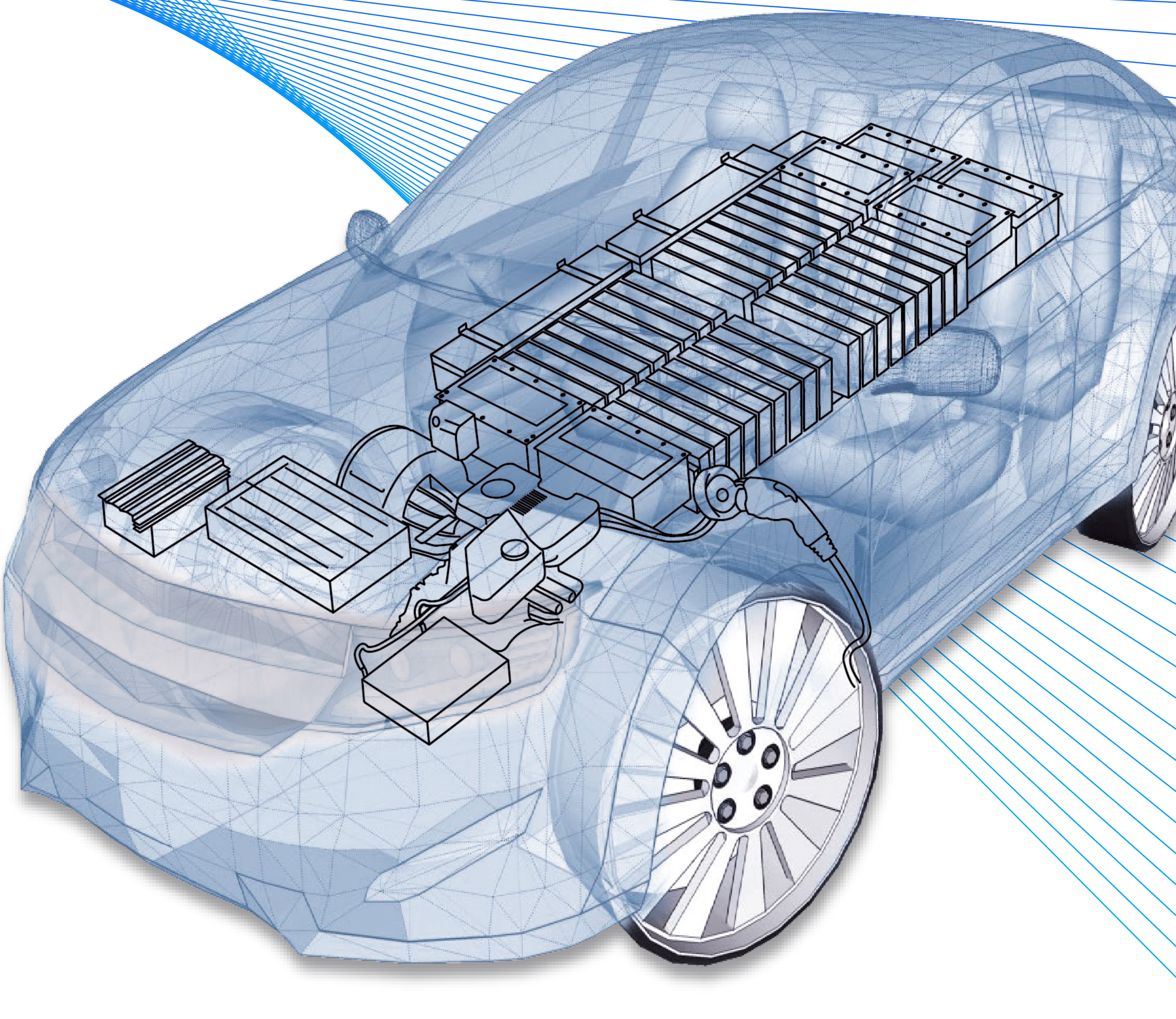
McKinsey & Company

Advanced Industries

Electromobility's impact on powertrain machinery



May 2021

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Introduction and key messages

In collaboration with the Entrepreneurship Research Institute of the Technical University of Munich, McKinsey & Company explored the impact of electrification on automotive powertrain machine tool manufacturers.

For more than 100 years, the automotive industry was dominated by internal combustion engine (ICE) powertrains. Today, there has been a shift towards alternative powertrains based on both regulatory pushes across regions and shifting customer demand. Electrification is transforming mobility industries globally across on multiple levels.: In addition to having an positive impact on climate change, electrification has implications for the types of engines and demand for fuel moving forward. It also has implications for the underlying automotive production technologies as well as the required components, and, thus, on the machine tool industry.

Text Box 1: What the insights for this report are based on

— **A detailed, bottom-up model simulating the market development of 14 machine tool types** used to produce 39 key powertrain components. The assessment is based on the evolution of passenger vehicle unit sales and the number of average main components per powertrain combined with average industry prices for the powertrain component machines. The model analyzses these effects from 2020- to 2030 while leaving short-term disruptions caused by the COVID -19 pandemic out of scope. For further details on this model, see Text Box 3 on page 11.

— **A detailed technology-by-technology and component-by-component analysis** of the future growth and structural dynamics of the global powertrain-related machine tool market.

— **A proprietary survey among industry players and experts** to understand their expectations of and reactions to these shifts in the industry.

Based on extensive proprietary research and analyses **(Text Box 1),**), this report aims to provide a perspective on three key questions that are top-of-mind for all industry players and, in particular, for machine tool manufacturing players **(Text Box 2):**

— Why, to what extent, where, and by when are significant changes in the powertrain machine tool market to be expected?

— Which machine tool technologies are likely to be affected the most?

— How can players along the value chain in general, and machine tool manufacturers in particular, successfully respond to and prepare for the challenges they face?

Text Box 2: The three main audiences of our study

— **Powertrain machine tool manufacturers,** whose market is changing significantly and who need to make important strategic decisions on how to transform their business as the requirements for machinery change over time.

— **Automotive equipment suppliers,** who will need to supply different components as the shift towards e mobility continues as predicted. The shift in powertrain components especially affects suppliers who are mainly focused on classic ICE components, because they will be forced to both rethink their product portfolios and reevaluate their need for machinery.

— **Automotive original equipment manufacturers (OEMs),** who need to closely manage their supply chain reliability. Despite the shift towards e-mobility, OEMs need to ensure that they still have suppliers for the machinery required for ICE powertrain production lines.

By assessing the shifts in the powertrain machinery market, we have arrived at four key messages:

— **Shift in demand, shift in requirements.** The electrification of powertrains leads to shifting demand for components and, consequently, a change in the machine tools required to manufacture these components. The transmission is the most impacted part of the powertrain. Global new-car sales of electric vehicles (EVs), mainly battery electric vehicles (BEVs) and plug-in hybrid electric vehicles (PHEVs), are expected to increase from 3.5 percent of the global passenger vehicle sales share in 2020 (as of Q2 2020) to 39 percent in 2030 due to regulatory pressures and changing customer demand.

— **Reduction in the number of components.** The number of key components will significantly decline with the shift from ICE towards BEV powertrains. Since PHEVs and mild hybrid EVs have both ICE and BEV components, there will still be a need for ICE components, but on a much smaller scale. The number of key components will decrease from around 30 in an ICE powertrain to around 9 in a BEV powertrain.

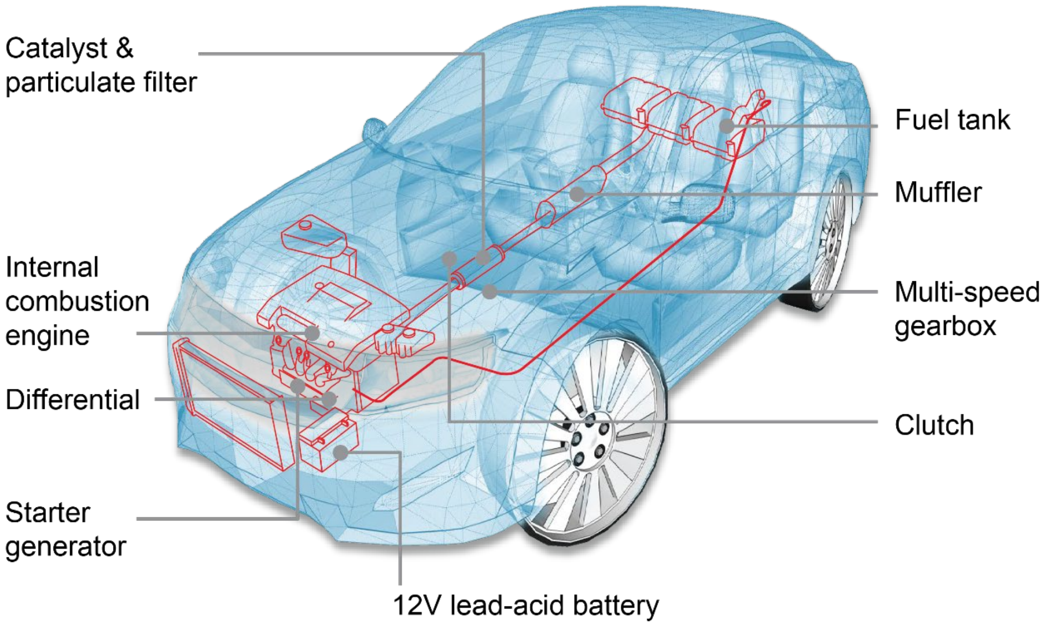
— **Decrease in powertrain capex.** A significant decrease in machinery capex per vehicle is expected over the next 10 years, as the decrease in demand for ICE powertrain manufacturing technologies such as drilling, milling, or punching will not be offset by the growth of e technologies such as stacking or winding. Total machinery capex is expected to decrease by around 25 percent, from USD 6.8 billion in 2020 to USD 5.1 billion in 2030.

— **Revamped product portfolio along the value chain.** Players along the value chain, predominantly machine tool manufacturers, need to rethink how they will cope with the changing market environment due to the shift towards e-mobility. To successfully navigate the powertrain transition, machine tool manufacturers must explore options from a solution space of strategic archetypes, taking a three-step approach that can guide them regardless of their starting points, current portfolio, or strategic aspirations. As some shifts can already be witnessed in the industry, such as the move from specialized to holistic automotive machine tool suppliers, players should actively think about how to react to the ongoing and future market dynamics.

Each of these statements will be explained in more detail in the following chapters.

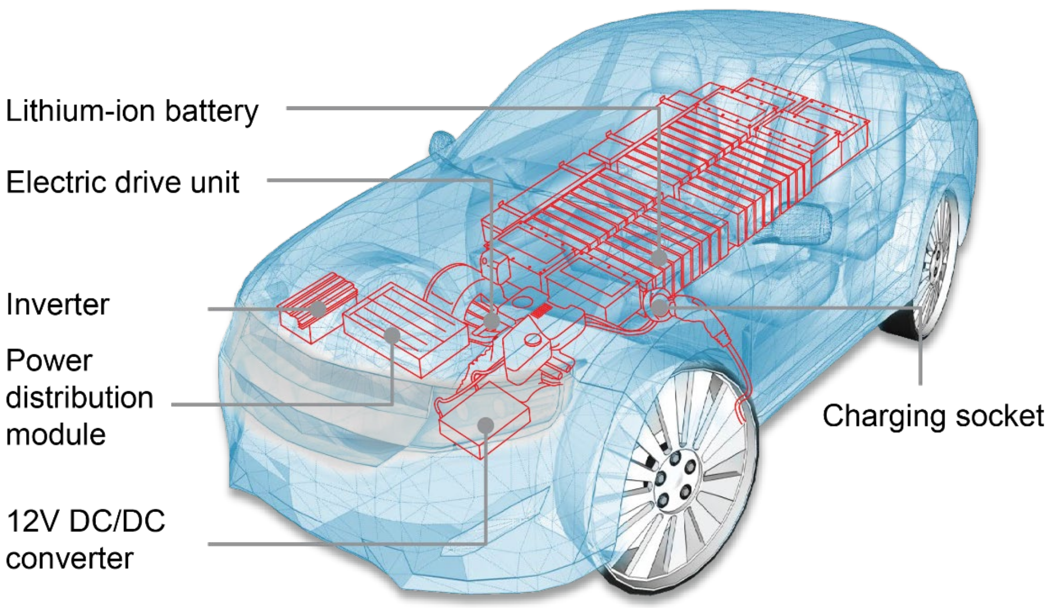
ICE powertrain

Engine, transmission, exhaust system



BEV powertrain

Engine, battery system



I. The effects of electrification on the global powertrain machinery market

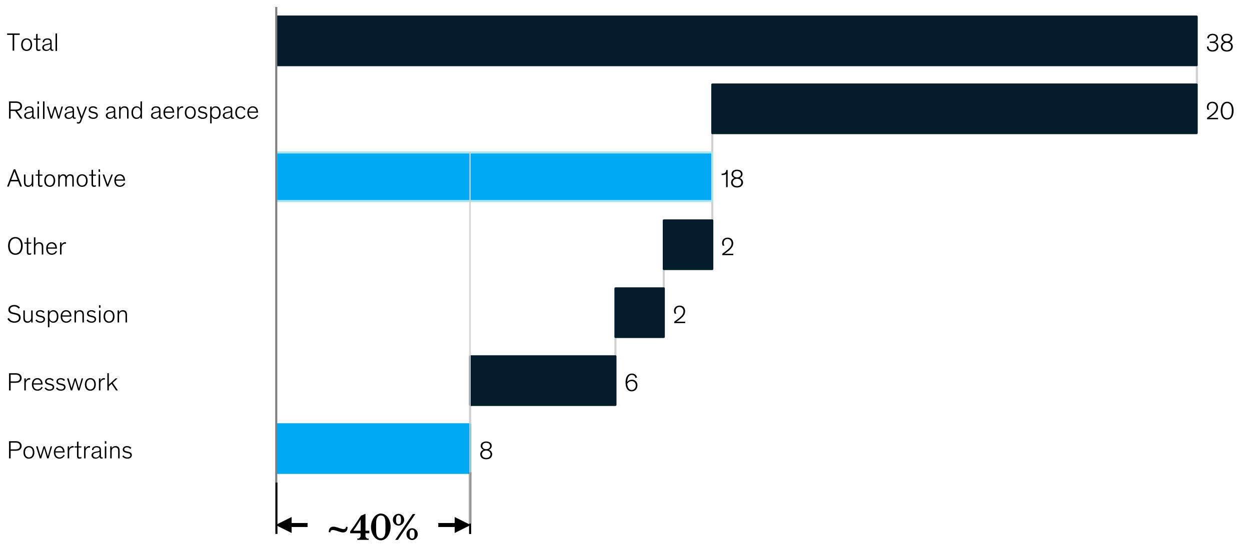
1. A forecast for the powertrain machinery market

As the global powertrain market becomes more complex and diversified, the related machine tool market – dominated by small to medium-sized companies, concentrated in Germany, Austria, Switzerland, and Japan – is also expected to change. In 2019, total global machine tool demand was at USD 77 billion. Of this amount, transportation equipment accounted for around 50 percent (USD 38 billion). Of this USD 38 billion, around 50 percent belongs to the automotive industry (Exhibit 1). Of automotive's share of transportation equipment demand, about USD 8 billion can be attributed to powertrains alone.

Exhibit 1

Powertrain equipment demand made up more than 40% of automotive's share of global transportation equipment demand in 2019

USD billions



In addition to powertrains, suspension, presswork, and other system areas make up the total set of machine tooling in automotive transportation equipment. We did not look at these other categories as part of this report, as they are significantly less impacted by electrification.

Our market projection focuses on special-purpose machinery for metal forming and machine tooling. More precisely, the focus is on projecting developments concerning the future demand for machine tools and components that are required for powertrain production. **(For details on our projection approach, see Text Box 3.)** The scope of our market projection comprises 14 machine tool types performing either machining and editing functions (e.g., laser cutting, turning) or transformative and dissipative functions (e.g., forging, welding, bending) (Table 1). At the same time, several machine tool types such as for metallurgy and casting, which are also used for powertrain manufacturing, are not included.

Table 1

We consider 14 machine tool types that are mainly used in the manufacturing process of powertrains

	Machine tool types[1]	Exemplary components
Machining and editing machinery	Laser cutting	Valve
	Turning	Camshaft, crankshaft, transmission shaft
	Drilling/milling	Engine block, cylinder head
	Grinding/honing	Engine block, cylinder head
	Gear cutting/sawing	Valve, transmission shaft
	Cutting	Rotor, engine mounting, piston
Transformative and dissipative machinery	Forging/welding	Camshaft, crankshaft, valve
	Bending	Silencer, tail pipe
	Punching	Rotor, silencer
	Winding	Stator, battery cell
	Surface hardening	Rotor shaft, piston, torque converter
	Laminating	Catalyst
	Stacking	Battery cell
	Impregnating/coating	Stator

1. We only concentrated on 85% of machine tools, excluding multistation transfer and unit construction machines

Source: McKinsey Automotive powertrain machinery investment model

These 14 machine tool types are used to varying degrees in the manufacturing and maintenance of components across the four main powertrain types: ICE, BEV, PHEV, and hybrid electric vehicle (HEV). They are required for building the main components of powertrains. Regarding the average number of components in different types of powertrains, a standard ICE, HEV, or PHEV powertrain has one transmission pump, for example, while a BEV powertrain has none. At the same time, a BEV, HEV, or PHEV powertrain has one battery junction box, while an ICE powertrain does not have one.

2. Effects on machine tool types

As key suppliers to the automotive industry, powertrain machine tool manufacturers will be impacted by the trend towards electrification. This trend will lead to the need for different components, and consequently, changes in both requirements and demand for machine tool manufacturers.

Text Box 3: How we arrived at our insights into the market shift

Based on overall new-car sales as well as the shift in the powertrain mix, we built a detailed bottom-up model simulating the market development of 14 powertrain machine tool types (covering around 85 percent of the machine tool market related to powertrain manufacturing) associated with 39 key powertrain components.

To arrive at a rather detailed breakdown, we looked at each powertrain component and considered its specific use in the powertrain. If a component serves multiple purposes in a powertrain, each purpose was considered separately. For example, while a rotor in an ICE powertrain is nonessential – i.e., only required for the automatic start/stop feature and only in 60 percent of ICE vehicles – it is a key component of the electric motor, and thus, of the electric powertrain.

The simulation is based on the evolution of new-car sales and the average number of main components per powertrain, the types of technology used to manufacture each component, average industry prices, and the average lifetime for each of the machines.

Our model projects capex demand for the powertrain component machinery market, broken down by region, powertrain type, component, and technology over the 2020 to 2030 time frame. The model can also be used to conduct scenario-based machine tool demand market simulations based on different lifetime assumptions for machinery and different EV penetration rates.

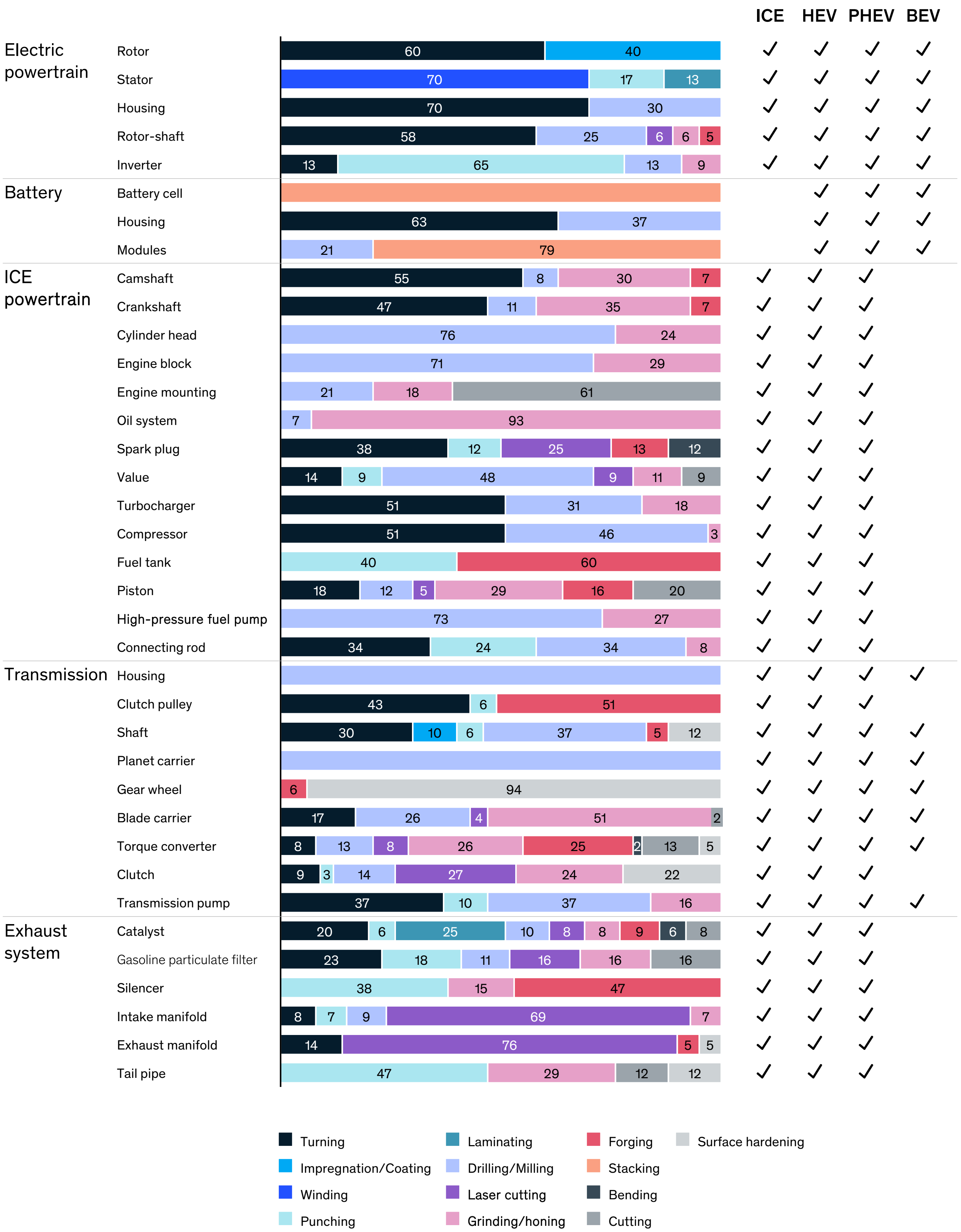
In this report, we first seek to describe the change in the powertrain mix and assess its impact on powertrain components and related manufacturing technologies. We then forecast the growth and describe the structural dynamics of the global powertrain machinery market via a detailed, technology-by-technology and component-by-component analysis of the various trends. In addition, we present the results of a survey we conducted among industry players and experts to understand their expectations of and reactions to these shifts in the industry.

Given the bottom-up modeling, our tool is also flexible, with the capacity to adapt to different breakdowns by technology and region if needed. **(For further details on our bottom-up modeling approach and the tool itself, see the Appendix.)**

Exhibit 2

Breakdown of machines used in component production

Percentage[1]



1. Differences to 100% might occur due to rounding

2.1 A decrease in ICE powertrains and higher reuse rates for its machinery

Supplier selection and ordering of new machine tools takes place about 2 years before the start of production for ICE powertrains and slightly less for electric powertrains. Given the positioning of machine tools so early in the production timeline, machine tool producers need to consider the decline in ICEs and increase in EVs far sooner than this impacts vehicle sales.

The shift towards electromobility means a shift towards longer machine lifetimes – especially for ICE powertrain machinery, as there won't be any new engine developments after a certain point in time. The decrease in volume of new ICE powertrains along with an increase in their lifetime is expected to lead to fewer new production lines for powertrains and less demand for new machine tools.

Our model captures the uncertainty in the automotive industry regarding investment decisions via two different scenarios:

— **Lower reuse rate.** OEMs and suppliers invest **steadily** in new machines to keep maintenance costs low and take advantage of technological progress in machinery.

— **Higher reuse rate.** OEMs and suppliers invest less into new machines as they reuse existing machines for new powertrain lines to lower overhead costs.

In addition, there are several other considerations regarding the future of the machinery market for powertrain components, which could structurally impact component and machinery demand:

— **Fewer powertrain variants.** Volvo, for example, is now only using four-cylinder engines in its passenger vehicles. This reduction in the number of variants would result in a reduced number of required machine tools.

— **No new ICE powertrains, longer lifetimes for current ones.** OEMs and suppliers would halt the building of new production lines for ICE powertrains, ordering fewer machine tools for them. Daimler, for example, announced it was stopping the development of ICE powertrains and focusing on electric powertrains going forward. VW is currently planning its last start of production based on an ICE powertrain for 2026.

— **Consolidation of powertrain-focused OEMs and suppliers.** Demand for machine tools would decrease due to pooling effects, potentially causing individual players to disappear from the market. This would have a potential impact on components, machinery, or maintenance. OEMs need to manage their supply chain reliability closely and ensure that key suppliers with declining revenue are able to make the shift towards the tools required for electric powertrain components.

— **Geographical shift.** Given the future demand pattern for passenger vehicles, there is also an expected geographical shift for machine tools. One important change is the overall lower demand for cars in specific regions – especially Europe, given urban regulations. This would lead to lower production volumes and therefore lower demand for machine tools in those geographies. Furthermore, geographical adoption rates for EVs are likely to vary due to different regulations. As a result, regions with less-strict regulations on ICEs (e.g., the US) will tend to have a lower adoption rate of EVs and hence be less impacted by the shift in demand for related machine tools.

2.2 Significant differences between ICE powertrain machinery tool types

The shift in powertrain components from ICEs to BEVs will lead to lower annual capex for both OEMs and their suppliers. In 2020, powertrain machinery capex amounted to USD 6.8 billion (covering 85 percent of the machine tools related to powertrain manufacturing). The specifics of the decline in powertrain machinery **capex** for OEMs will depend on the underlying assumptions of several possible scenarios. In the most likely scenario – EV share of the market at 39 percent in 2030 and a higher reuse rate for machinery – OEM **capex** would drop by USD 1.7 billion, representing a 25 percent decrease (CAGR: 2.9 percent) between 2020 and 2030, resulting in powertrain machinery capex of USD 5.1 billion in 2030.

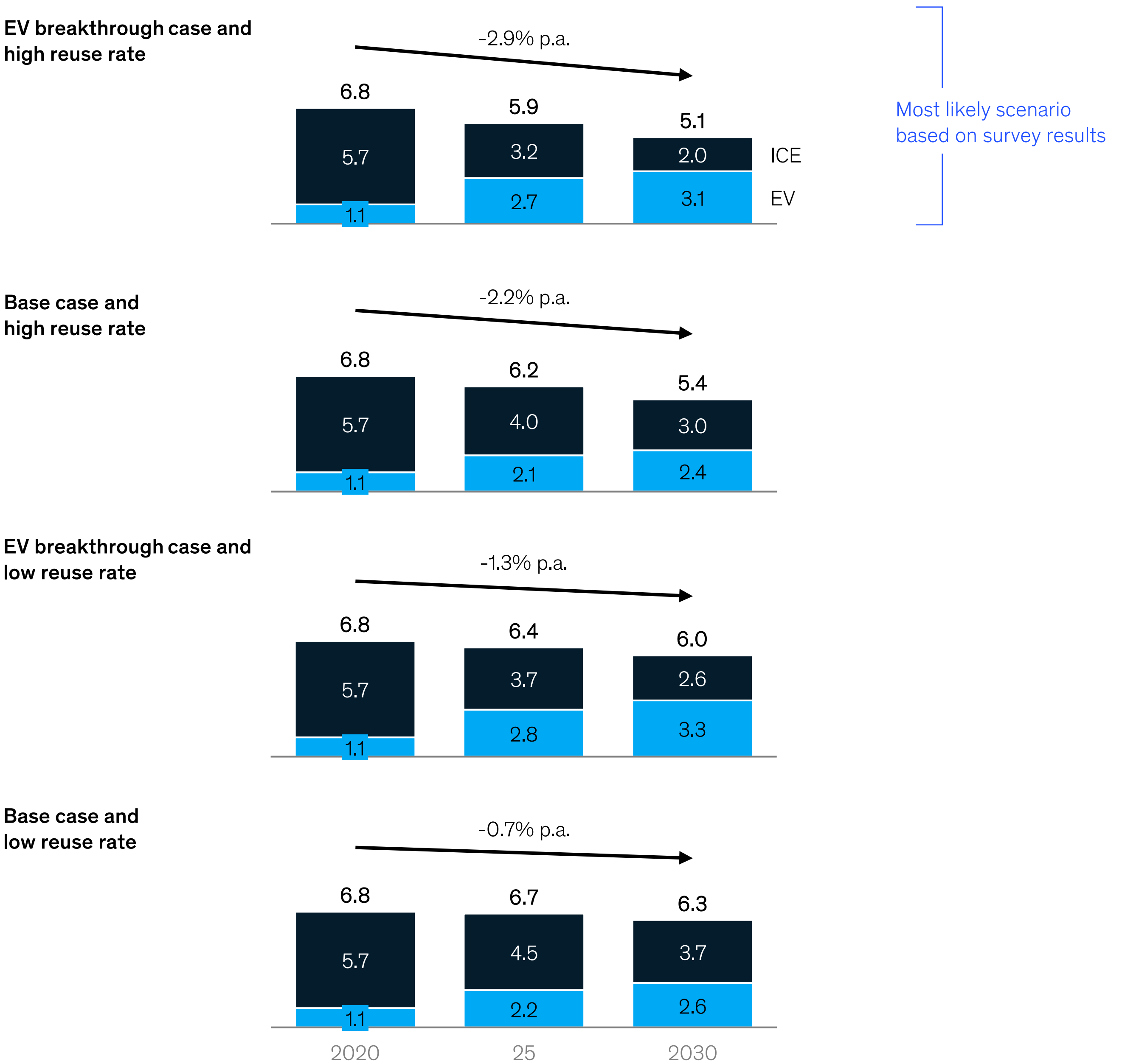
While the shift in overall OEM powertrain capex over the next decade is expected to be a net decrease, there will be strong differences between the two powertrain categories. At the same time, the decrease in ICE powertrain capex is expected to be around 65 percent (CAGR: -9.9 percent), whereas EV powertrain **capex** is expected to increase by around 180 percent (CAGR: 10.5 percent). However, as the market for EVs and related machine tools is just starting to take off, this is a chance for both established market players (currently active in ICE powertrains) and new market entrants (Exhibit 3).

Deep Dive 1: Machine types used in component production
To facilitate an understanding of our approach, the implications of our model may be illustrated with certain engine components. The crankshaft, one of the main components of

Exhibit 3

Capex development

USD billions



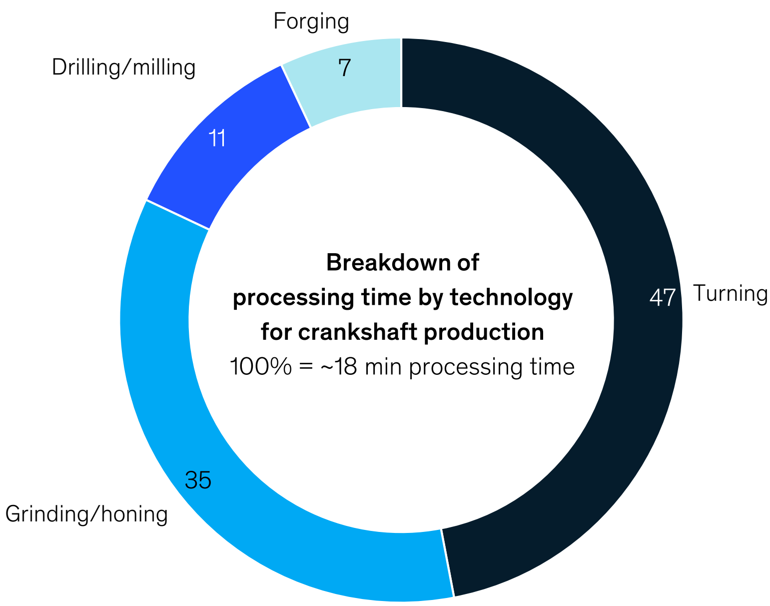
the engine block, is a moving part in an ICE. Its main function is to transform the linear motion of the piston into rotational motion. ICE, HEV, and PHEV powertrains have exactly one engine and therefore require one crankshaft. BEVs, on the other hand, do not have an ICE powertrain and do not require a crankshaft at all. To produce crankshafts, turning, grinding, honing, drilling, milling, and forging are the primary manufacturing methods, requiring all these different manufacturing technologies. But as BEV powertrains supersede the other types, these technologies will be needed less and less.

A breakdown of processing time by machine type is illustrated in Exhibit 4.

Exhibit 4

CAPEX share by technology for crankshaft production

Percentage



Due to developments in global new-car sales, crankshaft demand for 2020 was projected at 86 million crankshafts. Because of the increasing number and share of cars with electric powertrains, only 62 million crankshafts are expected to be required in 2030. Crankshaft production had a capex of USD 76 million in 2020; compare this to an expected capex of USD 25 million in 2030, based on the powertrain shift and assumed reuse rates.

Deep Dive 2: Shift in component demand

EVs require different components than ICE vehicles, and these components, in turn, require different machine tools. The shift towards electrification – including the decline in ICE powertrains and the increase in the volume and share of EV powertrains – will lead to opposing trends depending on the component.

Demand uptick. Some components are largely present in ICE powertrains today but are also needed in EV powertrains, while others are more specific to EVs. This will result in increases in demand between 2020 and 2030 for:

— Blade carriers, gear wheels, planet carriers, shafts, and transmission pumps (802 percent, CAGR: 25 percent)

— Battery cells and modules (706 percent, CAGR: 23 percent)

— Cylindrical battery cells (718 percent, CAGR: 23 percent)

— Prismatic battery cells (762 percent, CAGR: 24 percent)

— Compressors (346 percent, CAGR: 16 percent).

Demand decline. Other components will likely decrease in demand as they are specific to ICEs, including:

— High-pressure fuel pumps (-28 percent, CAGR: -3 percent)

— Gasoline particulate filters (-28 percent, CAGR: -3 percent)

— Pistons (-26 percent, CAGR: -3 percent).

Deep Dive 3: Shift in required technologies

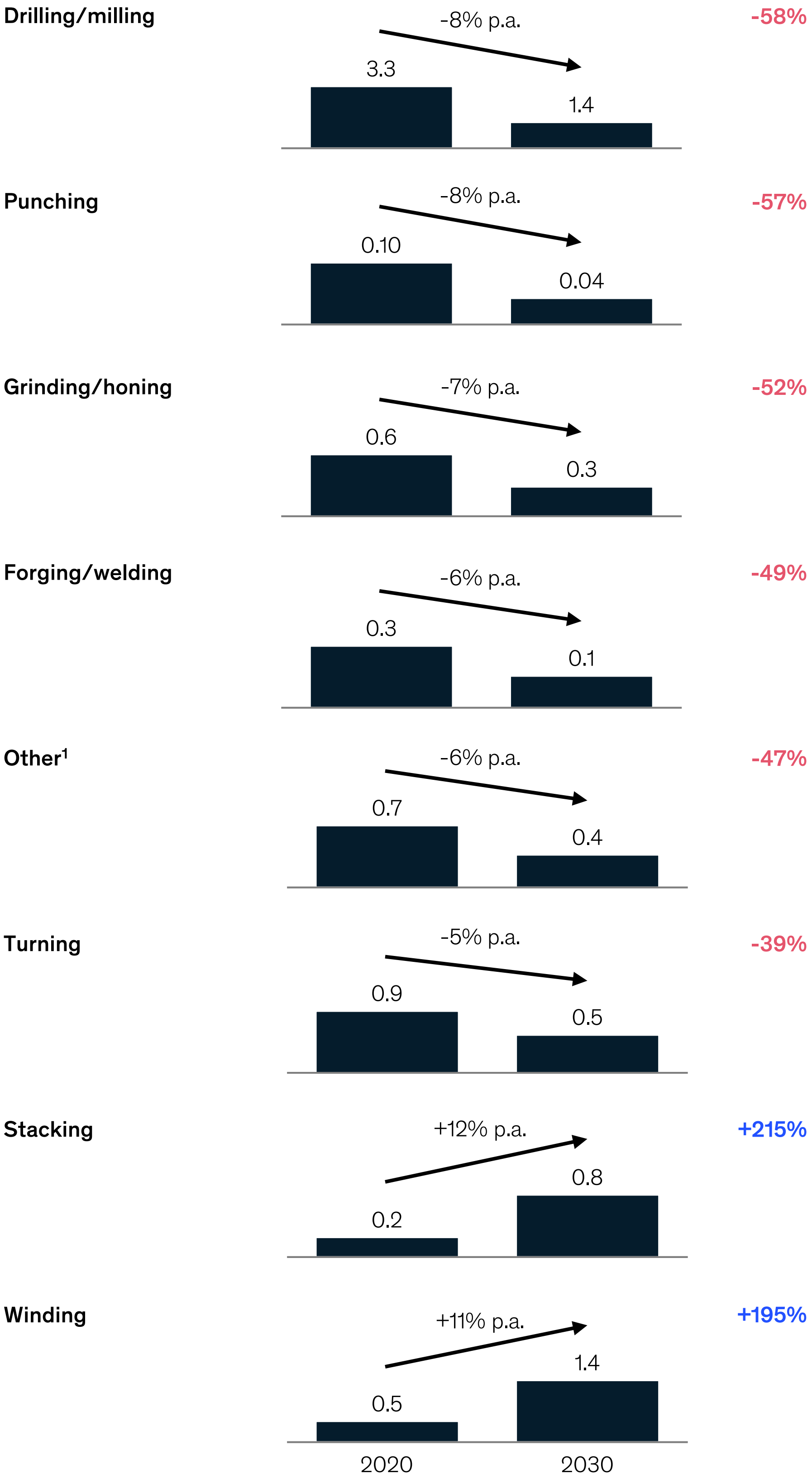
An overall net **capex** decrease of USD 1.7 billion is expected between 2020 and 2030 (CAGR: - 2.9 percent) but the direction of the change will vary dramatically by manufacturing type (Exhibit 5).

The biggest **capex** decreases will be seen in drilling and milling (CAGR: -8.3 percent), punching (CAGR: -8.2 percent), and grinding and honing (CAGR: -7.1 percent). By contrast, the biggest **capex** increases during this same timeframe – mainly driven by increased battery production – will likely be in the manufacturing areas of stacking (CAGR: 12.2 percent) and winding (CAGR: 11.4 percent).

Exhibit 5

CAPEX development by tool type 2020-2030

USD billions



1. Laser cutting, cutting, bending, laminating, impregnating/coating, and surface hardening

2.3 Strong regional differences expected due to levels of e-mobility uptake

Our analysis reveals that the direction in and degree to which **capex** is expected to shift will also vary significantly by region (Exhibit 6). These differences are, in part, attributable to different growth expectations with regard to the number of vehicles produced per region. Specifically, Europe and China – the regions with the highest e-mobility shares in 2030 – are expected to see the most significant **capex** reductions between 2020 and 2030. Based on recent developments, EV share is likely to increase even more in Germany, for example, based on more aggressive incentives due to COVID-19 in 2020. At the same time, regulatory targets are expected to increase in China and the US.

On the other hand, emerging markets will likely experience growth for both ICE and EV powertrains. In particular, we see growing markets in South Asia, South America, the Middle East, and Africa, where electrification is still relatively less advanced. These regions are also forecast to have the largest share of ICE vehicles in 2030.

The strong concentration of battery manufacturers in China might give Asian powertrain suppliers and OEMs easier access to EV technology, and consequently, a competitive advantage.

Exhibit 6

Machine tool capex spend

USD millions

	2020			2025			2030			Share of global capex	
										2020	2030
	Total	ICE	BEV	Total	ICE	BEV	Total	ICE	BEV		
Greater China	**1,888**	1,727	161	**1,510**	480	1,030	**1,264**	76	1,188	**27.8%**	**24.9%**
Europe	**1,830**	1,251	579	**1,280**	411	869	**1,056**	60	996	**26.9%**	**20.7%**
North America	**1,195**	967	228	**1,141**	609	532	**993**	380	613	**17.5%**	**19.5%**
Japan/Korea	**1,073**	923	150	**883**	714	169	**743**	558	185	**15.7%**	**14.6%**
South Asia	**490**	471	19	**608**	544	64	**572**	500	72	**7.2%**	**11.3%**
South America	**259**	247	12	**368**	352	16	**436**	365	71	**3.8%**	**4.6%**
Middle East/Africa	**94**	91	3	**138**	125	13	**138**	125	13	**1.3%**	**2.9%**

II. New strategies for mastering e mobility

1. Four strategic archetypes for machine tool manufacturers

Traditional automotive powertrain machinery is expected to face a market decline of 2.9 percent per annum until 2030, based on the EV breakthrough scenario with high reuse rates for machinery. This is due to the megatrend of electrification, and is a call to action for automotive powertrain machinery manufacturers. They can apply different strategies to either adapt their portfolios and profit from the growth caused by electrification, or build relevant long-term capabilities to diversify into other segments, as shown in some of the industry examples in the following section.

Going forward, machine tool manufacturers focusing on the automotive industry should respond to the shifts in the industry by reorienting their strategies towards assuming one of four strategic roles (Exhibit 7). In the following, we discuss these roles in the context of both their specific requirements and the strategic and operational levers that each implies.

Exhibit 7

4 strategic archetypes for machine tool manufacturers

	Levers		Archetypes: ICE business as a cash cow	Last-one-standing in ICE business	Holistic automotive machine tool supplier	Reduced automotive business
Strategic	Identification of new customer segments	Extend applicability of machines to adjacent customer segments			✔	✔
		Exit traditional automotive machine tool manufacturing			✓	✔
	Implementation approach	Develop capabilities/reskill employees			✔	✔
		Acquire capabilities through M&A			✔	✔
		Acquire other players to grow business and profit from economies of scale		✔		
Operational	Cost reduction	Cut costs across all categories to compensate for lower revenue	✔	✓	✓	✓
	Commercial excellence	Improve sales and aftersales processes		✔	✓	✔

✔ Recommended ✓ Optional

"ICE business as a cash cow." As the focus of this role is on profit margins, it is particularly suitable for machine tool manufacturers who can fulfill the key requirements of low operational costs, having manufacturing locations in low-cost countries, with only minimal investments into machine tools for ICE components being necessary. There is, however,

only one operational lever for assuming and executing this role: cost reduction across all categories to compensate for lower revenue.

"Last one standing in the ICE business." Machine tool manufacturers choosing this role need to aim at becoming the leading player in terms of revenue and secure a large share of profitable aftermarket business. Accordingly, key requirements include already having a high market share in machine tools for ICE powertrains, being willing and able to make investments to become the leading player, e.g., by acquiring business from competitors, and running a strong aftermarket business. To the players who choose this role, three main strategic and operational levers, in addition to limited cost reduction, are available:

— Acquire other players to scale the business

— Profit from economies of scale

— Improve commercial excellence through sales and aftersales in particular.

"Holistic automotive machine tool supplier." The focus here needs to be on extending the portfolio to electromobility and other non-powertrain components. Thus, the key requirements of this role are having machine tool capabilities that are also relevant for other automotive components, as well as a sales team with access to purchasing managers outside the powertrain business, with credibility in the market. Players who decide to assume and execute this role can primarily use these three levers:

— Extend the applicability of machines to adjacent customer segments

— Develop capabilities and reskill employees

— Acquire capabilities through M&A.

Three more levers are at least partially useful: exit traditional automotive machine tool manufacturing, reduce costs across all categories to compensate for lower revenue, and improve commercial excellence through sales and aftersales in particular.

"Reduced automotive business." This role aims at reducing automotive component production or exiting the automotive business entirely, instead focusing on other growth areas, such as medical products. Machine tool manufacturers deciding on this option need to have both the machine tool capabilities relevant for other industries and the financial background to make inorganic portfolio moves. In the context of this role, players can make use of five primary levers:

— Extend the applicability of machines to adjacent customer segments

— Develop capabilities and reskill employees

— Acquire capabilities through M&A

— Improve commercial excellence through sales and aftersales in particular.

In addition, these players can at least partially reduce costs across all categories to compensate for lower revenue.

2. Actions and strategy adaptations in the market

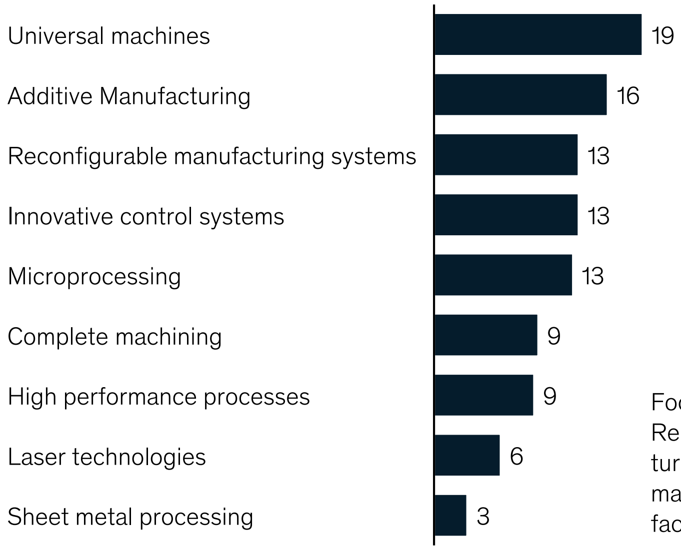
A survey of several industry experts and machine tool manufacturers shows that there is widespread recognition of the changes in the industry and a shifting focus to e-mobility segments and more universal machines which can be used for multiple applications (Exhibit 8).

Exhibit 8

Results from a survey of the machine tool industry show a focus on universal machines and additive manufacturing

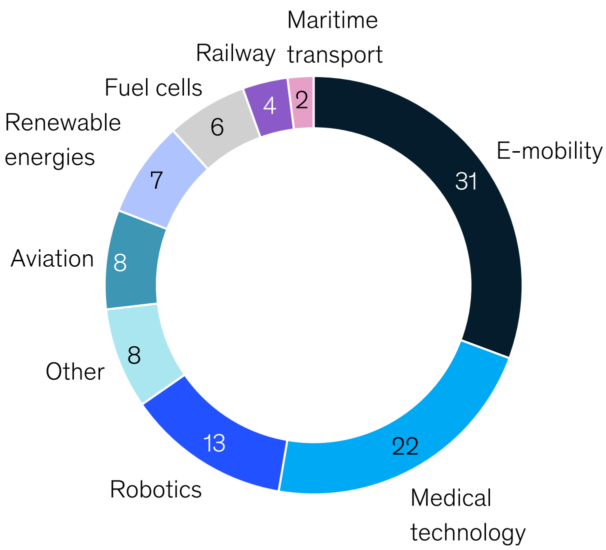
Survey of 17 executives in the machine tool industry, percent

Promising manufacturing processes for EVs



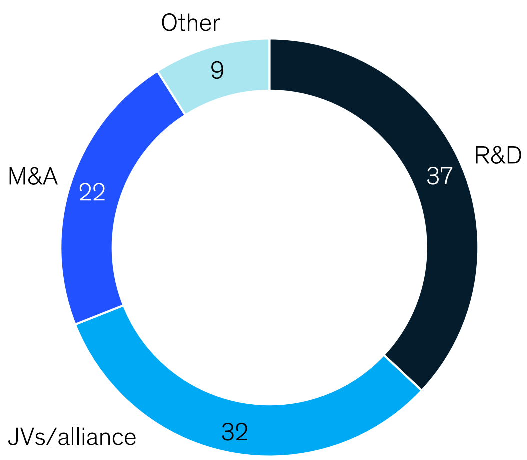
Focus on new technologies Required in the EV manufacturing process, e.g., universal machines and additive manufacturing technologies

Expected investments in new markets to recover from the declining ICE powertrain business



The best substitutes for the declining ICE powertrain business

Share of options to expand in new markets



The main strategies for entering new markets

At the same time, market participants see the COVID-19 pandemic as having only a temporary impact on machinery capex, with a catch-up effect until 2022 (64 percent of all respondents).

The following outside-in case examples show how several machine tool players are currently preparing for the future by adapting their portfolios primarily to the needs of electromobility and/or increasing their share of non-automotive business. Examples in the market show a focus on two of the four archetypes described above: the "holistic automotive machine tool supplier" and "reduced automotive business." Both archetypes lead to higher diversification and show a move away from a highly specialized product portfolio. Key information on the strategic role chosen and the specific strategic and operational levers to be used are indicated at the beginning of each example.

Okuma – computer numerical control machinery
Strategic archetype: "Holistic automotive machine tool supplier"
Key lever applied: "Extending the applicability of machines to adjacent customer segments"

Okuma, a global computer numerical control machinery player with over USD 1.5 billion in annual revenue and more than 3,000 employees, pursues a "holistic automotive machine tool supplier" strategy. As stated by one of Okuma's senior application managers, "the complexity of parts required is growing with the electric car and this is a challenge for manufacturers of machines and controls. [...] As components are becoming more and more complex, our customers are demanding highly integrated machines for electromobility." In order to meet the demands of its customers, the company decided to focus its efforts on integrated and universal machines so that it is able to quickly adapt to the short and flexible product cycles in the field of BEVs.

SW – multi-spindle machining centers and automation solutions
Strategic archetype: "Reduced automotive business"
Key levers applied: "Extending the applicability of machines to adjacent customer segments" and "exiting traditional automotive machine tool manufacturing"

A "reduced automotive business" strategy is pursued by SW, a global supplier of multi- spindle machining centers and automation solutions with over EUR 300 million in annual revenue and around 1,000 employees. Using this strategy, the company aims to leverage its expertise in other industries, such as medical technology, agricultural machinery, and e mobility. This implies a reduction of its share of conventional automotive business as well as new business building in other industries. One of its managing directors in sales summed up the strategy as follows: "[...] what works for turbochargers or connecting rods for the internal combustion engine also increases efficiency in the production of artificial hip and knee joints, bone plates, or surgical instruments [...] and thus significantly reduces their production costs."

Aumann – specialty machinery and automated production lines
Strategic archetype: "Holistic automotive machine tool supplier"
Key lever applied: "Developing capabilities and reskilling employees"

Another case of a "holistic automotive machine tool supplier" strategy is Aumann, a leading global provider of specialty machinery and automated production lines with over EUR 200 million in annual revenue and more than 1,000 employees. The company already geared its strategy towards the new needs of e-mobility some years ago. With decades of experience in the automotive industry, the company decided to focus on the megatrend of electrification and strengthen its portfolio accordingly. The financial impact of this early repositioning is already visible in the company's top line: while revenue in the company's regular automotive segment recorded a double-digit decline in 2019 and the first quarters of 2020, the company's e-mobility segment experienced a high single-digit growth rate for the same time period.

Grob – production systems and universal machines for the automotive industry
Strategic archetype: "Holistic automotive machine tool supplier"
Key levers applied: "Developing capabilities and reskilling employees" and "acquiring capabilities through M&A"

Grob, a leading manufacturer of innovative production systems and universal machines for the automotive industry with over EUR 1 billion in annual sales and more than 5,000 employees, is also leveraging its decades of industry experience for the electrification megatrend by pursuing a "holistic automotive machine tool supplier" strategy. Due to a lack of in-house capabilities, the company was confronted with the strategic decision to either develop technology in house or evolve via M&A activities. As stated by the CEO: "It quickly became clear that to be able to advance professionally, we must either develop winding technology ourselves or buy the appropriate technologies on the market." The company took the strategic decision to acquire a leading manufacturer of machines and systems for the production of stators for electric motors. Combined with its existing in-house technologies and processes, the company is now increasingly working for clients in the field of electromobility.

Outlook: Navigating the shift in the machine tool market for powertrains

As outlined above, electromobility is expected to have an impact along the entire supply chain of the automotive industry. Powertrain electrification may lead to a subsequent demand shift for components and machinery technologies. Four distinct strategic archetypes, each comprised of a different combination of seven strategic and operational levers, make up the emerging solution space in which machinery players might successfully navigate these shifts in demand.

Without a doubt, there is no one-size-fits-all approach to tackling the challenges that the shift described in this report presents to various automotive machinery tool market players. Our findings nevertheless reveal some (pragmatic) key actions that these companies should immediately take in response to these trends to adequately address the related challenges and opportunities.

Assess the capability set – and gear up in the right areas
Adjusting to the fundamental changes in the machinery tool market will require companies to update their current expertise and skills to keep up with the new rules of the industry. Are margins at risk due to a focus on current ICE powertrain technologies such as drilling or milling? Companies need to run the diagnostics to determine how well they are prepared to thrive in the new environment. As a first step, we recommend a 1- to 2-day stress test on site together with industry experts to determine the need for change and identify possible areas for action.

Choose the playing field – and assess current versus future positioning
Companies must decide which fields they want to play in and where to take action to set themselves up for the future. As a first step, they should take pragmatic action to secure quick wins and prepare themselves to prune their portfolios in the medium and long term. Already today, companies need to start thinking about which parts of their portfolios will remain a source of competitive advantage and which ones need to be replaced by more promising elements.

Design a road map – and start testing early
The pace of change should not be underestimated. Companies should develop a comprehensive, long-term strategy to benefit from megatrends and adapt their portfolios accordingly, e.g., by diversifying them or entering new business segments. Electrification of the powertrain and the subsequent impact across the value chain is increasing at an unprecedented rate, particularly with regard to required components and changing needs for machinery. Strategic decisions and questions will look different for OEMs, automotive suppliers, and machinery suppliers. Machine manufacturers should analyze their current portfolios with regard to EV versus ICE technologies, assess potential risk factors caused by a downturn, and elaborate on countermeasures, such as shifting towards new segments. Furthermore, strategic options should be aligned with other business segments and embedded in a company's overall strategy. For ICE-focused businesses, a winning strategy will likely be to drive the industry consolidation process, gain scale, and further improve the cost base.

As component suppliers are affected by both the shift in required components and required new machinery, they need to take into account both OEM demand changes as well as the consequences on their own tooling and equipment portfolios. In this regard, the expected shift to new components may happen faster than the shift towards EVs due to longer use cycles of ICE powertrain machinery. Given this staggered impact, OEMs, tier-one automotive suppliers, and machinery players may be called on to collaborate on solutions for safeguarding long-term supply chain reliability. OEMs may benefit from closely monitoring their supply chain reliability, including potential risks arising from key suppliers and machinery players with declining business or financials.

To sum up, the powertrain machine tool market will remain an attractive industry with a complex structure and considerable changes in the medium and long term. Based on these expected changes, we see a need for action. Those players who realize that they need to do more than simply continue manufacturing machine tools for ICE powertrains and who are willing to take strategic action now will be able to outperform their competitors and excel in their respective segments – and maybe even successfully take on new ones.

Appendix: Approach and methodology

The model considers annual new-car sales, the number of components per vehicle by powertrain type, and machine characteristics (e.g., average processing time per component, average purchasing price, expected lifetime).

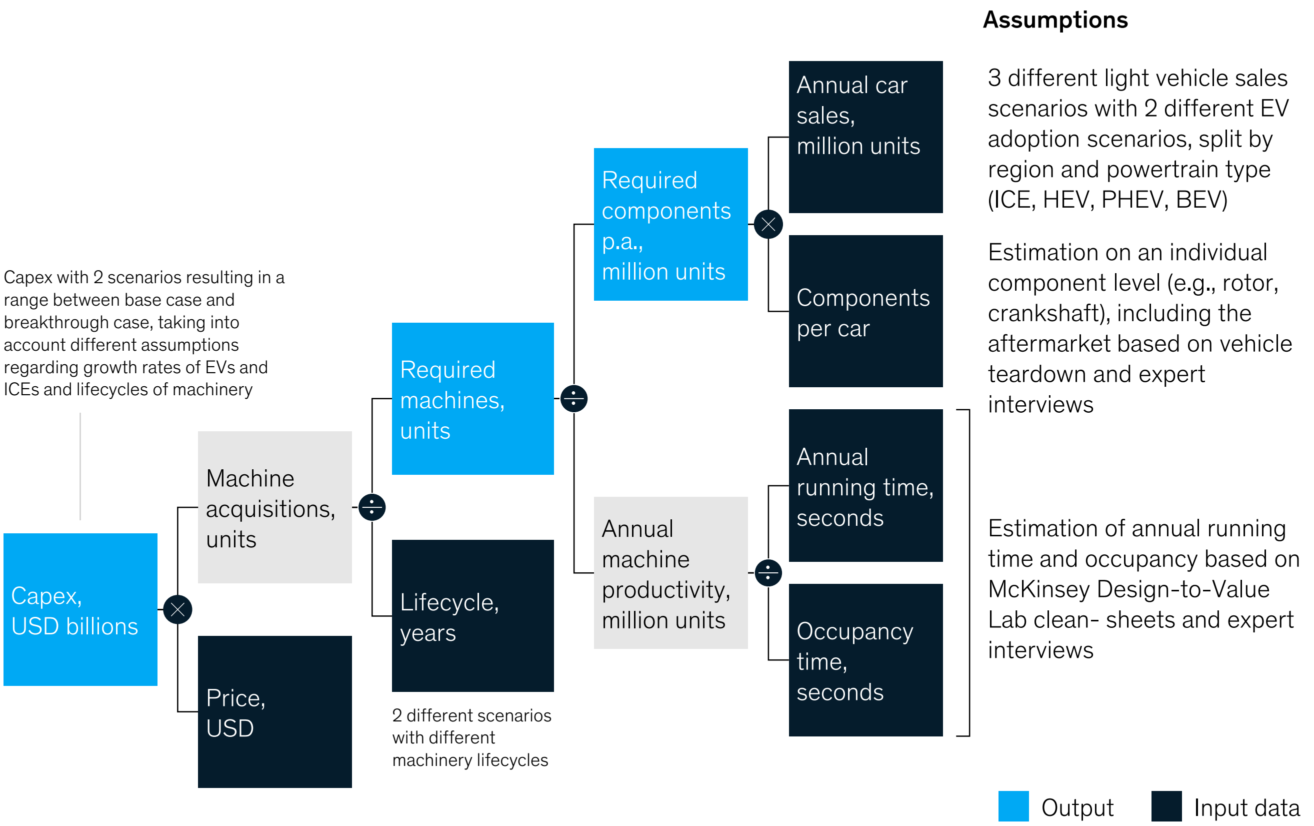
Text Box 4: How we arrived at our insights into new-car sales

Our proprietary forecast for the development of new-car sales by powertrain is based on the McKinsey Mobility Model. The forecast takes into account macroeconomic factors such as regulatory developments by region and expected consumer pull regarding EV share. Depending on the scenario, EV growth is based on regulatory developments only or takes into account additional consumer pull. Moreover, the forecast considers further trends, such as autonomous driving or shared mobility, in order to arrive at the number of new-car sales, as well as average vehicle cost and battery cost.

While the model is calculated based on a continuous yearly capex decrease, the shifts in affected machinery and demand will most likely happen stepwise based on the change in the number of powertrains manufactured. If OEMs switch to electric powertrains at a higher rate or earlier than assumed, there will be an immediate impact on the machinery primarily used for ICE powertrains.

Exhibit 9

CAPEX driven by development of components by powertrain type and machine lifecycle



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