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# ECONOMIC UPDATE

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## EXECUTIVE SUMMARY

**AMERICAS: LAST MONTH'S ECONOMIC DATA** supported opposing forecasts for the direction of the U.S. economy. Warnings of a downturn came from the manufacturing and services sectors, as well as news of dwindling business investment and flagging consumer spending. More reassuring signals flashed from the latest **employment data**, as the unemployment rate fell to a low not seen since 1969. **The housing market** improved with gains for new and existing home sales, while mortgage rates continued to edge lower. **Factory activity** tumbled to a more than 10-year low in September as lingering trade tensions weighed on exports. **Durable goods orders** climbed, but if Pentagon orders are set aside, bookings sank in an otherwise soft report that added to a picture of a slowing economy. **The trade deficit** widened further, driven by a huge increase in consumer goods imports to avoid new tariffs on China taking effect in the final quarter of this year. Imports of cellphones increased by double-digits. **The ISM services index activity** slowed to a three-year low amid rising concerns about tariffs, the latest sign that trade tensions were eroding economic momentum more broadly. **The Leading Economic Index** was unchanged, but **consumer confidence** fell by the most in nine months. **Retail sales** climbed, driven by a jump in spending on vehicles. However, outside of motor vehicles and parts, retail sales in most other categories were flat.

**OVERSEAS: EUROZONE MANUFACTURING ACTIVITY** fell to its worst level in seven years in September. The euro drifted toward its lowest levels against the dollar in years as Europe takes the brunt of a global growth slowdown. **The WTO** slashed its forecast for trade growth for this year and 2020. **India's central bank** cut its key lending rate to a nine-year low and slashed the country's growth forecast, as India struggles with a surprising slump in consumer demand. **China's manufacturing activity** rebounded in September due to improving domestic demand, but export orders remained subdued.

**STEEL: THE AMERICAN STEEL INDUSTRY** faced further challenges as the GM strike entered its third week, threatening to release additional finished metal into oversupplied spot market already suffering from depressed pricing. **Steel imports** into the U.S. for the first eight months of 2019 were down 13.6% compared to the same period in 2018. **U.S. Steel** announced it will acquire a substantial stake in Big River Steel, forging a partnership with a lower-cost rival that has threatened its core business. USS said the impact of falling steel prices through the 2<sup>nd</sup>Qtr and the larger than expected drop in scrap prices will lower flat-rolled earnings for the second half of this year.

**METALS/COMMODITIES: CHINA DOMINATES RARE EARTH SUPPLIES** which has caused the U.S. to find ways to lessen its dependence on China for the materials critical for a wide range of high-tech applications. This is particularly relevant for the U.S. military but equally for consumer electronics, automobiles, battery storage and wind turbines. **Nickel** posted its strongest quarterly performance since 2010 in the third quarter, rising 34% following rumors of an impending export ban and electric vehicle industry growth expectations. **Rio Tinto** has scrapped plans for a sale or initial public offering of its Canadian iron ore unit after years of looking to unload it. Depressed iron ore prices have now made such an investment unattractive.

**AEROSPACE: THE WTO RULED THE U.S. IS ENTITLED TO LEVY TARIFFS** on \$7.5 billion of exports from the EU over the bloc's subsidies to Airbus, potentially opening up a new front in the Trump administration's global trade fight. The U.S. said it would place new tariffs on European goods on October 18 and the EU vowed to retaliate. **Boeing and the U.S. Navy** successfully completed the first test flight of the MQ-25 unmanned aerial refueler. **Lockheed Martin** reported that the U.S. Air Force has cleared initial production for a new Sikorsky combat rescue helicopter.

**AUTOMOTIVE: U.S. LIGHT VEHICLE SALES FELL** about 12% in September, as the biggest Asian automakers recorded double-digit sales declines and estimates for the Detroit 3 showed double-digit drops as well. **Tesla** achieved record production and shipments in the 3<sup>rd</sup>Qtr. **Volkswagen** is preparing for the biggest legal claim of its kind in modern German history as the initial oral hearing of a collective lawsuit against the automaker for emissions test cheating begins in October. **Ford** will put most of its operations in India into a joint venture headed by the Indian vehicle maker Mahindra & Mahindra.

**MEDICAL: NEW 3D-PRINTED TITANIUM INTERBODY IMPLANTS** for spinal fusion were launched by **DePuy Synthes**. The implants are 80% porous, enabling them to mimic the natural bone structure and facilitate spinal fusion. They have a nanoscale surface roughness that may lead to an increase in adhesion of osteoblasts compared to conventional titanium materials. **Employer-provided health care coverage cost** passed \$20,000 for a family plan this year. Between 2013 and 2017 average prices increased 17.1%. In particular, small employers and their workers are struggling.

**ENERGY: RENEWABLE ENERGY SOURCES** are strongly favored by a large majority of Americans over fossil fuels, particularly solar and wind, according to a new poll. Around half of the respondents also said there should be less emphasis on coal power. **Xcel Energy** announced a partnership to develop a 240-megawatt solar facility at a steel mill in Pueblo, Colorado. The facility will be located at the EVRAZ Rocky Mountain Steel operation.

**INNOVATION: OCEAN FLOOR POLYMETALLIC NODULES** will be collected by **DeepGreen** from certain areas of the Pacific where they occur naturally and in high concentrations. The nodules contain high grades of manganese, nickel, cobalt and copper. DeepGreen will process them into battery-grade metals, producing no tailings and little or no waste from processing. German urban air mobility (UAM) developer **Volocopter** unveiled its first electric vertical take-off and landing (eVTOL) aircraft to enter series production. **MIT engineers** have developed robotic thread that can be steered magnetically through narrow spaces such as the vasculature of the human brain.

## THE AMERICAS

- **The U.S. economy** added 136,000 jobs in September. The jobless rate dropped to 3.5% from 3.7% in August, marking the lowest jobless rate since December 1969. Average hourly earnings climbed 2.9% from September 2018, a slowdown from previous months but still higher than inflation. Manufacturing employment declined by 2,000. Other industries, including health care and transportation, added jobs at a robust clip. The share of Americans working or searching for work last month held steady at 63.2 percent.
- **The U.S. trade gap** widened 1.6% in August from a month earlier to \$54.9 billion. Imports grew 0.5%, driven by a 3.4% increase in consumer goods imports to \$57.23 billion, the highest level on record. Imports of cellphones were up 13.3% in anticipation of new tariffs on China. Exports were up 0.2%, driven by a 3.4% increase in exports of capital goods and fuel oil. Automobile exports climbed 2.7% to \$14.28 billion, the highest level since July 2014.
- **U.S. import prices** fell 0.5% in August. Fuel prices dropped 4.3%, as lower-cost petroleum (-4.8%) more than offset higher prices for natural gas (+16%). Export prices declined 0.6%. Prices for agricultural exports slumped 2.5% in August, mainly due to lower prices for vegetables, corn, soybeans, cotton, meat and wheat.
- **U.S. consumer confidence** fell by the most in nine months in September, as Americans' economic outlooks darkened in the face of the U.S.-China trade war. The Conference Board index of consumer attitudes fell to 125.1 from an downwardly revised 134.2 the month before. The expectations index (based on consumers' short-term outlook for income, business and labor market conditions) declined to 95.8 in September from 106.4 in August.
- **U.S. retail sales** climbed 0.4% in August, driven by a 1.8% jump in spending on vehicles. Outside of motor vehicles and parts, retail sales were flat and without both vehicles and gasoline, they rose a tepid 0.1%. Consumers spent less on food, dining out and shopping at furniture and department stores.
- **U.S. consumer prices** increased 0.3% in August, but a decline in energy prices held back the increase in the overall CPI to 0.1%. The core CPI was boosted by a surge in healthcare costs and increases in prices for airline tickets, recreation and for used cars and trucks. In the 12 months through August, the core CPI increased 2.4%, while the overall CPI increased 1.7% in August.
- **The Leading Economic Index** was unchanged in August at 112.1 following a 0.4% increase in July, and no change in June. The Conference Board Coincident Economic Index increased 0.3% in August to 106.4 after no change in July and a 0.3% June gain.
- **U.S. producer prices** edged up 0.1% in August as a jump in the cost of services offset the largest drop in the price of goods in seven months. In the 12 months through August, the PPI advanced 1.8%. Excluding the volatile food, energy and trade services components, producer prices jumped 0.4%. The core PPI expanded 1.9% in the 12 months through August after increasing 1.7% in July.



- **U.S. factory activity** tumbled to a more than 10-year low in September as lingering trade tensions weighed on exports. The ISM index of national factory activity dropped 1.3 points to a reading of 47.8, the lowest level since June 2009, when the recession was ending. The manufacturing sector accounts for about 11% of the U.S. economy. The ISM index needs to drop below the 42.9 level to signal a recession in the broader economy.
- **U.S. industrial output** rose 0.6% in August. Mining output jumped 1.4%, partly because oil and gas drilling rebounded after Hurricane Barry shut down production in July. Utility output rose 0.6%. Manufacturing production climbed 0.5%. Auto production dropped 1%. Output of computers, aircraft and furniture rose. Manufacturing output fell in the first two quarters of this year. In the past 12 months, factory output has dropped 0.4 percent



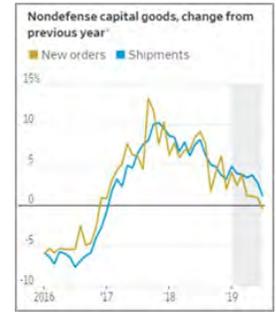
**Key Update:** August industrial production rose as manufacturing output and capacity utilization improved, but the ISM/PMI index points to further weakness in factory activity ahead.

- **Durable goods orders** rose 0.2% in August, but if Pentagon orders are set aside, bookings sank 0.6% in an otherwise soft report that added to a picture of a slowing U.S. economy. A key measure of business investment known as core orders slipped 0.2%. Orders fell sharply for commercial planes, reflecting the usual seasonal decline toward the end of the summer and Boeing's ongoing troubles with its grounded 737 MAX plane. Aircraft and parts shipments have crumbled 30.2% over the last year, the worst since the recession. Demand waned for new cars and trucks, computers, networking gear, appliances and electrical equipment.
- **U.S. factory orders** dipped 0.1% in August after surging by 1.4% in July. Factory orders edged down 0.1% compared to August 2018. Shipments of manufactured goods fell 0.1% in August after decreasing 0.3% in the prior month. Unfilled orders at factories nudged up 0.1% after the same gain in July. Inventories were unchanged in August after ticking up 0.1% in July.
- **The ISM nonmanufacturing index activity** slowed to a three-year low in September amid rising concerns about tariffs, the latest sign that trade tensions were eroding economic momentum. The ISM services index fell to 52.6 in September from 56.4 in August, reflecting declines in production and new orders.
- **U.S. consumer spending** in August edged up 0.1% as an increase in outlays for recreational goods and motor vehicles was offset by a decrease in spending at restaurants and hotels. Consumer spending accounts for more than two-thirds of U.S. economic activity. Personal income rose 0.4% in August. Wages increased 0.6%. Savings rose to \$1.35 trillion from \$1.29 trillion in July.



- **The U.S. housing market** improved in August as new home sales increased 7.1% to an annual rate of 713,000 units, boosted by a surge in activity in the South and West. Existing home sales expanded 1.3% to an annual rate of 5.49 million units and represented a 2.6% increase year-over-year. Housing starts climbed 12.3% to an annual rate of 1.364 million. The 30-year fixed mortgage rate has dropped about 120 basis points from last year's highs to an average of 3.73%. Home price growth continued to lose momentum. Average national home prices grew 3.2% in the year ending in July, unchanged from the prior month. The gain in the 20-city index slowed to 2% from 2.2% in July.
- **Construction spending** edged up 0.1% in August as continued weakness in nonresidential construction offset the best gain in home building in nine months. Home construction, which has been in the doldrums for much of this year, was up 0.9% in August. The latest overall figure marked the fourth month of lackluster results, including declines in May and June and a flat reading in July.  
**Key Update:** Overall construction expenditures came in at an annual rate of \$1.29 trillion in August, down 1.9% from a year ago.
- **U.S. business investment** declined at a 1.0% annualized rate in the 2<sup>nd</sup>Qtr, pulled down by an 11.1% rate of decline in spending on structures in the categories of commercial and healthcare, and mining exploration. After-tax profits, without inventory valuation and capital consumption adjustment, increased at a downwardly revised \$59.7 billion, or 3.3% rate. Profits were previously reported at \$86 billion, or at a 4.8% rate in the second quarter.
- **U.S. companies** have filed more than 16,000 requests for exemptions from the \$200 billion of tariffs on Chinese goods that the Trump administration imposed one year ago. Of those appeals, over 10,000 have come from just one company, Arrowhead Engineered Products of Blaine, MN. Arrowhead imports thousands of aftermarket repair parts for cars, lawn mowers, all-terrain vehicles and other items from China, which are now all being taxed with a 25% tariff that is set to jump to 30% on October 15. The duties have undermined Arrowhead's business model of selling cheaper alternatives to manufacturers' parts. Appealing the levies has proved a challenge in itself, illustrating the trade war's sometimes hidden toll on U.S. companies. Seeing no viable alternatives to the many parts it imports from China, Arrowhead ended up filing appeals for each gasket, air filter, spark plug and other imported parts, hiring a crew of temporary workers to submit the requests manually.
- **Rio Tinto**, after years of looking to unload its Canadian iron ore unit, has scrapped plans for a sale or initial public offering of the business. Rio Tinto has a 59% stake in Iron Ore Company of Canada. Timing has turned against a split, as iron ore prices that hit a multi-year high earlier this year have receded and look to decline further in 2020. (See [Appendix: Commodities](#), page 15)
- **Tesla** achieved record production of 96,155 vehicles in the third quarter and record deliveries of approximately 97,000 vehicles (consisting of 17,400 Model S/X cars and 79,600 Model 3s). In a push to make its delivery numbers, Tesla adjusted its Model 3 prices often, and in September offered customers two years of free supercharging and other incentives.

- **U.S. steel mills** shipped 8.1 million tons of steel in July, a 5.1% increase from June and a 2.6% increase from July last year. Steel mill shipments year-to-date through July were 56.3 million tons, a gain of 2.0% over 2018 shipments for seven months.
- **U.S. manufacturers** are investing less in their factories and workforces as the trade dispute with China makes it more difficult to anticipate costs and demand. Truck maker Navistar International expects to spend \$115 million on capital projects this year, down about 25% from its previous forecast after truck orders slowed sharply in recent months. Caterpillar's capital expenditures dropped 16% in the second quarter from a year earlier. Illinois Tool Works said business uncertainty reduced demand for its welding, measurement and other equipment in the second quarter.
- **U.S. raw steel production** for the year-to-date through September 28 was 72.6 million tons at a capability utilization rate of 80.6%, an increase of 3.4% from the 70.1 million tons produced during the same period in 2018 at a utilization rate of 77.5%.
- **Steel imports into the U.S.** were 2.0 million tons in August, including 1.783 million tons of finished steel, down 34% and 3.4% respectively vs. July's final numbers. For the first eight months of 2019, total and finished steel imports were 20.668 million and 15.321 million tons, down 13.6% and 15.9% respectively vs. the same period in 2018. Finished steel import market share was estimated at 19% in August and 20% year-to-date.
- **The United States** is looking to secure new supplies of rare earths to lessen its dependence on China for the materials critical for a wide range of high-tech applications. The current trade war with China has focused the U.S.'s attention on the perilous state of its raw material supply chain. This is particularly relevant for the U.S. military but equally so for a range of high-tech industries from consumer electronics, automobiles, battery storage and wind turbines. The U.S. is seeking cooperation from potential supplying countries outside of China — notably Australia, but also Greenland, Botswana and Peru. The U.S. is looking to develop not just alternative raw material supply, but it also seeks to develop and invest in overseas refining facilities.  
**Key Update:** China dominates about 80% of mining and over 90% of refining of rare earth metals.
- **U.S. Steel** will acquire a stake in Big River Steel, forging a partnership with a lower-cost rival that has threatened its core business. USS will pay \$700 million in cash for a 49.9% stake in Arkansas-based Big River, with an option to acquire the remaining 50.1% within four years. Big River, which began operating in 2017, gives U.S. Steel access to the technology and management for producing sheet steel from melting scrap in an electric furnace. Big River's mill in Arkansas is one of the newest and most efficient in the United States. The deal is expected to make U.S. Steel more cost-competitive with rivals that use electric furnaces to turn scrap metal into new steel. (See [Appendix: Steel](#), page 9)



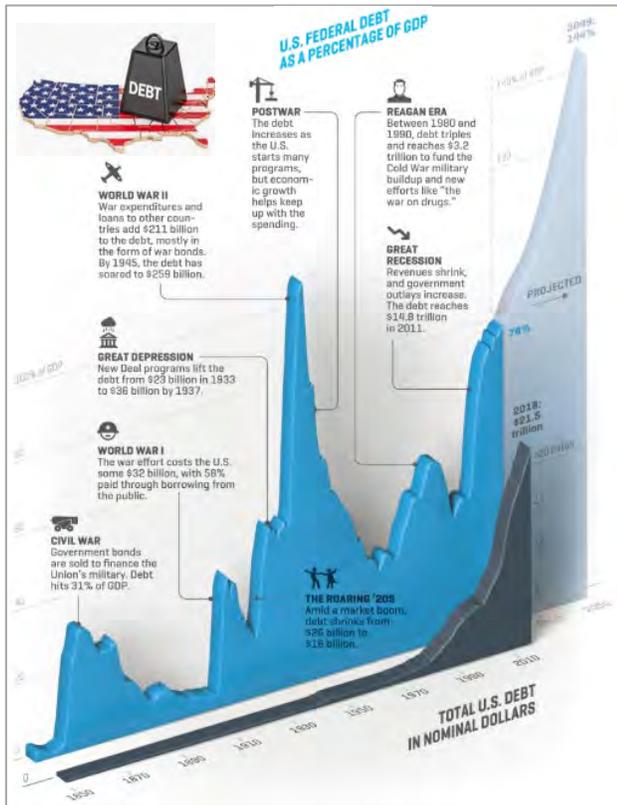


- **ArcelorMittal** is evaluating a potential sale of iron ore operations in Canada, Brazil and Liberia, as it seeks to cut debt by divesting non-core businesses. MT has not kicked off a formal sale process but is speaking with financial advisors about options, including selling partial or full stakes in at least some of the assets. The Canadian business, which produces over 26 million tonnes/year of iron ore concentrate, is the largest and most profitable of the three mining operations and according to reports could be valued at about \$2 billion.
- **U.S. Steel** forecast a 3<sup>rd</sup>Qtr adjusted loss of \$0.35/share vs. analyst consensus for a \$0.07/share loss. USS said the impact of falling steel prices through the 2<sup>nd</sup>Qtr and the larger than expected drop in scrap prices will lower flat-rolled earnings in the 2<sup>nd</sup>Half. The company estimated flat-rolled shipments will total 10.7 million tons this year, down from a prior outlook of 11 million tons and expects to keep its three idled blast furnaces offline through the rest of 2019. Nucor and Steel Dynamics issued similar warnings.
- **The United Auto Workers strike** at General Motors entered its third week at the start of October bringing the company's more than 30 U.S. factories to a standstill, denting third-quarter profits and limiting models to dealerships. GM and UAW bargainers continued to negotiate a new labor agreement for the company's 46,000 full-time factory workers. Top negotiators are trying to resolve differences on key economic issues, such as wages and use of temporary workers, but the two sides still remain at odds. The nationwide strike is the longest at the company since 1970. (See **Appendix: Automotive**, page 11)  
*Key Update: If the strike continues until October 6, GM will have lost \$660 million in profits, and the UAW members and nonunion workers who have been laid off will have lost more than \$412 million, according to analysts at Anderson Economic Group.*
- **A U.S.-Japan trade deal** was signed that will lower agricultural tariffs in Japan, industrial tariffs in the U.S. and set new rules for digital trade. The limited accord covering about \$7 billion of U.S. agricultural goods is potentially the first step in a broader trade agreement between the two countries. The U.S. and Japan kept the negotiations limited in scope to avoid the need for Congress to vote on the deal. Japan had expected to receive protection from the Trump administration's threatened tariffs on automobile imports, but the initial U.S. announcement made no mention of any assurances to Japan that it would avoid the tariffs. Prime Minister Abe said he had received reassurance from Trump that the U.S. would not impose previously threatened Section 232 national security tariffs on Japanese car imports.
- **The U.S. light-vehicle sales** fell about 12% in September, as the biggest Asian automakers recorded double-digit sales declines and estimates for the Detroit 3 showed double-digit drops as well. Still, the seasonally adjusted annual sales rate came in at a very robust 17.16 million. Ford Motor Co. posted a 12% drop for the month, while GM and Fiat Chrysler fell an estimated 10%. Ram was the only FCA brand to post a gain during the month. The latest quarter was the first in which each of the Detroit 3 reported on a quarterly basis. GM's 3<sup>rd</sup>Qtr sales rose 6.3%, as Ford's sales fell 4.9% and FCA sales increased only a fraction, up 527 vehicles to 565,045 units.

- **The steel and aluminum industries** face further challenges as the GM strike entered its third week, threatening to release additional finished metal into oversupplied spot markets. Several steel and aluminum suppliers already have seen their operations suffer, according to an *Argus* report, which cited an unnamed major steel service center that said if the strike continues it will "start sending a ripple through the entire supply base soon" and another that said at least 20% of its business had been impacted by the strike. *Argus* calculates GM consumes 8,600 tons of steel and 1,600 tons of aluminum daily, meaning a 30-day strike would cut 260,000 tons of steel and 49,000 tons of aluminum consumption. Finding a home for so much excess metal would be difficult; weakening flat-rolled steel demand already has weighed heavily on spot prices.
- **The WTO** ruled the U.S. is entitled to levy tariffs on \$7.5 billion of exports from the EU over the bloc's subsidies to Airbus, potentially opening up a new front in the Trump administration's global trade fight. A list was released of products that will get new tariffs as early as Oct. 18, including 25% levies on French wine, Italian cheese and single-malt Scotch whisky. The main target is Airbus aircraft made in the EU, which face a 10% duty that could hurt U.S. airlines like Delta which have billions of dollars of orders waiting to be filled. The WTO's decision concludes part of a 15-year battle over support programs for aircraft makers Airbus and Boeing. The WTO will rule on a separate EU case against U.S. subsidies to Boeing, also previously deemed illegal, in the first half of next year, determining the value of U.S. exports the EU will be permitted to hit with tariffs.  
*Key Update: Trump is poised to decide by Nov. 13 whether to levy tariffs on EU cars and auto parts, raising the threat of a rapid escalation of trans-Atlantic duties on goods worth \$100 billion.*
- **Boeing and the U.S. Navy** successfully completed the first test flight of the MQ-25 unmanned aerial refueler. The MQ-25 test plane completed the autonomous flight under the direction of Boeing test pilots operating from a ground control station. The test validated the aircraft's basic flight functions and operations with the ground control station. The MQ-25 will provide the Navy with a much-needed carrier-based unmanned aerial refueling capability. Meanwhile, each country will make its own decision on when the Boeing 737 MAX returns to service, according to the FAA, which hasn't yet set a timeline on when to allow the jets back into U.S. skies.
- **Lockheed Martin** reported that the U.S. Air Force has cleared for initial production a new Sikorsky combat rescue helicopter based on the venerable Black Hawk helicopter. The new helicopter will perform combat search-and-rescue and personnel recovery operations for all U.S. military services. The new design includes a fuel system that nearly doubles the capacity of the internal tank on a Black Hawk, giving the Air Force crew extended range and more capability to rescue those injured in battle. It also improves the craft's performance in hovering, electrical capacity, avionics, cooling, weapons, cyber-security and environmental capabilities. The Air Force program calls for 113 helicopters to replace its predecessor, the Sikorsky HH-60G Pave Hawks.



- Piling up debt** in times of tumult is a strategy with a long, successful history in the U.S. When confronted with wars or cataclysmic downturns, the government borrows heavily, driving up debt relative to U.S. GDP and then rebalances when good times return. But a decade after the most recent crisis-driven borrowing binge, the Great Recession, U.S. debt continues to soar. According to the Treasury Department, federal borrowing is now set to hit \$1.23 trillion in 2019 on top of \$1.34 trillion in 2018. Absent major legal or policy changes, the CBO projects the debt-to-GDP ratio will rise into uncharted territory in decades to come.



**Key Update:** The U.S. budget gap widened to more than \$1 trillion in the first 11 months of the fiscal year, the first time year-to-date deficits have topped that mark since 2012.

- A new Business Insider poll** found that a large majority of Americans strongly favor cleaner sources of energy over fossil fuels. *Insider's* results align with other polling data on renewable energy. Americans overwhelmingly favor expanding the production of green energy sources, particularly solar and wind. Around half also said there should be less emphasis on coal power.
- Google** recently invested a record-breaking amount in renewable energy deals in the U.S., Chile and Europe. They have announced a total of 18 new deals, which is by far their largest investment in renewable energy deals. These renewable energy deals are worth a total of 1,600 megawatts (MW), which brings Google's set of wind and solar agreements to 5,500 MW in total. The company also plans to purchase around 720 MW in the U.S. from solar farms located in North Carolina, South Carolina and Texas. Google also plans to buy an additional 125 megawatts in Chile to power their data center in that country. (See [Appendix: Energy](#), page 12)

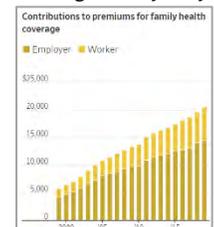
- Xcel Energy** announced a partnership to develop a 240-megawatt solar facility at a steel mill in Pueblo, Colorado. The facility will be located at the EVRAZ Rocky Mountain Steel mill. Lightsource BP will finance, build and own the "Bighorn Solar" facility and sell the energy to Xcel under a long-term power purchase agreement. The companies said the project provides EVRAZ with predictable electricity prices and allows the mill, which employs about 1,000 workers, to stay in Pueblo. The \$250 million solar facility is expected to begin operation by the end of 2021, create about 300 jobs and generate about \$22 million in property-tax revenue. Xcel touted the project as part of its goal to deliver 55% renewable energy to the grid by 2026 and reduce carbon emissions by 60%.

- DePuy Snythes** launched new 3D-printed titanium interbody implants for spinal fusion that are 80% porous, enabling them to mimic the natural bone structure and facilitate spinal fusion. The implants have a nanoscale surface roughness that may lead to an increase in adhesion of osteoblasts vs. conventional titanium materials; EIT cellular titanium material with a modulus of elasticity similar to cancellous bone; and clear visualization of the space in and around the implant both intra- and post-operatively on X-ray, CT scan and MRI without significant interference, as a result of the structure of the interbody cage.



- Boston Scientific** announced primary endpoint results from the first prospective study initiated in the U.S. to examine the safety of a shortened duration of dual antiplatelet therapy (DAPT) in patients at high risk for bleeding. The trial evaluated its Synergy Bioabsorbable Polymer stent. Synergy is a platinum chromium metal stent with a tiny-ultra-thin layer of polymer containing the drug that is sprayed onto the surface. The drug dilutes out of the polymer and the polymer itself biodegrades so that the final thing left in place is a platinum chromium metal stent. Boston Scientific said the trial demonstrated that a three-month regimen of DAPT is non-inferior to a 12-month or longer regimen in patients with an increased risk of bleeding after being treated with the SYNERGY stent. (See [Appendix: Medical](#), page 13)

- Employer-provided health care coverage cost** passed \$20,000 for a family plan this year. Annual premiums rose 5% to \$20,576 for an employer-provided family plan in 2019, according to the yearly poll of employers by the Kaiser Family Foundation. On average, employers bore 71% of that cost, while employees paid the rest. Employees' costs rose at an even faster clip—the average annual amount workers paid toward premiums for the family plans grew 8%, to \$6,015 this year.

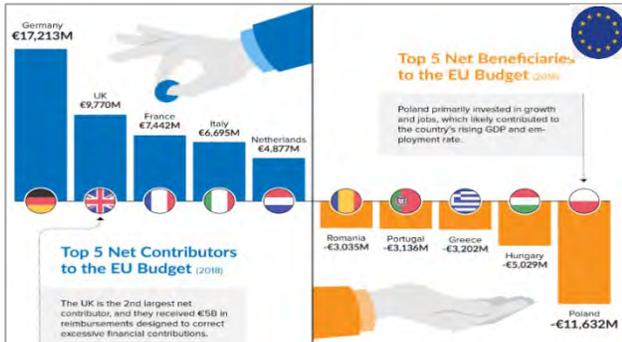


The average deductible for single coverage, which employees pay out of their pockets before insurance kicks in, went up as well to \$1,655, though that didn't factor in plans with no deductible. In particular, small employers and their workers are struggling.

**Key Update:** A report earlier this year that tracked health spending by examining insurer claims from employer-sponsored coverage found that between 2013 and 2017 health-care utilization declined 0.2% and average prices increased 17.1%.

## EUROPE, AFRICA & THE MIDDLE EAST

- **The euro** drifted toward its lowest levels against the dollar in years as Europe takes the brunt of a global growth slowdown. The currency briefly sank below \$1.09 the first week of October, the lowest since May 2017 and not far off the levels below \$1.04 last reached in 2003. Sending the currency weaker are the eurozone's deeply negative rates and expectations of further easing from the European Central Bank. Investors are shifting from the euro into higher-yielding U.S. assets, supporting the dollar. Also at play are broader concerns about trade tensions and the slowing global economy sending money into haven assets, like the dollar.



- **Eurozone manufacturing activity** fell to its worst level in seven years in September. The IHS/Markit final eurozone manufacturing purchasing managers' index slipped to 45.7 from 47.0 in August. This was the eighth successive month that the PMI came in below the 50 mark that separates contraction from expansion.
- **Global manufacturing activity** contracted in September, the fifth time in as many months. It has been slowing since early 2018, with nearly every major economy taking a hit, according to IHS Markit data. Global PMIs have emerged as an important indicator of manufacturing over the past year as the slowdown in the goods-producing sector deepened. "The thing that's really most striking about manufacturing is the extent to which it is such a global industry that is really characterized by trade and value chains," said Jason Thomas, head of global research at private-equity manager Carlyle Group. "Any product of any complexity is not produced in a single country really anymore."
- **Factory activity in Germany** is slowing to levels last seen during the global financial crisis as the country's manufacturing PMI tumbled to 41.4 in September from 43.5 the previous month. "The numbers are simply awful. All the uncertainty around trade wars, the outlook for the car industry and Brexit are paralyzing order books," said IHS Markit's principal economist.  
**Key Update:** *On its current trajectory, the German economy might not see any growth this year; a recession may be around the corner.*
- **ArcelorMittal's** South Africa unit may close some operations as it battles cheap imports, rising costs and a weak local economy. The unit says it plans to review some of its major operating sites, individual plants and production areas, but will exclude its coke operations and the Highveld Structural Mill. MT has started consultations with employees and trade unions on jobs. The business unit said in July it planned to cut more than 2,000 jobs.

- **EU flat-rolled steel market activity** was muted during the summer holidays, even quieter than usual for the time of year. In early/mid-September, the market remained subdued. Distributor buying is still weak due to concerns about their own tight resale margins. Overall demand indicates little or no improvement in the short-term. Global trade tensions and political uncertainty continue to create a great amount of caution. Steelmakers, whose profit margins are being squeezed, attempted to raise base prices but were rejected by buyers. Purchasing executives across Europe were able to negotiate rollover values or small discounts with regional steel producers. (See **Appendix: Steel**, page 10)  
**Key Update:** *Despite cutbacks in production by the major mills, customers perceive no significant supply tightness, although delivery lead times have extended.*
- **Volkswagen** is preparing for the biggest legal claim of its kind in modern German history as the initial oral hearing of a collective lawsuit against the automaker for emissions test cheating is set for early October. More than 400,000 German car owners have signed up for the collective lawsuit, the first "declaratory model action" in Germany, which bears some similarities to U.S. class action lawsuits. Lawyers for VW say they're confident that the case will be dismissed, although it could last for four years and end up at the country's highest court.
- **The European Union** unveiled a list of \$20 billion worth of U.S. imports that it might hit with tariffs in retaliation for new U.S. tariffs set to begin on Oct. 18. These moves represent the endgame of a dispute that goes back 14 years regarding planes made by Boeing and Airbus, the duopoly that controls 99% of the global market for large commercial aircraft. The government subsidies that allow Boeing and Airbus to build their planes are at issue. Boeing gets federal and state subsidies in the U.S., while Airbus is the beneficiary of subsidies from the EU and its national stakeholders, France, Germany, Spain and the U.K. Both sides' claims have been partially upheld by the WTO, giving each side the opportunity to hammer the other with tariffs.
- **The World Trade Organization** slashed its forecast for trade growth for this year and 2020, a troubling indicator as economists warn of continued weakness in the global economy. World trade in merchandise is now expected to expand by only 1.2% during 2019, less than half the 2.6% pace of growth anticipated in April. World trade is forecast to reach 2.7% next year, below the 3% previously foreseen. A weakening world economy, President Trump's trade war with China and fears of a potentially tumultuous Brexit have combined to produce a dramatic slowdown in global commerce, according to the WTO statement.
- **Saudi Arabia** has fully restored oil production to almost 10 million barrels a day following drone attacks on two of its key facilities in September, weighing on crude prices and sending them to the lowest level since August. Brent crude oil, the international benchmark, has fallen sharply since the kingdom said it would quickly be able to restore production, reversing all of the gains made in the immediate aftermath of the strikes. Brent spiked almost 20% to a high above \$71/barrel on the first post-attack trading day, but was trading near \$57.50 in early October.

## ASIA/PACIFIC, JAPAN, AUSTRALIA & INDIA

- The U.S. and India** can reach a trade agreement quickly if New Delhi takes strong, decisive actions, U.S. Commerce Secretary Wilbur Ross said as he was set to meet one-on-one with India's minister for railways and commerce. Washington and New Delhi have been locked in a trade dispute for months. The U.S. removed India from the Generalized System of Preferences (GSP) earlier this year, citing unequal access to the Indian market—the program, in place since the 1970s and aimed at developing nations, allowed India to export many of its goods into the U.S. market without tariffs. India responded by imposing retaliatory tariffs on 28 U.S. products. India was the 13<sup>th</sup> largest goods export market for the U.S. in 2018.

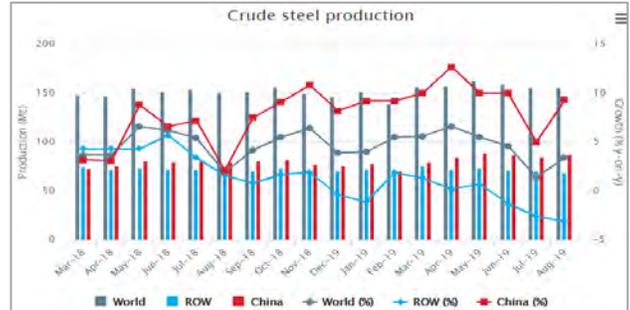


- India's central bank** cut its key lending rate to a nine-year low and slashed the country's growth forecast as Asia's third-largest economy struggles with a surprising slump in consumer demand. Caps on New Delhi's spending, debt-laden companies, thrifty consumers and growing trade tensions globally helped slow India's gross domestic product growth to 5.0% in the quarter ending with June, a six-year low.

**Key Update:** Just last year, India claimed the title as the world's fastest-growing large economy. In the 2<sup>nd</sup>Qtr, its slowing expansion put it behind China and Indonesia, among others.

- China's manufacturing activity** rebounded in September due to improving domestic demand, but export orders remained subdued amid a protracted trade fight between Beijing and Washington. China's official manufacturing PMI rose to 49.8 in September from 49.5 in August, the fifth straight month that the index has stayed below the 50-mark, indicating a contraction in activity. A sub-index measuring total new orders rose above the 50-mark for the first time since May as domestic demand increased. New export orders improved but remained in contraction territory.
- Japan** raised its national sales tax for the first time in more than five years, putting the world's third-largest economy and its cautious consumers to the test. After postponing it twice, the Abe government went ahead with raising the tax to 10% from 8% to support a fast-aging population. Consumption in Japan has only now gotten back to its level before the previous tax increase in April 2014, when the tax rose to 8% from 5%. Initial signs suggested the economy could be in for at least a partial repeat of 2014, when consumers rushed to buy goods before the tax increase and then held back afterward.
- Nickel** posted its strongest quarterly performance since 2010 in the third quarter, with prices rising 34% following rumors of an export ban and electric vehicle industry growth expectations. The price of nickel has seen explosive growth since July, rising as high as US\$16,080 per tonne on the London Metal Exchange in August. When news broke concerning Indonesia's upcoming nickel ore export ban, prices surged to US\$15,490 from US\$14,735 in a single day. As of October 1, nickel was trading at US\$17,375 per tonne. (See [Appendix: Metals](#), page 15)

- World crude steel production** was 156 million tonnes (Mt) in August, up 3.4% vs. a year ago. China's output was 87.3 Mt, up 9.3% from August 2018. Japan produced 8.1 Mt of crude steel, down 7.8% on August 2018. The US produced 7.5 Mt of crude steel in August, an increase of 0.3% vs a year ago. Substantial reductions in output occurred in Brazil, with crude steel production at 2.5 Mt, down by 13.4% and Turkey at 2.6 Mt, down 12.4% on August 2018.

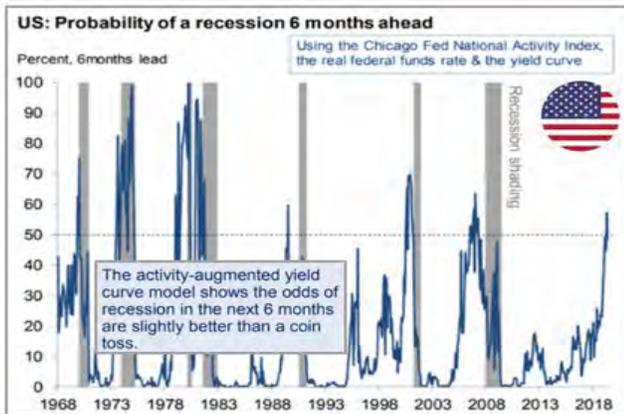


- China's northern regions** are facing a sustained period of heavy smog threatening to overshadow the country's National Day celebrations in Beijing in early October. Cities throughout the region imposed output curbs on steel mills, power plants, coking coal operations and cement factories.
- Tesla's Chinese factory** aims to start production in October but it is uncertain when it will meet year-end production targets due to uncertainties around orders, labor and suppliers. Tesla plans to produce at least 1,000 Model 3s a week from the new factory by the end of this year, the centerpiece of Tesla's ambitions to boost sales in the world's biggest auto market and avoid higher import tariffs imposed on U.S. cars. The plant's mass production schedule is crucial for Tesla's hopes of reaching its total production rate at an annualized 500,000 vehicles by the end of 2019.
- Ford Motor** will put most of its operations in India into a joint venture valued at \$275 million to be headed by the Indian vehicle maker Mahindra & Mahindra, a bid to bolster Ford's position there. Mahindra will own 51% of the joint venture, which will take control of Ford's assembly plant at Chennai and another in Sanand. Ford and other automakers are under pressure as sales slow in key markets, while they are spending billions of dollars to develop electric vehicles and self-driving technologies. The two trends are forcing carmakers to seek alliances to share costs and risk.
- Chinese car maker Geely** is taking a minority stake in German flying taxi start-up Volocopter, the latest investment from the carmaker after it bought into Mercedes-Benz owner Daimler last year. The group's holding company is the lead investor in a financing round by Volocopter to raise €50 million, with the aim of bringing its VoloCity all-electric aircraft to commercial launch within the next three years. In addition to the funding, Geely aims to work with Volocopter to launch air taxis across Chinese cities. (See [Appendix: Innovation](#), page 14)
- Nissan** is seeking to sell a wholly owned subsidiary that distributes vehicle parts and materials in a deal that may be valued at about \$1 billion. The move comes as the struggling Japanese automaker moves to slim down against a backdrop of persistent allegations of financial misconduct. The sale process for the unit is ongoing.



## INDUSTRY OBSERVATIONS

- **The inverted yield curve**, a key predictor for financial downturns, has appeared in recent months at a time when international markets have soured. U.S. stock markets are still near their all-time high and retail sales appear upbeat. Some are arguing the yield curve inversion that has predicted each of the last seven downturns is mistaken this time around. The academic who discovered the correlation between an inverted yield curve and the subsequent downturn stands by its predictive power. "I have gone on the record to issue a recession code red," said Campbell Harvey, a professor of finance at the Fuqua School of Business at Duke University. "Growth will slow according to my model." He also pointed to a recent CFO survey conducted by Duke, in which 67% of CFOs said they expect a recession in late 2020.



- **Tariffs** are not abstract and they are not distant. For example, if the full weight of new U.S. tariffs goes into effect, the price of a pick-up truck dash cover will increase \$25 in price, a Nissan catalytic converter will increase by \$40 and a Honda CR-V driveshaft will increase \$50. "At a time when studies say 40% of Americans have trouble handling a \$400 emergency, such price increases would be problematic for lower-income and even middle-class citizens," the chief merchandising officer at CarParts.com wrote.

**Key Update:** Although Chinese negotiators are scheduled to visit Washington in October, Morgan Stanley said tariff increases scheduled for Oct. 15 on \$250 billion of Chinese goods are likely to go ahead. They point out that past meetings at the negotiator level have been followed by tariff increases, not de-escalation.

- **The IHS Markit index for U.S. services employment** fell to 49.1 in September from 50.4 a month earlier, marking the first contraction and the lowest reading in the sector since December 2009. The overall PMI services index rose by less than expected but still indicated expansion. It was the latest sign that trade tensions have spilled over into broader parts of the economy and firms have become more risk adverse and more eager to cut costs. IHS Markit said its survey on its service-sector employment index is indicative of non-farm payroll growth falling below 100,000.

- **The European Union** will take retaliatory measures in reaction to new U.S. tariffs on European goods, German foreign minister Heiko Maas said. "The EU will have to react and, after obtaining the approval of the WTO, probably impose punitive tariffs as well."

## U.S. LIGHT VEHICLE SALES & INVENTORY LEVELS SEPTEMBER 2019

Company	Sales	Inventory
General Motors	210,863	80
Ford Motor Company	173,333	82
Fiat / Chrysler	180,406	67
Toyota	169,656	50
Honda	113,925	57
Nissan Group	108,966	52
Hyundai / Kia	96,129	47
VW Group	48,691	91
All Cars Sold	338,831	58
All Trucks Sold	930,040	64
<b>Total All Cars &amp; Trucks Sold</b>	<b>1,268,871</b>	<b>63</b>

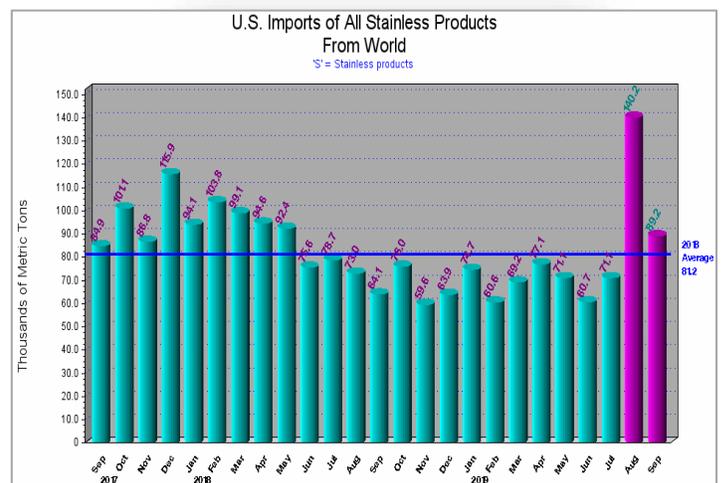
Note: Table reflects U.S. sales for manufacturers that continue to report monthly. GM, Ford and FCA now only report sales quarterly. Inventory is shown in 'Days-will-Last' as of the first day of the month.

## CURRENCIES IN OCTOBER



From	To	Rate	From	To	Rate
USD	¥en	<b>106.43</b>	USD	Korean Won	<b>1,166</b>
CAN \$	USD	<b>.7549</b>	Chinese Yuan	USD	<b>.1428</b>
€uro	USD	<b>1.1036</b>	Australian Dollar	USD	<b>.6805</b>
UK £	USD	<b>1.2930</b>	Mexican Peso	USD	<b>.0516</b>

## U.S. IMPORTS ALL STAINLESS PRODUCTS SEPTEMBER 2019



SOURCE: U.S. Department of Commerce, Enforcement and Compliance  
 Graph last modified on : September 25, 2019 with  
 Licensing Data collected through September 25, 2019  
 Commerce license data used for the last months appear in a different color  
 Data extracted from the import licenses are not official Census data

## ECONOMIC UPDATE: APPENDIX TO OCTOBER 2019 REPORT

### STEEL: STAINLESS STEEL PRECISION ENGINEERED CASES SAFEGUARD PRICELESS ANCIENT MANUSCRIPTS

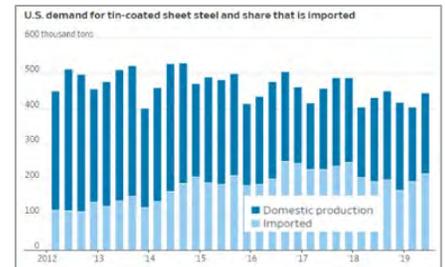
St. Catherine's monastery in Egypt is protecting its priceless collection of ancient manuscripts using precision-engineered stainless steel cases. Situated on the sun-baked slopes of Mount Sinai is the ancient UNESCO World Heritage Site of St. Catherine's, the oldest continuously working monastery in the world. With a history stretching back more than 17 centuries, the Greek Orthodox monastery has been able to endure, untroubled by physical attack, under the constant and careful watch of its monks. This has left both its historic buildings and precious relics completely intact, making the institution's library a treasure trove of irreplaceable texts, with a collection of early codices and manuscripts second only in size to the Vatican's. With such a vital store of ancient and delicate manuscripts, artworks and architectural structures, a UK-based non-profit organization, the Saint Catherine Foundation (which has Prince Charles as its patron), was formed to preserve the monastery. **Working in partnership with the Ligatus Research Center at London's University of the Arts, the Foundation commissioned a set of stainless steel boxes for storing and transporting rare and precious**



**documents from the ancient library.** Part of a huge conservation project to protect the manuscripts for future generations, these ground-breaking stainless steel cases vastly improve the documents' longevity and safety during transport and storage. The case design was put together by the Ligatus Research Center, with Professor Nicholas Pickwood one of the principle designers. For his research team, the decision to look beyond the choice of materials made in traditional manuscript cases was based on certain key factors. First, in the extremely dry conditions of the Sinai desert more traditional case designs would deform, whereas stainless steel is unaffected by low humidity and retains its structure. The cases also make use of precision manufacturing techniques borrowed from the steel industry, which allow for rapid and precise production of the cases. Professor Pickwood's team concluded that although the cost of manufacture for a stainless steel box was higher than traditional alternatives, their superior strength and durability, as well as their near-infinite lifespan, made these manuscript cases more than competitive in price.

### STEEL: U.S. STEELMAKERS STUNG BY TARIFFS AND A BAD VEGETABLE HARVEST

U.S. steelmakers, already stung from tariff-related business moves that have backfired, are facing an unexpected new woe: a bad vegetable harvest. Falling demand for steel cans is a fresh ding to producers. The wettest 12 months on record have wreaked havoc across the Farm Belt and hurt this year's crop of peas, beans and other vegetables packed in steel cans. Halfway through the packing season, canned vegetable volumes are running 10% below last year's level. At that pace, about one billion fewer cans will be needed this year, leaving can makers with an excess of steel sheet. **As a result, U.S. steel mills are dialing back production of steel for cans, undermining recent investments to improve the quality of that product.** Cutting production is also a setback for their efforts to take market share from foreign producers. Last year, nearly half of the domestic demand for 1.7 million tons of tin-coated steel sheet, known in the industry as tinplate or tin mill products (TMP), came from foreign producers, up from about one-third in 2013. Demand for tinplate rose 1.6% during the first half of the year from the same period last year. Imports rose 2.5% as can makers stepped up purchases in anticipation of a bigger vegetable harvest.



But production of cans for vegetables dropped 2.8% in that same period, according to the Can Manufacturers Institute, an industry association. **Tin mill products are also used extensively for automotive components, another market where demand has been declining.** After the Trump administration last year implemented the 25% tariff on foreign metal, domestic producers of steel for cans raised their prices to match what imports would cost including the tariff fee. U.S. Steel and ArcelorMittal used the proceeds to upgrade production lines, hoping to win back customers that were buying more imports. U.S. Steel has committed about \$150 million to its TMP production lines. ArcelorMittal is spending about \$20 million. Those investments are being undermined by the Trump administration's May exemption for Canada and Mexico from the 25% tariff. Duty-free tinplate from Canada (produced at ArcelorMittal's tin mill rolling facilities in Hamilton, Ontario) now accounts for almost one-third of imports of that product into the U.S. Overcapacity and high inventory levels are likely to pressure domestic companies to offer lower prices to can makers in supply contract negotiations this fall.

### STEEL: ESSENTIAL RAW MATERIALS FORECAST NOTES FROM BHP



**Steel:** Demand slowing. China numbers won't hold up. Growth rate is 5% this year on BHP analysis (looking at proxy indicators). Demand has been propped-up by the machinery sector, but that is showing clear signs of rolling over. China steel production at a plateau over the next five years, but electric-arc furnace (EAF) share increasing (doubling by mid-century). **Iron Ore:** Against that steel backdrop, see intermediate target/support at US\$70/t. Think will take 2-3 years for Vale to recover, but China's +30Mt of production added to meet the shortfall becomes uneconomic at \$70/t. **Met Coal:** See less downside than in iron ore. Below cost support for U.S. producers. However, don't expect a rapid recovery as it will take time to deplete inventories in India that were built up heading into the monsoon season. Next 3-6 months still a bit weak. Much more bullish a few years out driven by growing India demand. Not overly worried about China port restrictions, but noted a market expectation that imports don't blow through the 280Mt cap, which would imply a clamp-down over the next few months. **Copper:** Won't slow to the extent steel will next year. Believe fundamentals are unchanged.

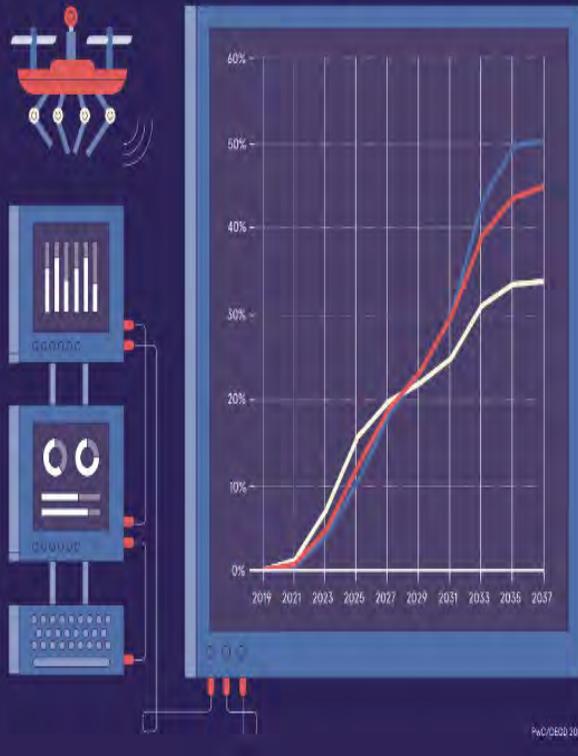


## MANUFACTURING: AUTOMATION'S IMPACT ON THE JOB MARKET

### 01 AUTOMATION'S IMPACT ON THE JOBS MARKET WILL START TO BE FELT FROM THE MID-2020S

Share of jobs with a high potential of automation

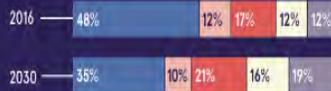
Transportation and storage Manufacturing Wholesale and retail trade



### 02 UPSKILLING NEEDED AS ROUTINE AND MANUAL JOBS MAKE UP HALF OF WORKFORCE

Composition of current skills needed for current and future manufacturing jobs

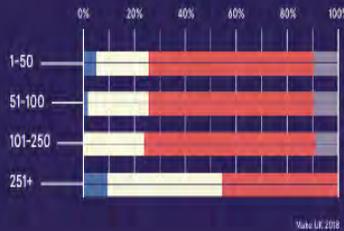
Physical and manual Social and emotional  
Basic cognitive Technological  
Higher cognitive



### 03 AUTOMATION ADOPTION VARIES WITH COMPANY SIZE

Percentage of manufacturers investing to automate processes by number of employees

All of the processes Most of our processes  
Some of our processes None of our processes



### The Age of Automation

The precise details are up to debate, but here are a few key areas that many experts agree on with respect to the coming age of automation:

Half of manufacturing hours worked today are spent on manual jobs.

- In an analysis of North American and European manufacturing jobs, it was found that roughly 48% of hours primarily relied on the use of manual or physical labor.
- By the year 2030, it's estimated that only 35% of time will be spent on such routine work.

Automation's impact will be felt by the mid-2020s.

- According to a recent report from PwC, the impact on OECD jobs will start to be felt in the mid-2020s.
- By 2035, for example, it's projected that 10-15% of jobs in three sectors (manufacturing, transportation and storage, and wholesales and retail trade) will have high potential for automation.
- By 2035, the range of jobs with high automation potential will be closer to 35-50% for those sectors.

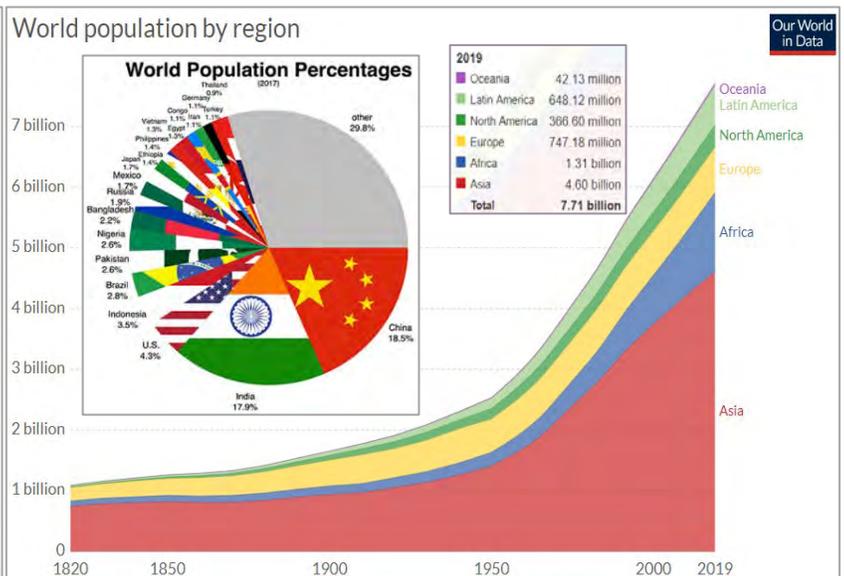
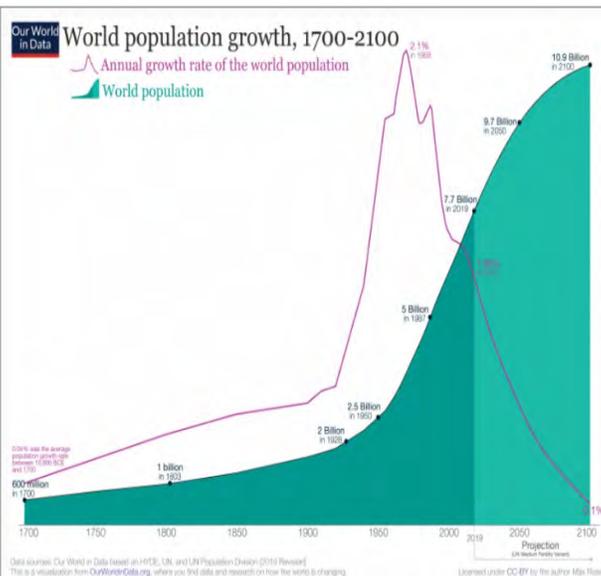
Industrial robot prices are decreasing.

- Industrial robot sales are sky high, mainly the result of falling industry costs.
- This trend is expected to continue, with the cost of robots falling by 65% between 2015 and 2025.
- With the cost of labor generally rising, this makes it more difficult to keep low-skilled jobs.

Technology simultaneously creates jobs, but how many?

- One bright spot is that automation and AI will also create jobs, likely in functions that are difficult for us to conceive of today.
- Historically, technology has created more jobs than it has destroyed.
- AI alone is expected to have an economic impact of \$15.7 trillion by 2030.

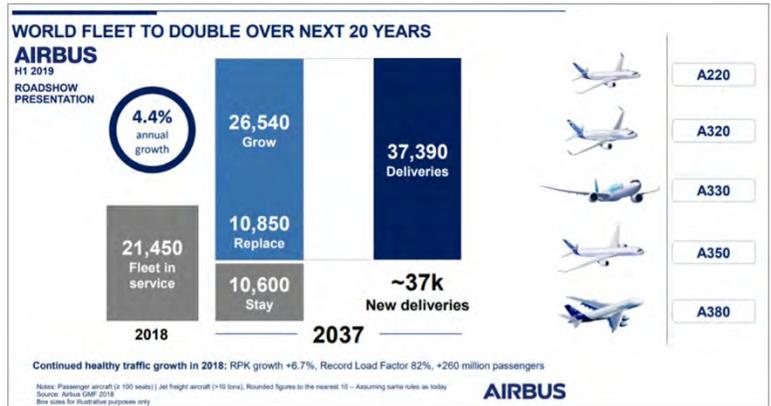
## DEMOGRAPHICS: VISUALIZING A DEMOGRAPHIC TRANSITION OF THE WORLD'S POPULATION





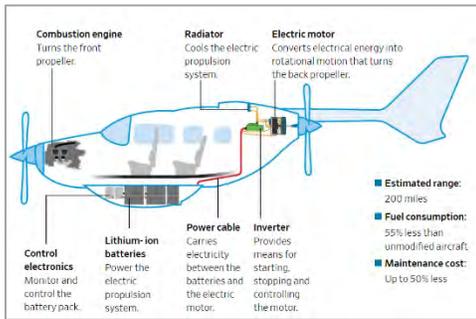
## AEROSPACE: AIRBUS FORECASTS THE WORLD COMMERCIAL AIR FLEET WILL DOUBLE BY 2037

The number of commercial aircraft in operation will more than double in the next 20 years to 48,000 planes worldwide, Airbus has forecast. The European aerospace company said that despite mounting concerns about the effects of aviation and the climate crisis, it believes air travel will continue to grow rapidly. Urbanization and development will mean the emerging global middle class of air passengers could rise 50% by 2038 to almost 6 billion people. **Most of the expected 4.3% annual growth in air traffic will occur in the Asia-Pacific region, where demand for new planes is set to surpass that of Europe and North America combined.** Airbus executives said aviation growth had proved resilient in the face of economic and geopolitical shocks, such as war and oil price rises, and they expected it to continue. Last year, the growth in flying exceeded predictions, with the number of flights per year up by 280,000. Christian Scherer, the chief commercial officer of Airbus, said, “It is as if every single inhabitant of the U.S. took another trip.” **The manufacturer expects about 60% of the global fleet of 22,680 passenger jets and freight aircraft to be replaced with new planes in the next two decades, which it said would “contribute to progressive decarbonization of the air transport industry”.** While newer models of planes are far lighter and consume much less fuel, aviation’s overall carbon emissions have grown due to the huge rise in passenger numbers. Airbus said that on average, fuel consumption by distance per passenger is 47% of what it was in 1990. However, the number of annual passenger flights worldwide has quadrupled to 4 billion during that period. The average aircraft has more seats and spends 2.3 more hours per day flying than 20 years ago, a trend that suggests even more air journeys could come from the 39,000 planes Airbus forecasts to be delivered by 2038.



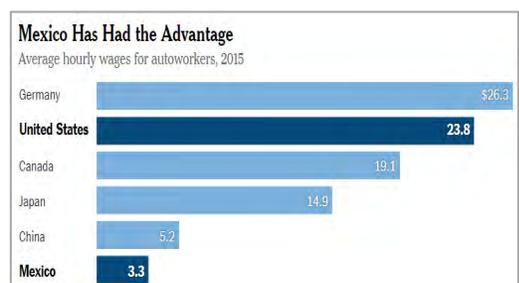
## AEROSPACE: ELECTRIC PLANES START TO TAKE OFF; RETROFITTING EXISTING PLANES DRAWS INTEREST

Aerospace giants and startups are developing electric aircraft that can navigate autonomously, take off and land vertically and potentially shuttle thousands of commuters around cities and suburbs in coming decades. Uber Technologies even plans to launch a transportation service using electric, vertical-takeoff aircraft in 2023. Other entrepreneurs believe retrofitting existing airplanes could help electric aviation take flight even sooner. Ampaire said its planes could be ready for customers by the end of 2021. **Ampaire and others are betting that regulators will approve modified planes more quickly than new electric aircraft and retrofitted planes will still offer significant savings on fuel and maintenance for small airlines and charter companies.** The first retrofitted aircraft, which could be either hybrid or fully electric, will likely carry fewer than 20 passengers and fly between 100 and 200 miles on a single charge. That is enough to connect small airports in regions where traffic or natural obstacles make driving time-consuming. Fitting electrical components on an existing airframe is a challenge, and other industry players aren’t sure that focusing on retrofits is a winning strategy. Planes retrofitted with heavy batteries and generators could quickly become obsolete with the introduction of newly designed, fully electric aircraft, which would be expected to be more efficient and have greater range. Big manufacturers are also studying retrofits. Airbus said it would replace one of the four turbofans on a short-haul jetliner with an electric motor, and plans to test-fly it by 2021. The aim is to demonstrate new technology, and Airbus doesn’t plan to commercially produce that particular model. Some small airlines, however, are already retrofitting their fleets. In Vancouver, Harbor Air Seaplanes took one of its aircraft out of storage to install a 750-horsepower electric motor developed by magniX, which moved its HQ to the Seattle area from Australia about a year ago. The first test flight is planned for November.



## AUTOMOTIVE: AUTOWORKERS FACE A TOUGH ROAD AHEAD

After years of labor peace in the automobile industry, about 50,000 members of the United Automobile Workers union have gone on strike against General Motors, seeking to redress years of pain, particularly during the 2008 recession and subsequent rescue by the Obama administration. **Competition from Mexico and other countries makes raising pay for American employees challenging.** The financial challenges of Americans toiling in the auto sector have been building for nearly two decades. Wages for blue-collar workers in the sector peaked (after adjusting for inflation) back in 2002 at \$30.90 per hour, which was then roughly 44% more than the average for all jobs across the economy. Today, those once-prized jobs pay just \$23.84 per hour, a thin dime less than what a typical worker across the economy earns.





## AUTOMOTIVE: ELECTRIC CARS NEED A CURE FOR RANGE ANXIETY

Electric vehicles have so many advantages: they're quiet, they have amazing acceleration, they run on sun if charged via solar panels and above all, they have no tailpipe emissions. So why were electric vehicles only 0.6% of passenger vehicles world-wide last year? Range anxiety. In the U.S., 63% of drivers



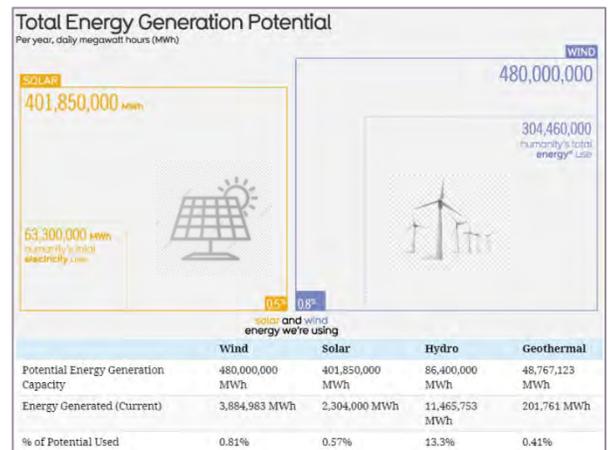
surveyed by Deloitte said they wanted a range of 300 miles, even though globally the average person drives only 50 miles per day. The average electric vehicle has a range of 114 miles. **In a survey by Volvo and Harris Poll, 58% of people cited running out of power as their top worry about electric vehicles. Just knowing that a vehicle can meet their perceived needs is key to overcoming this important barrier for most consumers.** A range extender offers relief from range anxiety. Mitsubishi Turbocharger and Engine Europe (MTEE) developed power generators that charge the battery of an electric vehicle while driving. With an output of 30 kW, range extenders deliver enough energy to drive a passenger vehicle at 80 miles per hour. Unlike a hybrid electric vehicle, an electric vehicle with a range extender has only an electric engine; the range extender never drives the car but only charges the battery. A range-extended battery electric vehicle is an improvement on plug-in hybrid electric vehicles, which switch between electric and gas engines. The range extender, by contrast, can operate optimally because it doesn't have to respond to traffic; it just has to charge the battery. Meanwhile, the vehicle maintains its superior responsiveness because it remains electric-powered. Beyond peace of mind while on the road, a range extender lets electric vehicles use a smaller battery pack as backup, making the cars more affordable and accessible. Since battery packs can weigh as much as 1,000 pounds, keeping battery packs as small as possible actually increases range by reducing weight.

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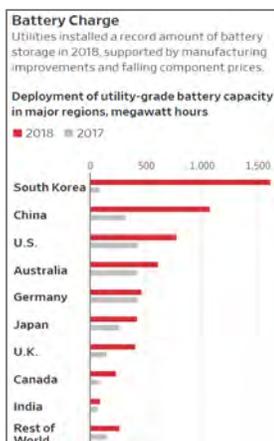
## ENERGY: THE POTENTIAL FOR RENEWABLES IS FAR BEYOND EXISTING GENERATION CAPACITY.

**Relying on Renewables:** Located in the United Kingdom, Drax Power Station is the world's largest biomass plant, powered chiefly by burning wood. **Originally a coal-fired plant, Drax is expected to fully phase out coal by the year 2025.** Meanwhile, Tengger Desert Solar Park in China was the biggest solar operation until 2018, but it has since been displaced by the Shakti Sthala plant in India. The latter uses only solar panels with no mirrors to generate energy from the sun. Overall, solar photovoltaics have experienced the highest growth of all energy source segments, showing 31% annual growth which is nearly triple the rate of wind power according to the International Energy Association (IEA).

**Untapped Potential:** Currently, 27% of the world's power comes from renewable energy sources such as solar, wind, hydro, biomass and other similar resources. However, according to back-of-the-envelope calculations, the potential for renewables is far beyond existing generation capacity. **In fact, humans are just using 0.81% of solar's potential generation capacity and only 0.57% of the potential from wind.**



## ENERGY: GIANT BATTERIES SUPERCHARGE WIND AND SOLAR ENERGY PLANS

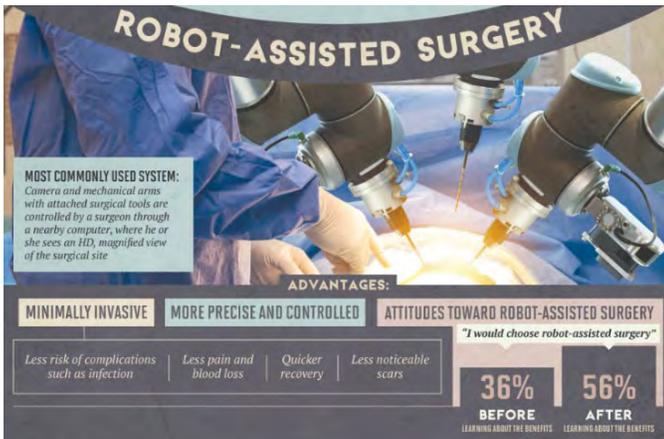


A global wave of investment in high-capacity batteries is poised to transform the market for renewable energy in coming years, making it more practical and affordable to store wind and solar power and deploy it when needed. **Government-owned utilities and companies are buying batteries that can be larger than shipping containers. A configuration of Tesla's new utility-scale batteries can hold enough energy to power every home in San Francisco for six hours.** Battery makers are also working on more advanced models that will hold more power and last longer. In September, the Silicon Valley-based firm introduced its new battery technology called Megapack that Pacific Gas & Electric plans to use in California. Mitsubishi Hitachi Power Systems is developing high-capacity batteries for a 1,000-megawatt venture in Utah that it touts as the world's largest renewable-energy storage project. In the U.K., ScottishPower is spending \$7.2 billion on renewable energy, grid upgrades and battery storage between 2018 and 2022. The utility owns Scotland's largest electricity network, operates in Europe's windiest region and generates all its power from renewable sources after selling its last fossil fuel assets in January. China's goal is to increase the use of renewable energy and batteries by 2030 as part of a massive national energy overhaul aimed at helping to reduce the use of polluting coal-fired power plants. The World Bank Group has set aside \$1 billion to invest in battery projects, including one of the world's largest mixed solar, wind and storage power plants in India and a battery project in South Africa anticipated to be the largest of its kind in sub-Saharan Africa.

High-capacity batteries previously have been too expensive for most energy providers to invest in, which has slowed the growth of renewable power, according to analysts. However, storage-battery prices have dropped nearly 40% since 2015, according to Wood Mackenzie data. The prices of lithium and vanadium—two of several key raw materials that are used in such batteries—also have declined over the past year.



## MEDICAL: TECHNOLOGY IS TRANSFORMING THE HEALTHCARE INDUSTRY



**Robot-Assisted Surgery** allows doctors to perform delicate and complex procedures that might be otherwise impossible. Typically, surgeons control a device with a camera and mechanical arms, giving them a high-def view of the surgical site. According to the Mayo Clinic, this method generally: enhances precision, flexibility, and control; comes with fewer complications such as infections; and results in less obvious scars as it is minimally invasive. **Artificial Intelligence will have a dramatic impact on many industries, and healthcare is no exception.** A large share of healthcare executives are already applying artificial intelligence in their operations, with data showing plans to increase budgets last year. The artificial intelligence (AI) technology used in some online health services for preliminary screening before connecting patients with a doctor actually outperformed real physicians in terms of reaching an accurate diagnosis. AI technology correctly diagnosed conditions in 81% of patients, compared to a 72% average for accurate diagnoses among real physicians over

a five-year period. As the technology becomes more developed and widespread, it's expected that AI could help diagnose strokes, eye disease, heart disease, skin cancer and other conditions.

## MEDICAL: AUTOMATED INSULIN DELIVERY ZEROES IN ON REAL-TIME RESPONSIVENESS

About 1.25 million Americans live with Type 1 diabetes, which until recently required them to measure their blood sugar half a dozen times a day, stabbing a finger each time, and administer insulin to keep it within a normal range. Since the introduction of the first commercial insulin pump in 1983, which dispensed insulin on command through a catheter, many patients have escaped the burden of giving themselves insulin injections, but they still need to monitor their sugars. **Today, more than 150,000 people with Type 1 diabetes are using an insulin pump the size of a deck of cards, along with a glucose sensor connected to the body, to keep their blood sugars stable without having to pay constant attention.** After a week or so of training to learn the user's patterns of insulin use, the algorithm that coordinates the pump and the sensor is ready for automatic mode. The sensor sends continuous information to the pump and most of the time can determine the correct amount of background insulin needed.



These small devices enabled by artificial intelligence, are the closest that technology has come to duplicating the functions of a healthy pancreas. Software collects data from the pump and sensor so users and their physicians can track the numbers and compile reports. User data can also help pump makers refine its algorithms and make future devices smarter over time. Automated insulin delivery zeroes in on real-time responsiveness, but clinicians may check in virtually instead, changing care plans or tweaking medications based on verbal reports of how patients are feeling along with data from devices. As more smart devices come on the scene, health-care organizations will be able to modify how they use their personnel and facilities. Pump makers are working with providers and insurers to develop recommended "care pathways" to capitalize on the efficiencies made possible by medical technologies, while still keeping a close eye on patients.

## MEDICAL: ROBOTIC THREAD IS DESIGNED TO SLIP THROUGH THE BRAIN'S BLOOD VESSELS

MIT engineers have developed robotic thread (in black) that can be steered magnetically and is small enough to work through narrow spaces such as the vasculature of the human brain. In the future, this robotic thread may be paired with existing endovascular technologies, enabling doctors to remotely



guide the robot through a patient's brain vessels to quickly treat blockages and lesions, such as those that occur in aneurysms and stroke. "Stroke is the number five cause of death and a leading cause of disability in the U.S. If acute stroke can be treated within the first 90 minutes or so, patients' survival rates could increase significantly," says Xuanhe Zhao, associate professor of mechanical engineering and of civil and environmental engineering at MIT. "If we could design a device to reverse blood vessel blockage within this 'golden hour, we could potentially avoid permanent brain damage. That's our hope." **The core of the robotic thread is made from nickel-titanium alloy, or "nitinol," a material that is both bendy and springy.** Unlike a clothes hanger, which would retain its shape when

bent, a nitinol wire would return to its original shape, giving it more flexibility in winding through tight, tortuous vessels. The team coated the wire's core in a rubbery paste, or ink, which they embedded throughout with magnetic particles. Finally, they used a chemical process they developed previously, to coat and bond the magnetic covering with hydrogel — a material that does not affect the responsiveness of the underlying magnetic particles and yet provides the wire with a smooth, friction-free, biocompatible surface. They demonstrated the robotic thread's precision and activation by using a large magnet, much like the strings of a marionette, to steer the thread through an obstacle course of small rings, reminiscent of a thread working its way through the eye of a needle. A magnetically steerable guidewire does away with the necessity for surgeons to physically push a wire through a patient's blood vessels. This means that doctors also wouldn't have to be in close proximity to a patient and the radiation-generating fluoroscope.

## INNOVATION: VOLOCOPTER'S FIRST ELECTRIC VERTICAL TAKE-OFF AND LANDING (EVTOL)

German urban air mobility (UAM) developer Volocopter has unveiled its first electric vertical take-off and landing (eVTOL) aircraft to enter series production. **The two-seat air taxi, dubbed VoloCity, is the fourth generation of the all-electric multicopter, scheduled to make its first flight within 18 months.** Describing the VoloCity as “the most powerful Volocopter yet”, the start-up says it will certificate the battery-powered aircraft under the European Union Aviation Safety Agency’s new special condition for VTOL (SC-VTOL) airworthiness regulations, which were announced in July. “It is rigorously designed to meet the demands of urban air mobility,” said Volocopter chief executive Florian Reuter. The VoloCity incorporates changes and improvements identified following more than 1,000 flights with earlier generation prototypes, the company said. The design retains the multicopter configuration of the current test aircraft, known as the 2X, but the company has refined the aerodynamics of the beams that house the aircraft's 18 rotors. A new stabilizer has also been added to increase lift and stability in flight. Designed for inter-city transport, the eVTOL is expected to have a range of 35k, a top speed of 110 km/h and be able to carry two people and hand luggage. A piloted version will be first to market, with an autonomous VoloCity expected to follow at a later date. The VoloCity will be operated from ground stations – dubbed VoloPorts – which the Bruchsal-headquartered firm is developing in partnership with the UK company Skyports. The first example will be unveiled in the fourth quarter in Singapore, where the 2X will perform a public test flight.



## INNOVATION: BATTERY METALS FROM DEEP SEA NODULES — PIPE DREAM OR PANACEA?



**DeepGreen** is an intriguing and potentially disruptive company that seeks to supply EV battery metals at low cost and with relatively lower environmental impact. DeepGreen will collect polymetallic nodules from certain areas of the ocean floor where they occur naturally and in high concentrations. The nodules contain high grades of manganese, nickel, cobalt and copper. DeepGreen will process them into battery grade metals producing no tailings and little/no waste from processing. These elements are the key metals in EV batteries. If EV adoption continues, BofA Merrill Lynch estimates class 1 nickel and cobalt markets could move to large deficits over the next several years without new supply.

**What is a polymetallic nodule?** Put simply: a potato sized lump of manganese and other metals. Typical grades: 1-1.5% nickel, 1% copper, 0.2% cobalt and ≈ 30% manganese. The existence of nodules in certain zones of the ocean has been known for decades. They were investigated extensively in the 1970s by various entities including Lockheed and Kennecott (now part of Rio Tinto). Nodules “grow” over millions of years through precipitation of metal hydroxides. The metal enters the ocean over time via erosion and weathering of local mountain ranges (in this case, the Rockies & Andes). According to DeepGreen, subsidiaries of Lockheed Martin, China Minmetals, Keppel, and DEME have also secured exploration contracts, as well as government organizations from Japan, Korea, Russia, France and Germany.



Exhibit 3: Polymetallic nodules



**A potentially huge resource:** The group has rights to collect nodules from an area of approximately 75,000 sq. km in the so called “Clarion Clipperton Zone” in the Pacific Ocean. The NORI Area D deposit covers 25,160 km<sup>2</sup> and has its center point at latitude 10° 29’ N and longitude 116° 57’ W, approximately 850 km due west of the nearest land—the uninhabited Clipperton Island, which itself is about 1100 km west of Mexico. According to a 43-101 technical report filed by the company, the NORI Area D Project Area, based on one subarea of the NORI resource is estimated to contain 383 Mt (wet) of nodules grading 1.3% Ni, 1.1% Cu, 31% Mn and 0.13% Co with an average nodule abundance of 13.1 kg/m<sup>2</sup> at a cut-off abundance of 4 kg/m<sup>2</sup>. The combined NORI Resource, in all four sub-areas, contains 893 Mt of wet nodules grading 1.3% Ni, 1.1% Cu, 29% Mn and 0.18% Co with an average nodule abundance of 13.1 kg/m<sup>2</sup> at a cut-off abundance of 4 kg/m<sup>2</sup>. For context, the working plan is to collect ≈ 5 Mt. This is versus nearly 900 Mt of nodules in the “resource” category. The resource is in the process being moved from inferred into measured. To be clear, these are not yet “reserves” which could have greater certainty in terms of sampling and with a proven economic path to exploitation.

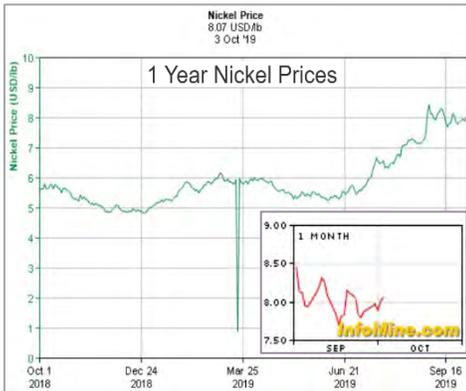
**Is it technically feasible?** On paper, yes, but why hasn’t this happened before? In short, (1) Legal: Inasmuch as the nodules exist in international waters, there wasn’t a framework to regulate the activity nor to protect the exploitation rights of companies., (2) Land-based alternatives: To date, land-based metal mining has supplied human’s needs for metals, albeit at ever higher costs and environmental impact as grades decline and strip ratios increase. Now with a coming step-change in metal use required to deliver a low-carbon economy, it is hard to see conventional mining companies delivering the required EV metals in the quantities they are required. DeepGreen has collected a few hundred tonnes of nodules as part of its resource mapping activities. The company has also demonstrated an extraction process that separates the metals in the nodule into usable, saleable products. More studies are required, particularly on the environmental front but also around scaling the metal processing. The company believes it could be in a position to produce metal on a commercial scale as early as 2023.



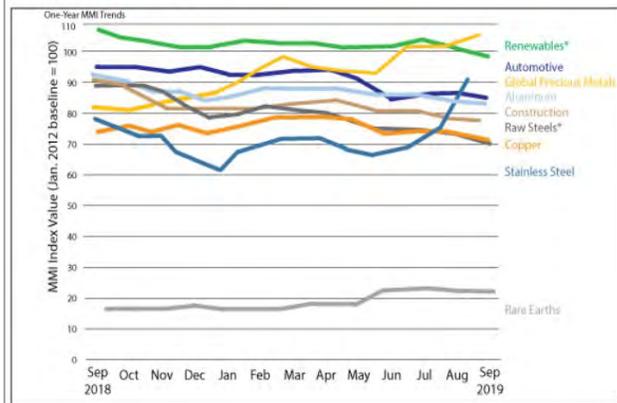
**Should we be “mining” the ocean floor?** For some, the gut reaction to this question is easy: Absolutely not. A more balanced discussion is warranted. What is the alternative? One answer: Greatly increased conventional land-based mining activity with its associated deforestation, potential population and fauna displacement, land disturbance, tailings and greenhouse gas emissions. Which route to metal production would be “less bad”? DeepGreen believes that its approach offers significant advantages in terms of capital and energy intensity, biodiversity, environmental impact and carbon emissions.



## METALS: COMMODITY PRICES — NICKEL, ALUMINUM, COPPER, COLBALT & IRON ORE

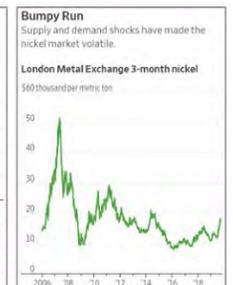
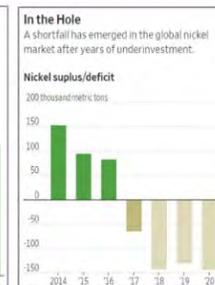
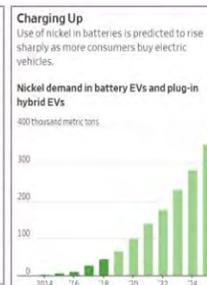
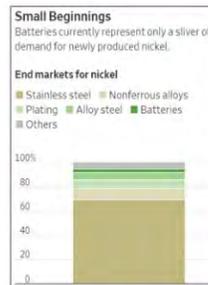


### Monthly Report: Price Index Trends – September 2019



## METALS: DEMAND FOR A FORM OF NICKEL NEEDED IN EV BATTERIES STARTING TO OUTPACE SUPPLY

Global producers of electric cars have big ambitions and a bigger problem: supplies of a key material are running short. Nickel sulfate is a brilliantly colored crystalline substance used in electric-vehicle batteries. The ore most commonly used to produce it is mined in only a handful of places—and they include some of the most politically or operationally challenging, such as Russia or Canada’s frozen northeast. **Nickel sulfate accounts for just a fraction of global nickel sales; about 70% of nickel is used in stainless steel.** But auto makers will launch more than 200 new plug-in electric vehicles through 2023, consulting firm AlixPartners estimates—and that isn’t counting hybrids. UBS expects batteries in electric vehicles to account for 12% of global nickel demand by then, up from 3% in 2018 and after years of low prices that stalled investment by global miners, nickel supply is falling short of demand. Betting on a demand boom is a tough business, especially for a niche commodity that isn’t easily priced or hedged. Today, trading on the LME is for nickel cathodes, pellets and briquettes only. Buyers typically pay a premium for battery-grade nickel sulfate, which makes pricing opaque. The benchmark nickel price is historically volatile. It has surged roughly 70% in 2019, to about \$18,000 a metric ton, because of a ban on nickel-ore exports from Indonesia that will take effect earlier than traders had expected.



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Charles was a Senior Vice President of procurement in the metal container industry, with a career spanning nearly four decades. He specializes in steel and aluminum procurement and utilizes his expansive knowledge of the steel and aluminum industry in the production of this detailed monthly update for Ulbrich and the company's valued employees and partners.



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