

The electric vehicle revolution and synthetic rubber

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Butadiene and derivatives
Petrochemicals Asia

May 17, 2019

Asia Petrochemical Industry Conference 2019



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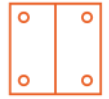
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LNG



METALS



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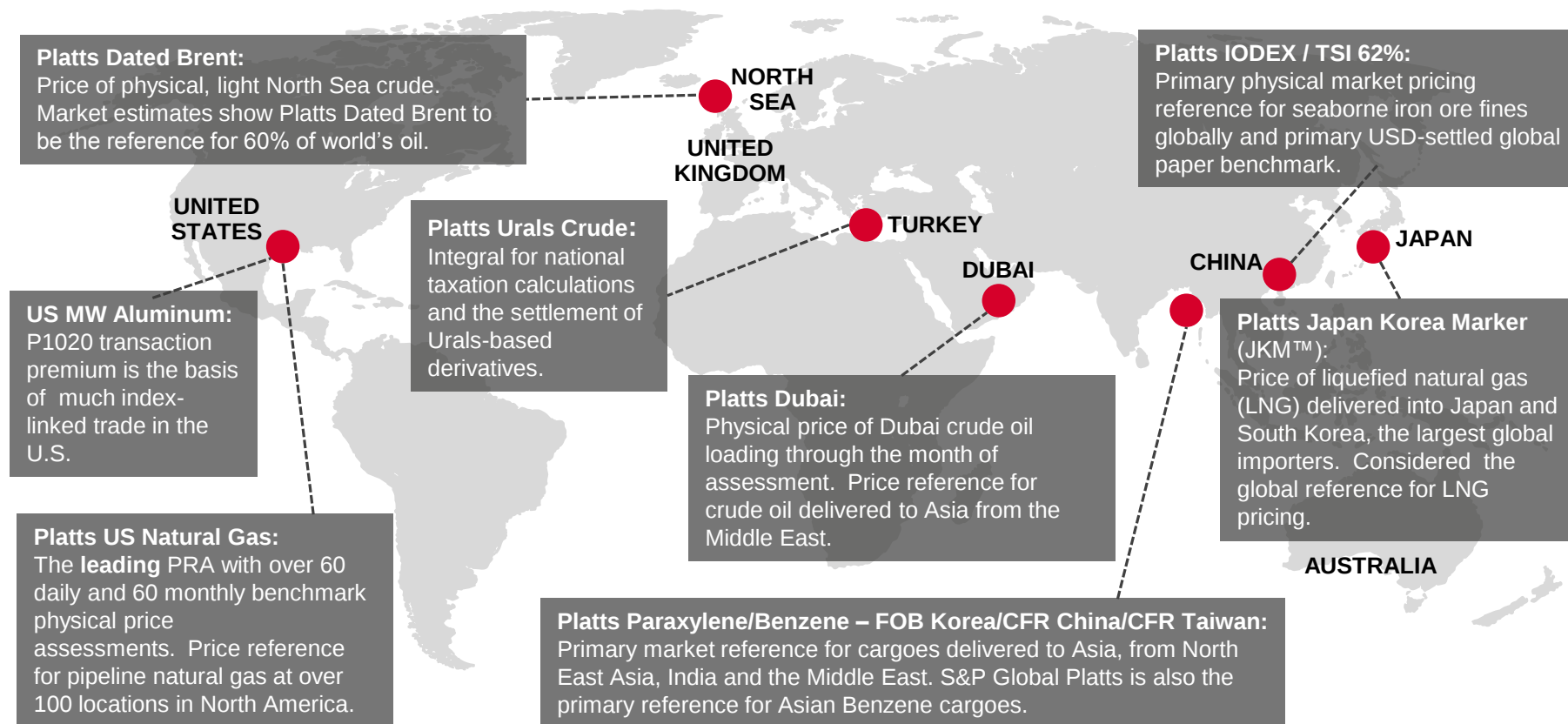
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Our benchmarks

Many of our price assessments have become “benchmarks” that market participants use to write contracts, monitor their commodity market and achieve full transparency around transactions. Here is a global selection across the markets that we cover.

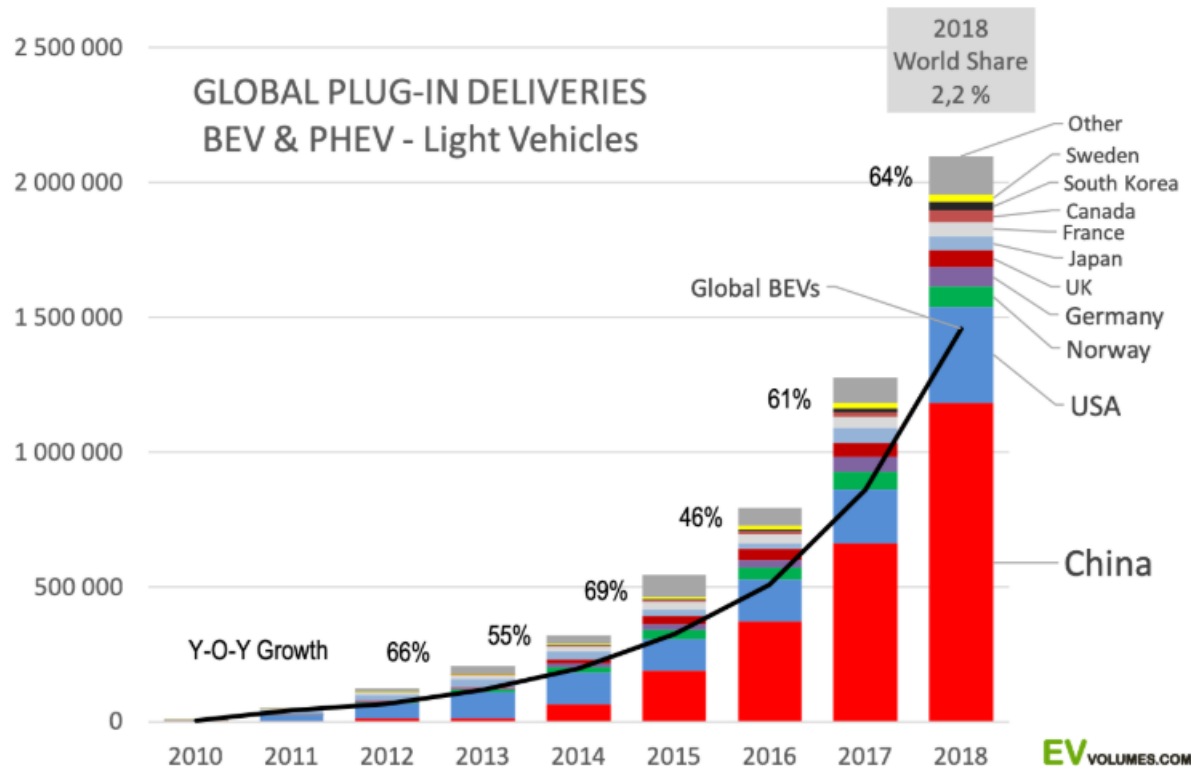


Agenda

- 1** The growth trajectory of electric vehicles
- 2** Tire requirements for electric vehicles
- 3** The impact on the synthetic rubber markets
- 4** The impact on butadiene supply and demand

1. The growth trajectory of electric vehicles

2018: Overall automobile sales down, EV sales up



Source: EV-Volumes

- In a year of weak growth for auto sales, light vehicle EVs grew 64%.
- China was the largest contributor, up by 140% to 1.2 million in the year.
- While many other auto giants - Toyota, General Motors, Daimler, Ford - posted losses in Q4, 2018, Tesla posted a profit for the first time.

Policy-driven electrification

- EV deployment has mostly been driven by policy. The main markets by volume (China) and sales share (Norway) have the strongest policy push.
- The Electric Vehicles Initiative (EVI) was established in 2009 under the Clean Energy Ministerial, dedicated to accelerating the deployment of electric vehicles worldwide.
- Governments currently active in the EVI include Canada, China, Finland, France, Germany, India, Japan, Mexico, Netherlands, Norway, Sweden, United Kingdom and United States.
- In 2017, The EV30@30 campaign was launched, with a goal for all EVI members of a 30% market share for electric vehicles in the total of all vehicles (except two-wheelers) by 2030.*

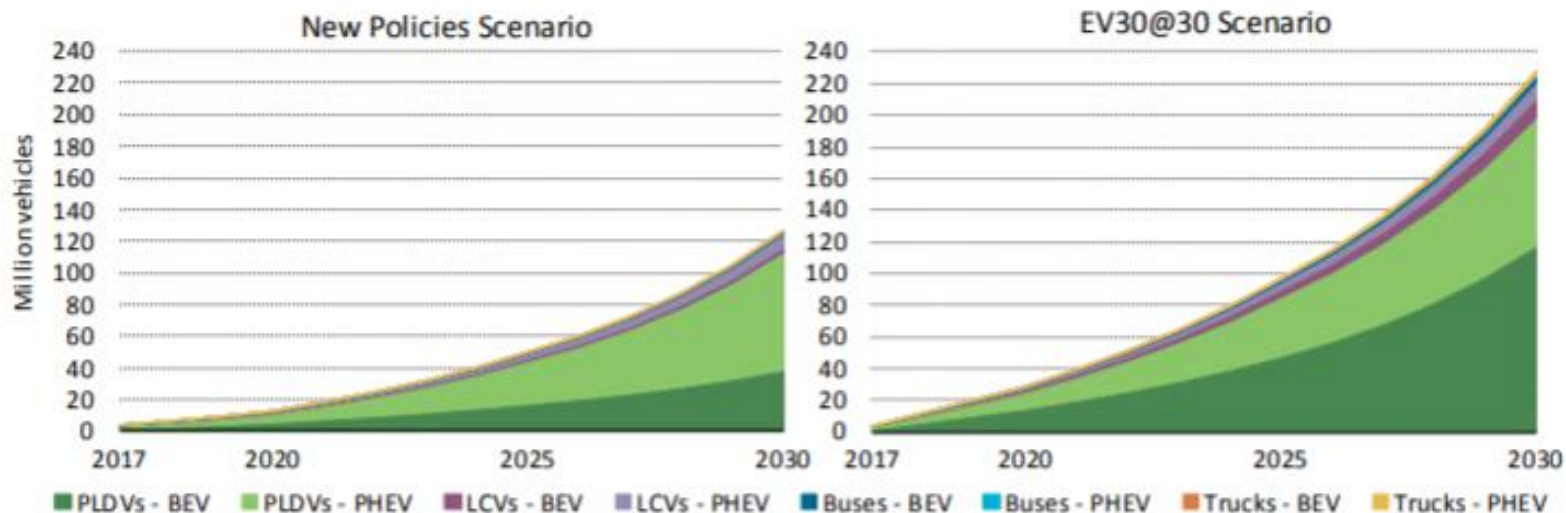
Source: International Energy Agency

Policy-driven electrification

The campaign includes several implementing actions to help achieve the goal. These actions include:

- Supporting the deployment of EV chargers and tracking progress.
- Galvanizing public and private sector commitments for EV uptake in company and supplier fleets.
- Scaling up policy research, including policy efficacy analysis, information and experience sharing and capacity building.
- Supporting governments in need of policy and technical assistance through training and capacity building.
- Establishing the Global EV Pilot City Programme, a global co-operative programme that aims to facilitate the exchange of experiences and the replication of best practices for the promotion of EVs in cities

EV30@30: A growth projection



Notes: PLDVs = passenger light duty vehicles; LCVs = light commercial vehicles; BEVs = battery electric vehicles; PHEV = plug-in hybrid electric vehicles.

Source: IEA analysis developed with the IEA Mobility Model (IEA, 2018b).

- Supportive policies and cost reductions are likely to lead to significant growth in the market uptake of EVs in the outlook period to 2030.
- The number of electric light-duty vehicles on the road could reach 125-220 million in 2030
- McKinsey forecast: The share of electrified vehicles could range from 10-50% of new-vehicle sales by 2030.

Announced country targets for EV deployment

Country	2020-30 EV target	Country	2020-30 EV target
China	• 5 million EVs by 2020 • NEV sales share: 7-10%, 15-20% by 2025, 40-50% by 2030	New Zealand	• 64,000 EVs by 2021
European Union	• Post 2020 proposed CO2 targets for cars and vans include benchmarks. • 15% EV sales by 2025, 30% by 2030	Norway	• 100% EV sales in PLDVs LCVs, urban buses by 2025 • 75% EV sales in long distance buses and 50% in trucks by 2030
Finland	• 250,000 EVs by 2030	Korea	• 200,000mt EVs in PLDVs by 2020
India	• 30% electric car sales by 2030 • 100% battery electric vehicles for urban buses by 2030	Slovenia	• 100% electric car sales by 2030
Ireland	• 500,000 EVs, 100% EV sales by 2030	UK	• 396,000 to 431,000 electric cars by 2020.
Netherlands	• 10% electric car market share by 2020 • 100% EV sales in PLDVs by 2030 • 100% electric public bus sales by 2025, 100% electric bus stock by 2030	US	• 3.3 million EVs in 8 states by 2025.4 • ZEV mandate in 10 states: 22% ZEV credit sales in passenger cars and light-duty trucks by 2025.
Japan	• 20-30% electric car sales by 2030	*Source: International Energy Agency	

Automakers' EV targets until 2030

OEM	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
BMW							15-25%	25				
BAIC							100%					
BYD		0.6										
Dongfeng Motor Co				30%								
Ford				40								
Geely	2	30										
GM			20									
Honda												67%
Hyundai-Kia							44					
Mahindra & Mahindra				0.036								
Maruti-Suzuki			2%									
Mazda												95%
Mercedes-Benz				10								
Other Chinese OEMs				7								
PSA							100%					
Renault-Nissan				20								
Tesla	100%											
Toyota												5.5
Volkswagen							20					
Volvo							50%					

Number of sales (Millions)

Number of new EV models

Percentage of electric sales

Share of models with electric versions

2. Tire requirements for electric vehicles

Common characteristics of electric vehicles

- Increased torque
- Heavier vehicles due to battery weight
- Potentially poorer tire mileage



Source: Tesla.com

Increasing demand on tires

- Higher rolling resistance
- Greater mileage
- Fuel efficiency
- Less noise
- Lightweight



Innovative tire design



Precision raw materials

Tire companies launch EV models

Tire companies have already begun launching EV models:

E.g: Goodyear, Hankook

<https://youtu.be/Ug3KUjwo1BM>

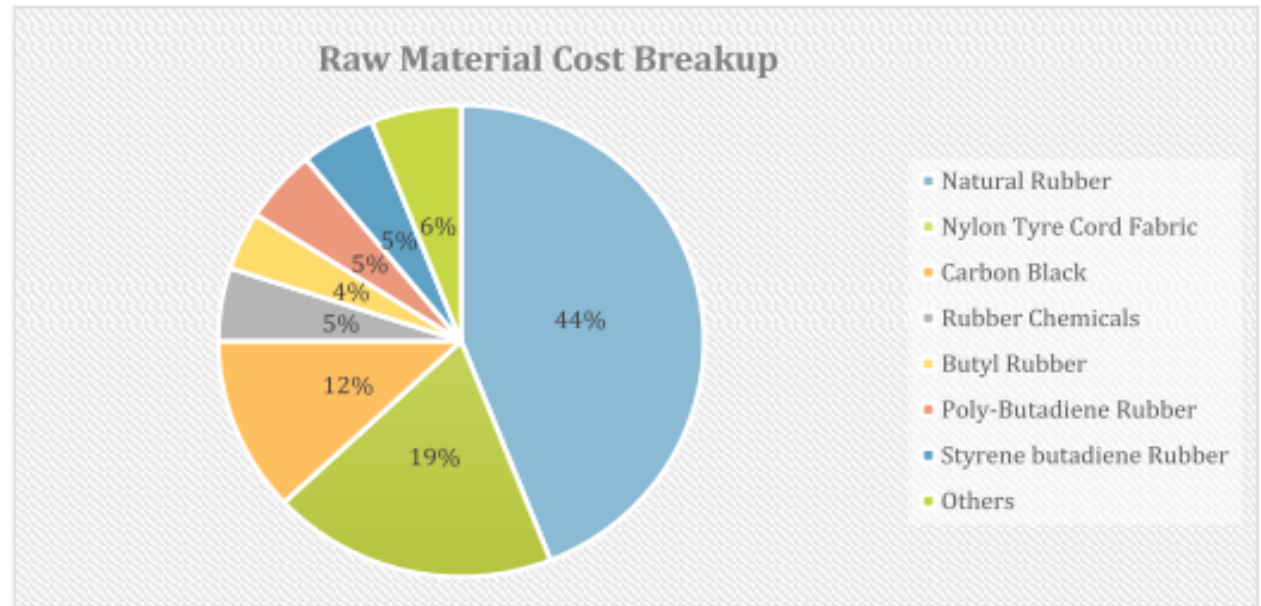


Source: Goodyear

3. The impact on raw materials

Performance driven by raw materials

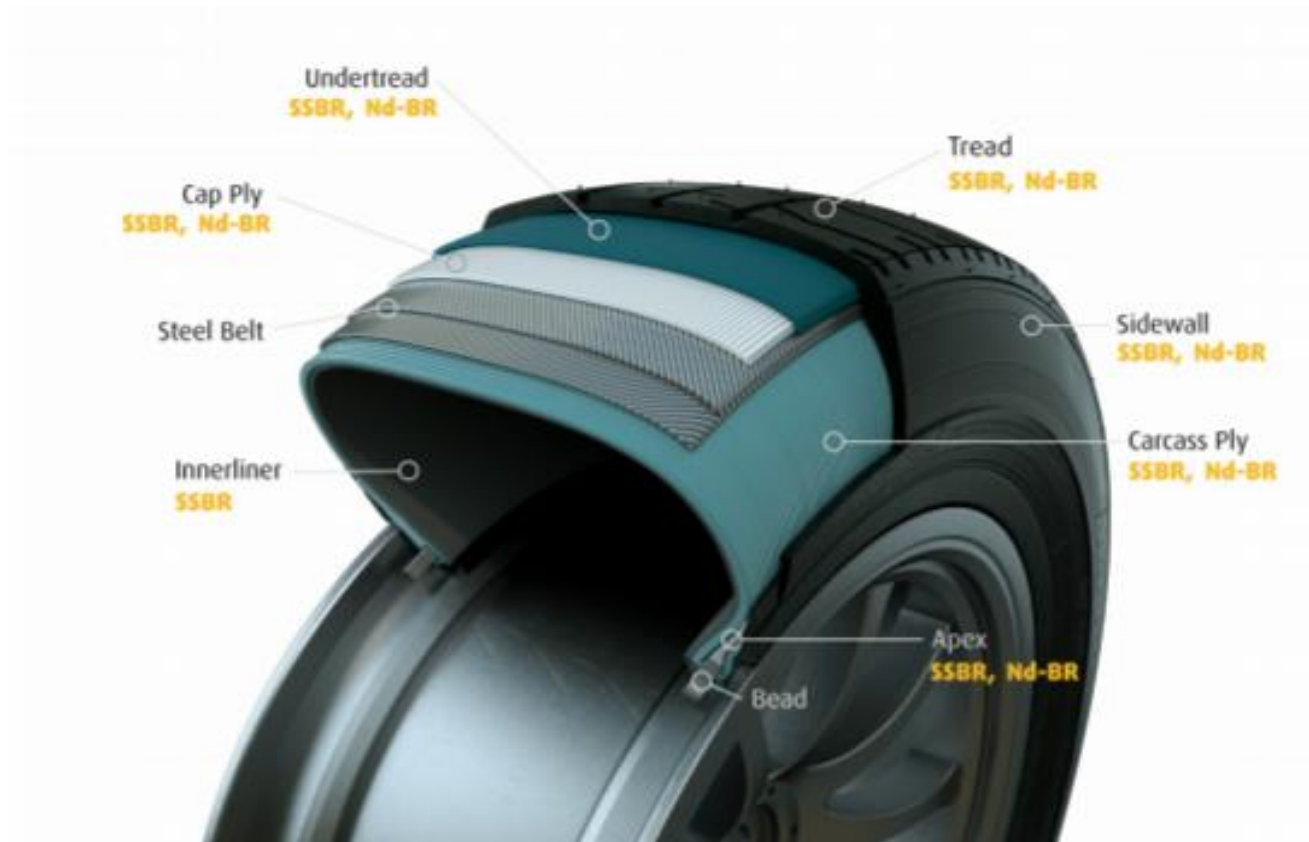
Areas of focus
for raw
materials:
sustainability
and
performance



Source: ATMA, TARI Estimates

- Sustainability: Trend towards environmentally friendly materials
 - Higher silica, less carbon black
 - More SSBR
- Performance: More SSBR over SBR

Tire design and SSBR for performance

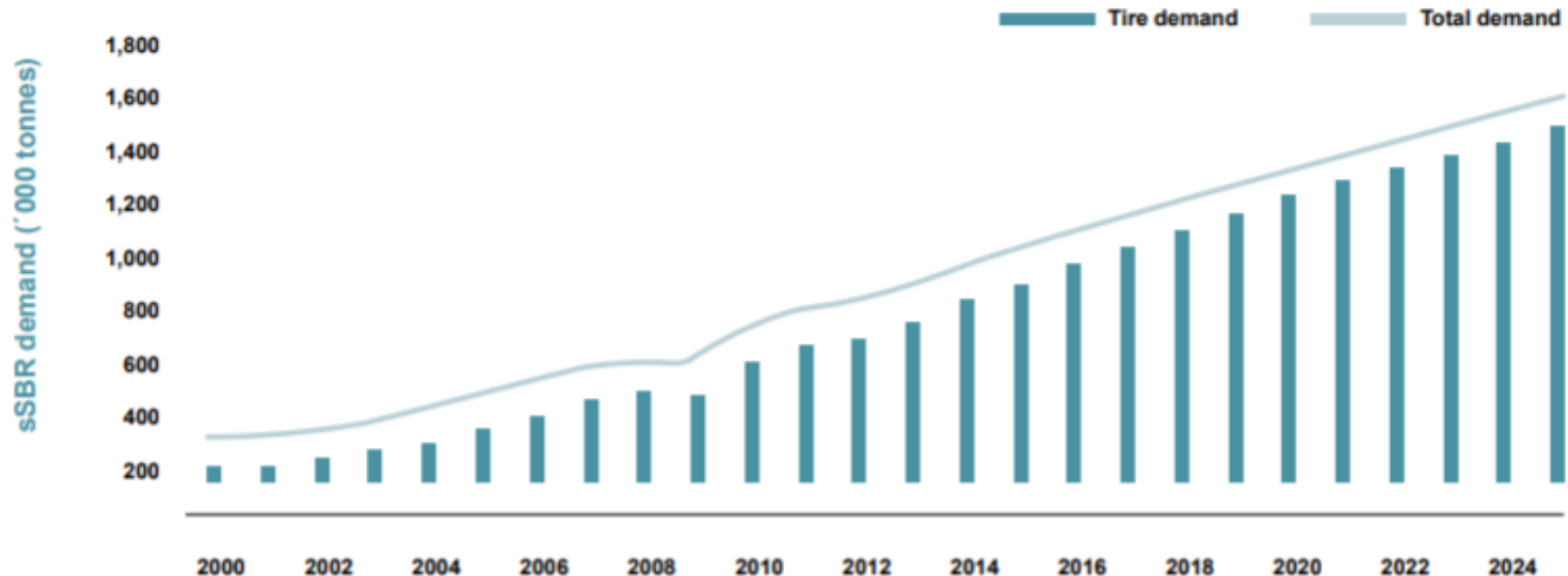


Source: Trinseo

- SSBR has a high rolling resistance, and promotes lower fuel consumption
- Trinseo: an estimated 10% difference in fuel consumption between tires with non-functionalized SBR and those with the latest functionalized S-SBR.

Strong growth projection for SSBR market

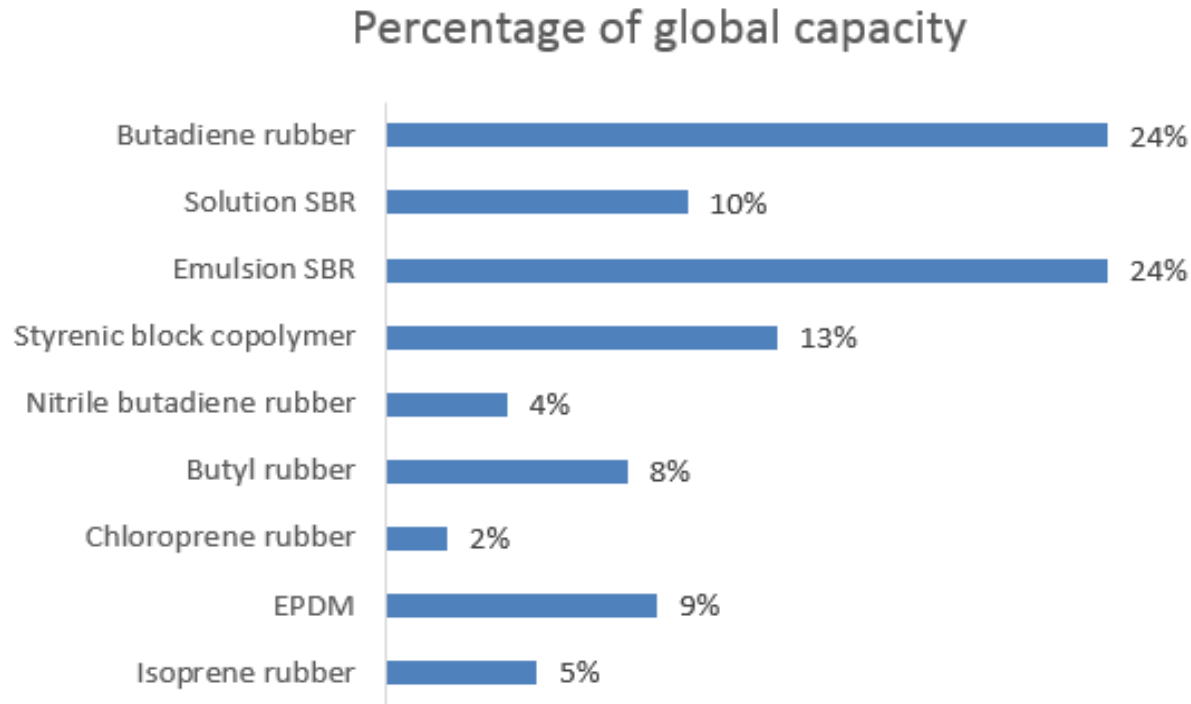
Total sSBR demand, 2000-2025



- According to Trinseo, the performance tire market is projected to grow at a compound annual growth rate of 7-8%, while the market for standard tires has remained relatively flat.

- This is in comparison to a 4.4 % growth projected for the overall SR industry by 2026.

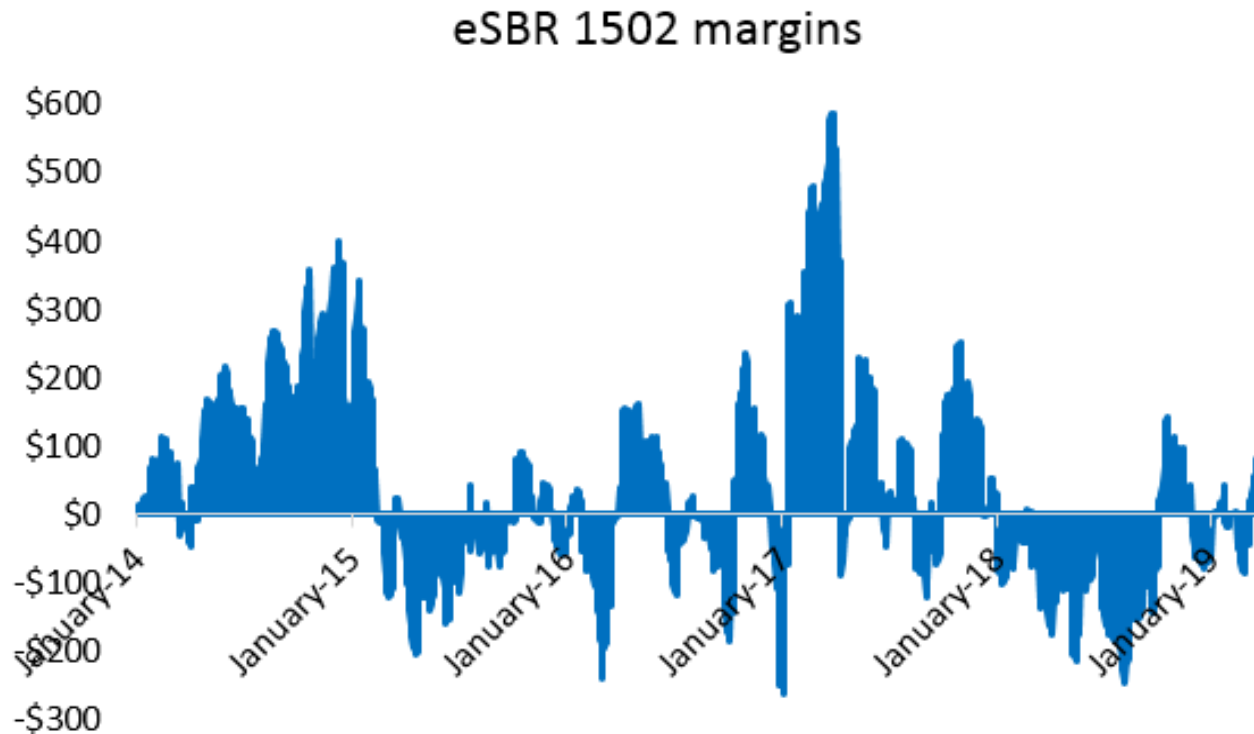
Limited near term impact to overall synthetic rubber market



Source: International Institute of Synthetic Rubber Producers

- However, this growth trajectory is expected to have little near term impact to the overall synthetic rubber landscape, comprising a small percentage of overall capacity.
- Also, growth is limited by the transfer of technology, which SSBR is highly dependent on, with a handful of key players in the market.

A backdrop of oversupply, weak synthetic rubber margins



- The synthetic rubber segment has been plagued by oversupply, and weak margins.
- Evidenced by poor performance of largest segment, ESBR, in the last 5 years.

A weak overall auto industry ahead



- Major automakers (Toyota, General Motors, Daimler, Ford) report losses in 2018, downgrade outlook.
- Unstable or weak outlooks in major auto markets such as China and Europe to add to weakness.

*Image source: Big Data Companies.com
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4.The impact on butadiene supply and demand

Butadiene outlook in Asia: Additional capacity to weaken prices

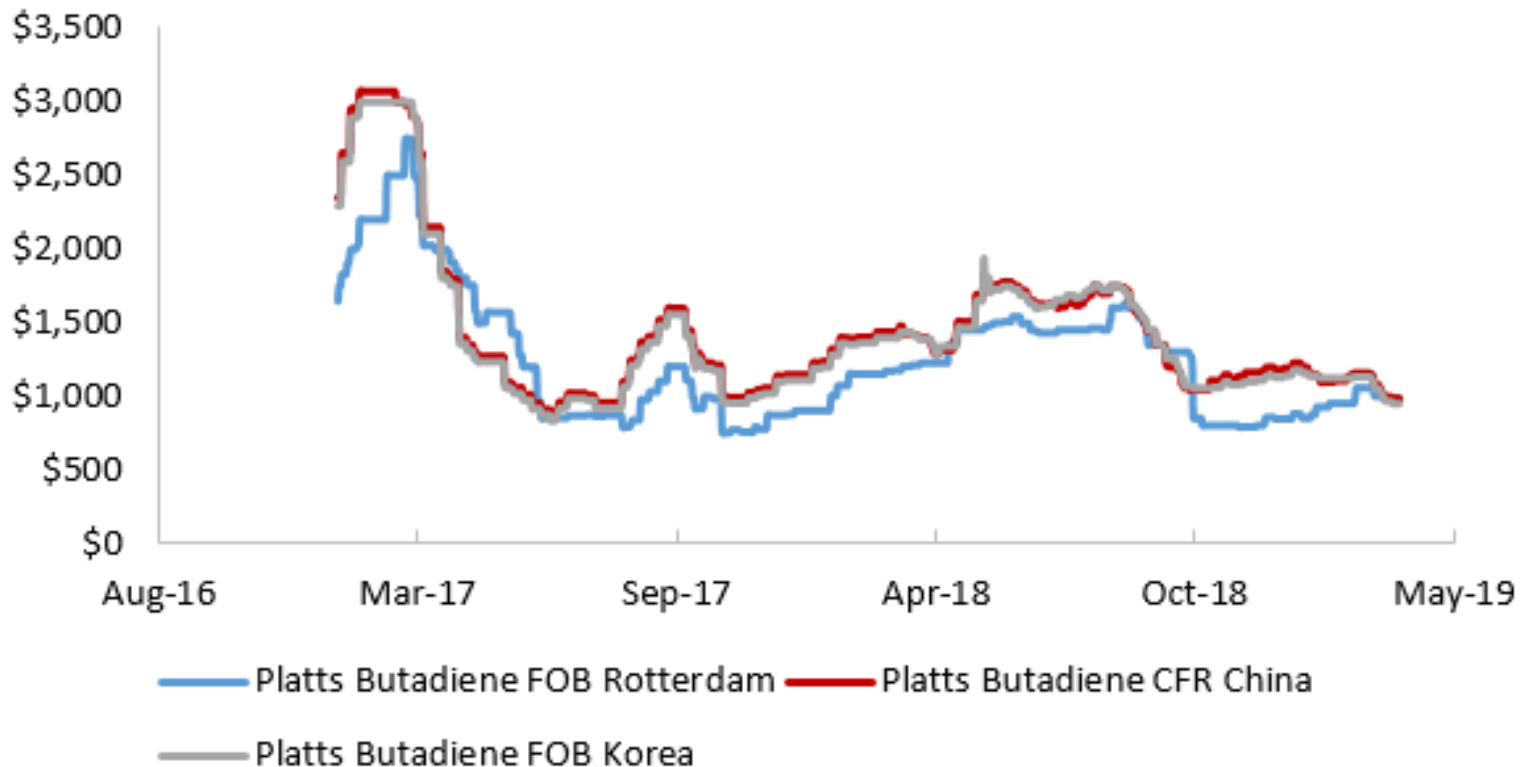
China	Kt/yr	Start
Zhejiang PC	200	Q4, 2019
Nanjing Chengzhi	100	April, 2019
Jiutai Energy	60	April, 2019
Hengli Petrochemical	140	Q1, 2020

S Korea	Kt/yr	Start
LG Chemicals	30	March
LG Chemicals	50	September

S.East Asia	Kt/yr	Start
RAPID	185	Q2

- Mega-refinery expansions in the next 2 years expected to add pressure on prices.

Butadiene prices weaken amid greater supply



- Butadiene prices have been weakening on year.
- This is due to both increased supply globally, and weak downstream markets.

Questions & Key Takeaways

- The electric vehicle revolution is likely to support the growth of precision materials. How much will it drive the SSBR industry, and can the latter catch up with demand?
- While the SSBR is set to pick up pace, how much can it make up for stagnating SBR demand, which dominates the market?
- Additionally, with expanded butadiene capacities expected in the next few years, SSBR makers may enjoy the benefits of lower or more stable raw material prices.

Thank you!

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