale day-ahead and real-time markets.



Lux Take:

Smart charging will likely emerge as a standard for EV charging. In the future, EV charging with the right regulatory support could:

- Be included as part of a service package to reduce bills for customers
- Offer services ancillary services like frequency regulation

Although China and India both expressed long-term goals, China's EV policy decisions fostered significant growth

China's EV policy decisions had three features which led to successfully growth of EV sales:

1. Focus on early growth using subsidy policies
2. Structured its subsidy scheme to encourage development of high energy density batteries
3. Removing subsidies and replace with a ZEV mandate as prices fall and capacity increases

Policy plays an important role in EV adoption and charging infrastructure development. When done right, it can foster growth, but a lack of clarity actually inhibits growth.



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