



FEATURE

## Plugging into the future

Electrifying the global automotive industry

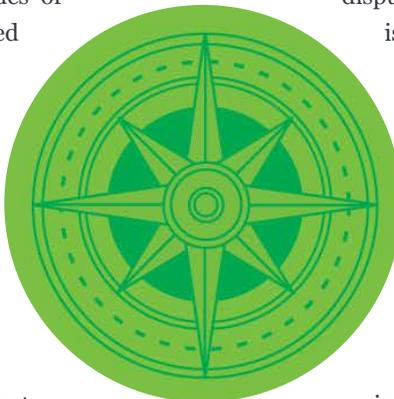
Ryan Robinson and Srinivasa Reddy Tummalapalli

Global vehicle electrification is finally shifting into a higher gear thanks to the convergence of several trends, including technology improvements, more accepting consumers, big brand bets, and increasingly supportive regulation.

IT WAS A time of rapid, unbridled innovation. Advances in electrified mobility were emerging at breakneck speed as companies raced to develop new ways to move the masses. In fact, electric cars accounted for *a third* of all the vehicles on the road.<sup>1</sup>

This is not another rose-colored vision for a utopian future, but the reality of a fledgling automotive industry that was just finding its feet in the United States over a century ago. Ultimately, our first dance with electric vehicles (EVs) was cut short by the introduction of the Ford Model T in 1908, setting up the following 10 decades of fossil fuel dominance that relegated EVs to the shadows.

Over the years, EVs have seen sporadic attempts at resuscitation,<sup>2</sup> but they were never able to get around fundamental obstacles that included high production costs, limited driving range (particularly in cold weather),<sup>3</sup> and lengthy charging times. However, over the last decade or so, rising pollution levels and the necessity to reduce dependence on imported fuel have prompted governments around the world to embrace a migration from fossil fuel-based vehicles to vehicles powered by electric motors. Having said that, this fundamental evolution in mobility is playing out in different ways around the world.



## China is quickly and deliberately putting the pieces in place to drive global EV growth

China has been at the forefront of promoting EV usage whether the aim is to address a rapidly

increasing pollution problem, to reduce its reliance on imported oil, or simply to stake a leadership claim on the next era of global mobility. Not only is China currently the largest light-vehicle market, but it is also leading global EV sales, accounting for more than half of the 1.1 million EVs sold in 2017.<sup>4</sup> China is also driving the electrification of other vehicle types, such as electric buses and electric two-wheelers, accounting for 99 percent of these two modes of electric transportation stock globally.<sup>5</sup> To meet its goal of becoming the undisputed EV champion by 2025, China

is implementing a two-pronged approach by offering subsidies to EV buyers while making it mandatory for automotive companies to amass credits on the sale of EVs that can then be transferred or traded.

India is another country heavily reliant on imported oil. In a bid to manage its massive oil import bill while curtailing a growing pollution problem, the government is encouraging EV adoption. It aims that by 2030, EV sales should account for 30 percent of all new vehicle sales.<sup>6</sup>

## The European love affair with diesel engines may be over

EV adoption is picking up in Europe. In the EU-15 region alone, the share of diesel engine-based vehicles declined from a high of 56 percent in 2011 to 45 percent in 2017, a whopping 11 percentage point drop in just six years.<sup>7</sup> The decline was set off by consumer reaction to the “dieselgate” scandal that engulfed Volkswagen in 2015. The

subsequent decision taken by the German federal court to allow individual cities to ban diesel vehicles and additional taxes imposed on diesel vehicles in countries such as the United Kingdom are causing auto buyers to think twice before committing to this engine technology. In addition, a few countries, including Norway, the United Kingdom, France, and the Netherlands, have already announced plans to ban the sale of vehicles that run on conventional gas and diesel fuel. This is planned over the next 2–3 decades, which bodes well for EVs.

In fact, Norway is at the forefront of the movement to adopt a greener vehicle strategy, as evidenced by increasing sales of all-battery electric vehicles (BEVs) and hybrid electric vehicles (HEVs)—together they accounted for 52 percent of all new car sales in 2017 compared to 40 percent in 2016. The overall move to EV technology that has taken hold of the market has come on the back of the Norwegian government’s generous subsidies in the form of tax exemptions, subsidized parking, and available recharging stations.<sup>8</sup>

## North America is likely to lag for some time

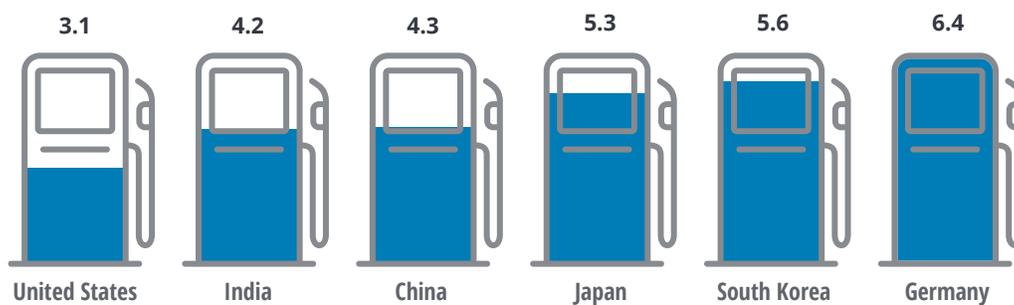
Consumers in North America prefer to drive vehicles with gasoline engines as the price of gasoline is significantly lower there than in many other markets around the world (figure 1). In fact, even though retail gasoline prices have been on an upswing recently, they remain much below the high point reached earlier in the decade (figure 2).<sup>9</sup> This low fuel-price environment encourages a growing consumer infatuation with large sport-utility vehicles.

The US government’s policy has shifted to looser emission standards and the government is tightening the screws on tax rebates; together these have dampened EV adoption. Consumers are also not fully bought into the idea of EVs as old perceptions regarding driving range, cost, and charging time are proving hard to shift even though the technology has improved exponentially over a very short period of time.

FIGURE 1

### Gasoline prices\* in North America are significantly lower than in other key markets

US\$/gallon



\* As of October 29, 2018.

Source: GlobalPetrolPrices.com, Deloitte analysis.

FIGURE 2

**US retail gasoline prices are still lower than the highs seen earlier in the decade**



Source: US Energy Information Administration.

**Global EV market is poised for an exponential increase in demand**

Global sales of electric and plug-in hybrid cars increased by 54 percent in 2017 to touch 1.15 million units. Of these, two-thirds (around 750,000 units) were BEVs and the remaining HEVs.<sup>10</sup> The International Energy Agency is optimistic that the global stock of electric cars will grow at a compounded annual growth rate of 33 percent from 3.1 million units in 2017 to 125 million by 2030, mainly driven by government policies encouraging vehicle owners, fleets, and municipalities to embrace cleaner vehicles.<sup>11</sup> Supportive policies in the form of financial incentives and public procurement programs, along with tighter emission standards and advancements in the lithium-ion battery technology, will likely be the key factors driving EV growth. Speaking of advancements in battery technology, battery prices

have dropped by more than 80 percent since 2010, from US\$1,000 per kilowatt-hour to US\$209 per kilowatt-hour in 2017.<sup>12</sup> Prices could drop even further, potentially touching US\$100 per kilowatt-hour by 2026, making battery-powered EVs an attractive option for auto buyers.<sup>13</sup>

**The International Energy Agency is optimistic that the number of electric cars will grow.**

The market for EVs may expand exponentially over the next few years, but as a percentage of both total annual sales and vehicles on the road, it will likely remain low for some time. As per industry forecasts, there will likely be around 2 billion cars on the road globally by 2040, which is expected to dwarf the number of electric and plug-in hybrid vehicles expected at that time.<sup>14</sup> Nonetheless, EV

penetration is growing, setting the stage for a full global transformation at some point down the road.

## Consumer interest in EVs is growing, but expectations regarding performance remain high

The appeal of EVs is intensifying globally, with consumers across several major automotive markets showing interest in acquiring a hybrid or full battery-electric powertrain as their next vehicle (figure 3). Nonetheless, perceived concerns, especially regarding vehicle performance, are proving difficult to shift (figure 4). Deloitte’s 2018 global automotive consumer study reveals that:

- Consumers in the United States and Japan are most concerned about price premiums, and about the limited driving range and a general lack of charging infrastructure.
- Consumers in China and Germany are concerned about how far they can drive on a single charge (driving range) and a lack of charging infrastructure. Interestingly, Chinese consumers

are also particularly worried about the safety of the battery technology.

- For consumers in India and South Korea, the perceived lack of an enabling charging infrastructure is the main concern.

Clearly, even though EVs’ driving range has improved to the point where it should not be an issue for the vast majority of consumers, negative perceptions remain deeply rooted in consumers’ minds; in fact, these are a major challenge for manufacturers.

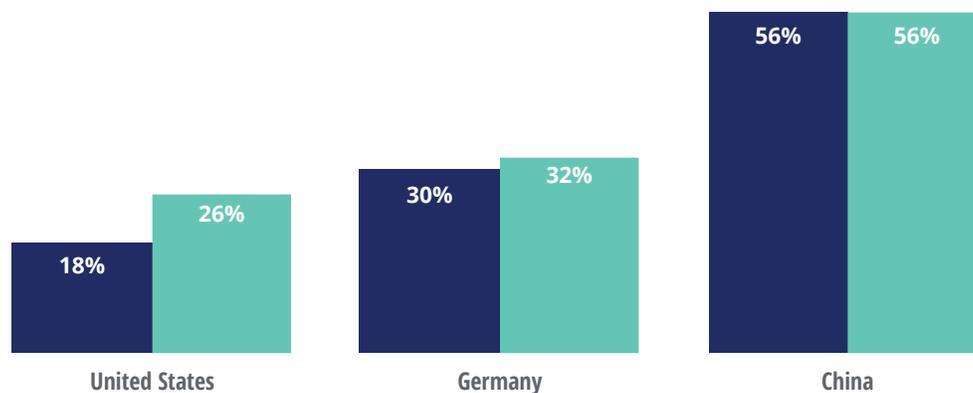
Building charging networks is typically the “chicken and egg” problem—consumers would be willing to try BEVs once there is an abundance of charging points, while original equipment manufacturers, governments, and private investors may wait for sales volumes to pick up before making the sizable investments necessary to install and maintain a viable charging network.

Consumers are also concerned about the time it takes to fully charge an EV. While even the fastest commercial charging points still take much longer to charge than a traditional stop takes for a gasoline fill-up, new battery technology on the horizon provides confidence. In fact, there are several companies and industry partnerships currently

FIGURE 3

### More consumers prefer an electrified powertrain (HEV and BEV combined) in their next vehicle

■ 2018 ■ 2019



Source: Deloitte Global Automotive Consumer Study, 2018 and 2019.

FIGURE 4

**Main consumer concerns regarding BEVs**

	United States	Germany	China
<b>Cost/price premium</b>	26%	22%	9%
<b>Driving range</b>	24%	35%	25%
<b>Lack of EV charging infrastructure</b>	22%	20%	18%
<b>Time required to charge</b>	10%	11%	12%
<b>Other</b>	10%	7%	14%
<b>Safety concerns with battery technology</b>	8%	5%	22%

Source: Deloitte Global Automotive Consumer Study, 2018.

**Even though EVs’ driving range has improved to the point where it should not be an issue for the vast majority of consumers, negative perceptions remain deeply rooted in consumers’ minds; in fact, these are a major challenge for manufacturers.**

conducting research to develop solid-state batteries that promise both faster charging times and significant improvements in overall safety.<sup>15</sup>

Electrification of the global vehicle fleet is likely to impact companies across the automotive value chain. The players that can effectively anticipate the changing environment and place their bets

accordingly are likely to be best positioned to create and sustain a competitive advantage as industry transformation plays out over the next few decades.

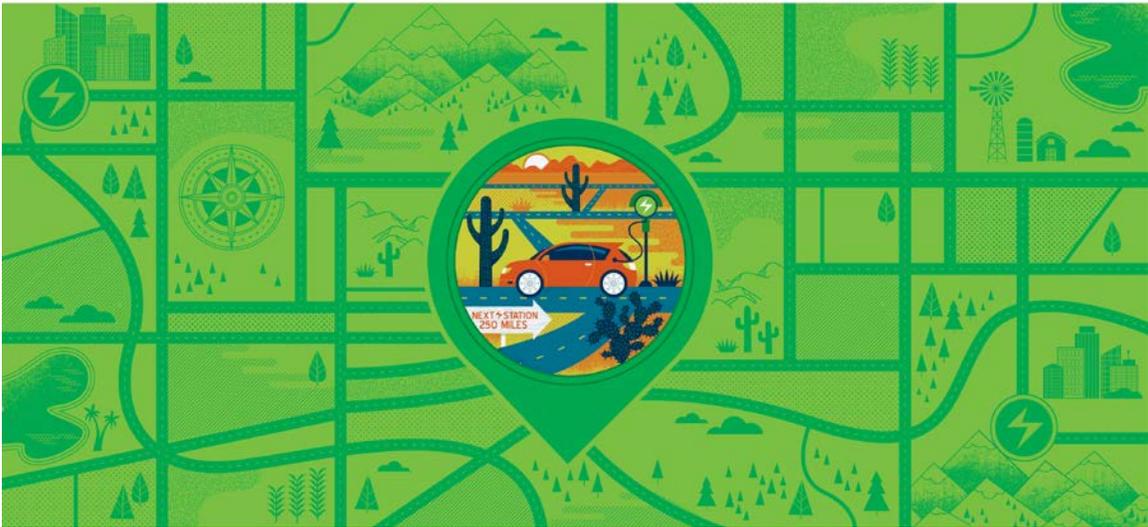
**Considerations for players across the automotive value chain**

1. Automotive manufacturers would be well served to think about both near- and long-term implications of vehicle electrification. Massive investments will likely need to be sustained in order to push EV technology to the next level where consumers will not have to compromise on their performance expectations. Collaborations and strategic partnerships will likely be increasingly necessary to gain access to the latest innovations while diluting the associated costs over a wider number of players.
2. Traditional parts suppliers may need to tweak their strategy to align themselves to the new landscape and take advantage of this long-term shift. Many suppliers, particularly those involved in the manufacture of traditional engine components, will likely be affected as there are

far fewer individual parts in a battery powertrain than in a traditional combustion vehicle.

3. Vehicle dealers are likely to face growing implications too, given that vehicle servicing is a major component of their revenue and profitability. Industry estimates indicate that revenue from servicing an EV would likely be 60 percent less than that from servicing a traditional vehicle.<sup>16</sup>

There may still be a long way to go before we see a full-scale migration away from the fossil fuels that have underpinned global mobility for so long. Nonetheless, the confluence of several important trends may finally return us to the bright, electric future envisaged over a century ago.



## Endnotes

1. Rebecca Matulka, "Timeline: History of the electric car," US Department of Energy, September 15, 2014.
2. Oliver Staley, "The General Motors CEO who killed the original electric car is now in the electric car business," Quartz, April 7, 2017.
3. Jim Gorzelany, "The cold truth: Icy temps can slash an electric car's range by more than half," *Forbes*, March 24, 2014.
4. Bloomberg, "China's drive to become the Detroit of electric cars," February 27, 2018.
5. International Energy Agency, "Strong policy and falling battery costs drive another record year for electric car," May 30, 2018.
6. Bhanvi Arora, "India's sputtering electric vehicle ambition needs direction," Bloomberg, September 4, 2018.
7. European Automobile Manufacturers Association, "Share of diesel in new passenger cars," accessed September 24, 2018.
8. Camilla Knudsen and Alister Doyle, "Norway powers ahead (electrically): Over half new car sales now electric or hybrid," Reuters, January 3, 2018.
9. US Energy Information Administration, "Weekly US all grades all formulations retail gasoline prices," accessed October 30, 2018.
10. International Energy Agency, *Global EV Outlook 2018*, 2018.
11. Ibid.
12. Ibid.
13. Chisaki Watanabe, "Why battery cost could put the brakes on electric car sales," Bloomberg, November 29, 2017.
14. Tom DiChristopher, "Electric vehicles will grow from 3 million to 125 million by 2030, International Energy Agency forecasts," CNBC, May 30, 2018.
15. Keiichi Furukawa, "Battery wars: Japan teams up for next-gen electric cars," *Nikkei Asian Review*, June 16, 2018; Domenick Yoney, "Researchers reveal new faster-charging solid-state batteries," InsideEVs, August 21, 2018.
16. Richard Truett, "Electric vehicles and the future of fixed ops," Automotive News, December 18, 2017.

## About the authors

**RYAN ROBINSON** is the lead researcher supporting the global Automotive practice at Deloitte LLP. For the past two decades, his primary focus has been to create actionable insights that support strategic client decisions. He has been a frequent speaker at industry conferences and has been quoted as a subject matter expert in major media outlets around the world. He is based in Toronto.

**SRINIVASA REDDY TUMMALAPALLI** is a senior research consultant supporting Deloitte's global Automotive practice. He has more than a decade of experience in financial modeling, market intelligence, and the development of engaging, actionable insights. He is based in Hyderabad, India.

## Acknowledgments

The authors would like to thank **Ramakrishna Sadhu** for his contributions to the research for the article.

## Contacts

**Joe Vitale**

Global Automotive sector leader  
Principal  
Deloitte Consulting LLP  
+1 313 324 1120  
jvitale@deloitte.com

**Craig A. Giffi**

Vice chairman and national Automotive leader  
Principal  
Deloitte Consulting LLP  
+1 216 830 6604  
cgiffi@deloitte.com

Deloitte's Automotive practice is at the forefront of top trends and issues facing the industry. Our industry professionals can help you navigate through complex issues and challenges impacting your company and the rapidly evolving automotive industry. To learn more, visit the [Deloitte Automotive practice page](#).



# Deloitte.

## Insights

Sign up for Deloitte Insights updates at [www.deloitte.com/insights](http://www.deloitte.com/insights).



Follow @DeloitteInsight

### **Deloitte Insights contributors**

**Editorial:** Kavita Saini, Abrar Khan, and Preetha Devan

**Creative:** Sonya Vasilieff

**Promotion:** Nikita Garia

**Cover artwork:** Lucie Rice

### **About Deloitte Insights**

Deloitte Insights publishes original articles, reports and periodicals that provide insights for businesses, the public sector and NGOs. Our goal is to draw upon research and experience from throughout our professional services organization, and that of coauthors in academia and business, to advance the conversation on a broad spectrum of topics of interest to executives and government leaders.

Deloitte Insights is an imprint of Deloitte Development LLC.

### **About this publication**

This publication contains general information only, and none of Deloitte Touche Tohmatsu Limited, its member firms, or its and their affiliates are, by means of this publication, rendering accounting, business, financial, investment, legal, tax, or other professional advice or services. This publication is not a substitute for such professional advice or services, nor should it be used as a basis for any decision or action that may affect your finances or your business. Before making any decision or taking any action that may affect your finances or your business, you should consult a qualified professional adviser.

None of Deloitte Touche Tohmatsu Limited, its member firms, or its and their respective affiliates shall be responsible for any loss whatsoever sustained by any person who relies on this publication.

### **About Deloitte**

Deloitte refers to one or more of Deloitte Touche Tohmatsu Limited, a UK private company limited by guarantee ("DTTL"), its network of member firms, and their related entities. DTTL and each of its member firms are legally separate and independent entities. DTTL (also referred to as "Deloitte Global") does not provide services to clients. In the United States, Deloitte refers to one or more of the US member firms of DTTL, their related entities that operate using the "Deloitte" name in the United States and their respective affiliates. Certain services may not be available to attest clients under the rules and regulations of public accounting. Please see [www.deloitte.com/about](http://www.deloitte.com/about) to learn more about our global network of member firms.