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ECONOMIC UPDATE

Number 7 • MARCH 2020

EXECUTIVE SUMMARY

THE IMPACT OF THE COVID-19 EPIDEMIC HAS PROMPTED US TO SHORTEN THIS MONTH'S ISSUE. We recognize that there is considerable turmoil in everyone's business, as managers work to reposition production and delivery schedules, expedite material shipments, rearrange travel schedules and deal with a myriad of issues. There is less time for reading when there is so much to be done.

THE AMERICAS: CHINA'S CORONAVIRUS OUTBREAK WILL LIKELY DAMPEN U.S. GDP IN THE 1ST QTR. The monthly *WSJ* survey of economists found 83% of participants expected the coronavirus outbreak will have a small impact on U.S. GDP from January to March, less than 0.5%. **U.S. consumer confidence** edged higher in February, but the cutoff date for the survey was before the outbreak of the COVID-19 spread beyond China to South Korea, Iran and Italy. **Durable goods orders** dipped 0.2% in January, pulled down by decreased demand for cars, auto parts and military aircraft. **The ISM index of U.S. national factory activity** fell to a reading of 50.1 in February from 50.9 in January. The ISM said global supply chains are impacting most, if not all, of the manufacturing industry sectors.

OVERSEAS: EUROZONE MANUFACTURING PICKED UP IN FEBRUARY FROM A DEEP SLUMP. Despite disruption from the new coronavirus, the IHS Markit PMI index expanded in February at its fastest rate in six months as services grew and trouble in manufacturing eased. The latest OECD best case scenario forecast the global economy would grow by 2.4%, weaker than the 2.9% expansion projected before the viral outbreak. That lost growth is roughly equivalent to \$400 billion.

STEEL: NUCOR, U.S. STEEL AND ARCELORMITTAL RAISED CARBON STEEL SHEET PRICES BY \$40 PER TON. The increase follows tentative signs that the global manufacturing slump may have started to ease at the beginning of the year. Mill outages in April may benefit prices going forward. **Allegheny Technologies** reported 4thQtr 2019 results. The stainless steel producer secured several key long-term contract renewals in 2019, including a \$2.5 billion agreement with GE Aviation. **U.S. Steel** will fully acquire the joint venture UPI by the end of the 1stQtr when USS acquires South Korean steelmaker POSCO's 50% stake.

COMMODITIES: IRON ORE FUTURES RISE AS CHINA KEEPS CHURNING OUT STEEL THAT NO ONE WANTS. The collapse in economic activity amid China's unprecedented measures to contain the coronavirus outbreak means there are few buyers of steel, which has sent prices tumbling and put margins under intense pressure. Iron Ore decreased 8.15% since the beginning of 2020.

AEROSPACE: THE SOLAR ORBITER SPACECRAFT SET OFF ON A 10 YEAR JOURNEY TO THE SUN. The mission is expected to yield insight into how solar radiant energy affects Earth. **Airbus** is ramping up production of its bestselling single-aisle jet, moving to fill a hole in the market created by the prolonged grounding of rival Boeing's 737 MAX. Airbus reported a loss for 2019 after taking a substantial charge to settle U.S., U.K. and French allegations of bribery. **Lockheed Martin's Sikorsky unit** was awarded a U.S. Navy contract to build six VH-92A helicopters for the presidential helicopter replacement program.

AUTOMOTIVE: THE MARKET FOR AI IN CARS WILL GROW 1200% IN NEXT SIX YEARS - A GMI PREDICTION. The market for artificial intelligence in the automotive industry will go from \$1 billion today to \$12 billion by 2026, according to a report from Global Market Insights. **U.S. light-vehicle sales** were expected to rise in February, helped by two extra selling days, an additional weekend and higher incentives. It's unclear how much of an impact the spread of the coronavirus will have on deliveries going forward, though several automakers warned new-vehicle supplies will likely be disrupted by manufacturing and supply chain bottlenecks, mostly in China.


MEDICAL: MED EQUIPMENT AND SUPPLIES PRODUCTION IN 2019 ROSE 4.0% FROM THE YEAR-AGO LEVEL. Production is expected to peak imminently before declining through the remainder of 2020 and the first half of 2021. To commercialize its patented system for continuous Atomic Layer Deposition (ALD), **Argonne National Labs** signed an exclusive license with Forge Nano to use Argonne's patent for ALD. Forge Nano recently expanded its coating capacity ten-fold by opening a new production plant.

ENERGY: CARBON EMISSIONS FROM ENERGY FLATTENED LAST YEAR AT 33 GIGATONS. This follows two years of increases, even as the world economy expanded by 2.9%. The U.S. recorded the largest emissions decline on a country basis, falling 140 million tons (2.9%) and is now down by nearly one gigaton from its 2000 peak. **GE Hitachi Nuclear Energy and TerraPower** are jointly pursuing an opportunity to design and build the Dept. of Energy's Versatile Test Reactor (VTR), an experimental fast neutron nuclear reactor that could start up by 2026. There is currently no fast neutron testing capability in the U.S.

INNOVATION: THE WORLD NEEDS BETTER BATTERIES AND AMPRIUS TECHNOLOGIES PROVIDES THEM. Researchers at Stanford University discovered a solution to the problem associated with silicon in batteries. Using new techniques in nanotechnology, they were able to store lithium in tiny silicon nanowires. Amprius Technologies was formed to bring this revolutionary battery technology to the world.



THE AMERICAS

- **U.S. employers** added 273,000 jobs in February and the jobless rate was 3.5%, signs of labor-market strength before the coronavirus spread widely in the U.S. Wages increased 3.0% from a year ago. 

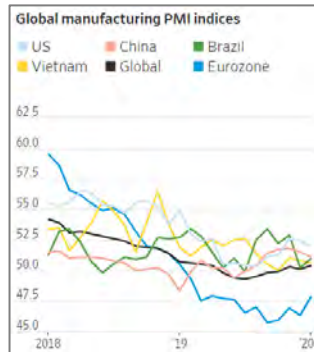
Key Update: *The sectors where demand would suffer the most from the spread of the virus include air transportation and those that rely on discretionary spending in public places, such as restaurants, entertainment and retail.*

The U.S. foreign trade gap contracted 6.7% to \$45.34 billion in January. Imports decreased 1.6% while exports slid by 0.4% from December. The decrease in imports reflected fewer purchases of industrial supplies, capital equipment and autos. Meanwhile, U.S. firms shipped fewer aircraft and less oil.
- **U.S. import prices** were unchanged in January as the cost of petroleum products fell, offsetting gains in the prices of motor vehicles and capital goods. Excluding fuels and food, import prices rose 0.2%. Import prices exclude tariffs. Prices of U.S. exports climbed 0.7% in January.
- **Retail sales** excluding automobiles, gasoline, building materials and food services (core sales) were unchanged in January. Data for December was revised down to show core retail sales rising 0.2% instead of jumping 0.5% as previously reported. Core retail sales correspond most closely with the consumer spending component of GDP.
- **U.S. consumer prices** edged up 0.1% in January, restrained by falling gasoline prices. In the 12 months through January, the CPI rose 2.5%, after advancing 2.3% in December. The core consumer price index excluding the volatile food and energy components rose 0.2% in January and 2.3% in the 12 months through January.
- **The U.S. Leading Economic Index (LEI)** jumped 0.8% in January. The LEI's biggest boost came from rising permits to build new homes. Fewer applications for unemployment benefits, higher consumer confidence, record stock prices and cheaper credit also added to the surge in the index.
- **U.S. industrial production** fell 0.3% in January, driven down by unseasonably warm temperatures and a halt in 737-MAX production at Boeing. Utility production dropped 4%, with electric and natural-gas utilities falling 3.2% and 7.7% respectively. Boeing halted production of the 737 MAX jet in January, leading to a 7.4% decrease in aerospace production and a 0.1% decline in overall manufacturing output. Excluding the production of aircraft and parts, factory output was up 0.3% in January.

- **U.S. producer prices** jumped by 0.5% in January, the largest gain since October 2018, after climbing 0.2% in December. In the 12 months through January, the PPI advanced 2.1%. Excluding the volatile food, energy and trade services components, producer prices increased 0.4% and by 1.5% in the 12 months through January. Wholesale energy prices fell 0.7% in January (after jumping 1.5% in December) pulled down by a 1.5% drop in gasoline prices, which followed a 4.2% acceleration in December.
- **China's coronavirus outbreak** will likely dampen U.S. economic growth in the 1stQtr. The monthly *WSJ* survey of economists found 83% of economists expected the coronavirus outbreak will have a small impact on U.S. GDP from January to March of less than 0.5%. About 5% of the forecasters expected a significant reduction of more than 0.5% off the quarter's annual growth rate, while 10% expected no impact.

Recession Odds
The average probability of the U.S. economy being in a recession within the next 12 months
- **Durable goods orders** dipped 0.2% in January, pulled down by decreased demand for cars, auto parts and military aircraft. Excluding volatile transportation orders, durable goods orders rose 0.9%. Over the past year, orders are down 2.3% and are flat excluding transportation. The numbers have been especially volatile in recent months because of Boeing's decision to suspend production of its troubled 737 MAX airliner. Orders for civilian aircraft surged 346.2% in January after dropping 66.7% in December.
- **U.S. consumer confidence** edged up to 130.7 in February from a downwardly revised January of 130.4, but the cutoff date for the survey was before the outbreak of the COVID-19 spread beyond China to South Korea, Iran and Italy.
- **The ISM index of U.S. national factory activity** fell to a reading of 50.1 in February from 50.9 in January. The ISM said global supply chains are impacting most, if not all, of the manufacturing industry sectors. About six industries, including computers and electronics, fabricated metal and chemical producers, reported the coronavirus outbreak was impacting their businesses.
- **U.S. factory orders** fell 0.5% in January as an increase in demand for machinery was offset by a decline in transportation equipment. Orders for transportation equipment fell 2.1% in January after rebounding 8.8% in the prior month. Orders were held down by a 19.6% drop in demand for defense aircraft and parts. Motor vehicle and parts orders rose 2.7% in January.

- **Services sector activity** grew at a faster pace in February, an indication that the economy was still expanding immediately after the first cases of the coronavirus were reported in the U.S. The ISM service-sector index rose to 57.3 from 55.5 in January. Services companies added jobs at a faster pace but business activity declined.
- **The two-year trade war** between the U.S. and China upended commerce worldwide, slamming the brakes on global trade growth—but also delivering modest benefits to a handful of industries and countries that saw gains as the giants tussled. Growth in global trade sank to a meager 1% last year, down from 4% in 2018 and 6% in 2017. It was the fourth worst showing in 40 years, and the worst ever outside a period of recession, according to the International Monetary Fund.
- **The U.S. housing market** was mixed in January. Existing home sales declined 1.3% to an annual rate of 5.46 million units as supply tightens. The median sales price for an existing home rose 6.8% YOY, while housing inventory fell 10.7%. New home starts dropped 3.6% to an annual rate of 1.567 million units. The 30-year fixed mortgage rate was at an average of 3.47%, the lowest since October 2016. New home sales climbed to a 12.5-year high in January, jumping 7.9% to an annual rate of 764,000 units.
- **U.S. consumer spending** rose 0.2% in January, a loss of momentum that could be exacerbated by the rapidly spreading coronavirus. Wages rose 0.5% in January after gaining 0.1% in the prior month. With income growth outpacing consumer spending, savings raced to \$1.33 trillion from \$1.26 trillion in December.
Key Update: Consumer spending increased at a 1.7% annualized rate in the 4thQtr, retreating from the third quarter's brisk 3.2% pace. The economy grew at a 2.1% rate in the last quarter of 2019, matching the third quarter's pace.
- **Spending on U.S. construction projects** increased 1.8% in January, pushing total spending to a record annual rate of \$1.37 trillion. Home building jumped 2.1%, with the strength coming from single-family home building which rose 2.7%. Apartment construction was unchanged. Government building projects outlays rose 2.6% with spending by state and local governments rising 2%. The federal government expenditures rose 9.9% to the highest level since May 2012.



- **Steel mills** in the U.S. shipped 8.021 million tons of steel in December, a 4.6% advance from November and a 2.8% decline from December 2018. Steel mill product shipments for the full year 2019 were 96.178 million tons, a 0.9% increase over full year 2018 shipments.
(See **Appendix: Steel**, page 6)
- **Nucor, U.S. Steel and ArcelorMittal** raised carbon steel sheet prices by at least \$40 per ton. The hike is the second this year for Nucor and it is the latest in a series of increases across the industry going back to October. The increase follows tentative signs that the global manufacturing slump may have started to ease at the beginning of the year. There are signs that the producers have had limited success so far in raising prices. Hot-rolled coil prices are down 1.4% in 2020 after declining 18% last year.
Key Update: Surveys of steel distributors and downstream manufacturers suggest steel inventories are better balanced and mills are betting that shipping snags arising from concerns over the coronavirus will limit inventory restocking. Mill outages in April may benefit prices going forward.
- **U.S. raw steel production** for the year through February 29 was 16.350 million tons at a capability utilization rate of 81.8%, an increase of 0.8% from the same period last year when the utilization rate was 81.3 percent.
- **Steel imports into the U.S.** were 3.135 million tons in January, including 1.633 million tons of finished steel, down 9.9% and up 33.4% respectively vs. January 2019. Finished steel import market share was an estimated 17% in the month of January.
- **U.S. Steel** will fully acquire the joint venture UPI by the end of the 1stQtr when USS acquires South Korean steelmaker POSCO's 50% stake. The venture's rolling mill in Pittsburg, CA, produces cold-rolled coil, tin mill products and coated steel from hot-rolled coil supplied by USS. POSCO stopped supplying its share of hot band in 2016 after losing a trade case resulting in import duties of 64 percent.
- **Allegheny Technologies** reported 4thQtr 2019 results with sales of \$1.02 billion. Excluding special charges and tax benefits, net income was \$50.2 million vs. a year ago, when 4thQtr sales were \$1.04 billion and net income was \$41.1 million. For the full year 2019, sales were \$4.12 billion; net income was \$257.6 million. The stainless steel producer secured several key long-term contract renewals in 2019, including a \$2.5 billion agreement with GE Aviation. In the flat-rolled segment, ATI recorded its third-straight year of profitability despite the ongoing negative impacts from global trade policies, domestic tariffs and weak commodity stainless end-market demand.



- **U.S. light-vehicle sales** were expected to rise in February, helped by two extra selling days, an additional weekend and higher incentives. It's unclear how much of an impact the spread of the coronavirus will have on deliveries going forward, though several automakers have warned new-vehicle supplies will likely be disrupted by manufacturing and supply chain bottlenecks, mostly in China.

(See **Appendix: Automotive**, page 8)

- **The U.S. Court of International Trade** issued a temporary restraining order preventing the government from expanding Section 232 steel/aluminum tariffs to cover imported steel nails, staples, electrical wires and parts that go into products such as cars and tractors. The trade law community interpreted the court's action as a sign it may ultimately strike down the administration's latest use of the Section 232 statutory provision.

- **JW Aluminum**, citing unfair Chinese trade practices, will close down a Missouri rolling mill in May. JW's CEO Lee McCarter said, "Even with multiple tariffs and duties in place, it hasn't been enough to overcome the devastating effects of China's market-distorting behavior." The closure will result in the layoff of 190 employees in the St. Louis plant which manufactures aluminum foil for converters.

- **Deere & Co.** said the cooling of U.S.-China trade tensions was giving farmers more confidence to buy equipment. Deere reported better-than-expected equipment sales and profit for the latest quarter. Sales of Deere's farm and landscaping equipment fell 4% from a year earlier. Sales of construction equipment dropped 10%. For the quarter ended February 2, Deere's net income was \$517 million compared with \$498.5 million a year earlier. Total equipment sales slipped 6% to \$6.53 billion. Deere expects net income this year of \$2.7 billion to \$3.1 billion, unchanged from its November 2019 forecast.



- **Carbon emissions from energy** flattened last year at 33 gigatons (following two years of increases), even as the world economy expanded by 2.9%. The IEA says global emissions were unchanged primarily due to declining emissions from electricity generation in advanced economies, the expanding role of renewable sources, switching from coal to natural gas and higher nuclear power generation. Milder weather in several countries also contributed. The United States recorded the largest emissions decline on a country basis, falling 140 million tons (2.9%) and is now down by nearly one gigaton from the 2000 peak.

- **The Solar Orbiter spacecraft**, the new probe built by NASA and the European Space Agency, set off on a 10 year journey to the Sun, a mission expected to yield insight into how solar radiant energy affects Earth. The spacecraft will deploy solar panels and antennas before carrying on toward the Sun, a trek assisted by the gravitational forces of Earth and Venus. It eventually will reach as close as 26 million miles from the Sun's surface, or about 72% of the distance between the Sun and Earth.



- **Airbus** is ramping up production of its bestselling single-aisle jet, moving to fill a hole in the market created by the prolonged grounding of rival Boeing's 737 MAX. Airbus plans to raise production of its A320neo to as many as 67 a month by 2023, from the current target of 63 a month in 2021. The A320neo competes directly with the MAX. Airbus said its deliveries this year will reach 880 aircraft, topping last year's 863. Still, that represents a slower rate of growth as the company reins in deliveries of its wide-body jets.


Key Update: *Airbus reported a loss for 2019 after taking a big charge to settle U.S., U.K. and French allegations of bribery. Airbus reported a full-year net loss of €1.36 billion, compared with a net profit of €3.05 billion in 2018. The company said its full-year sales rose 11% to €70.48 billion.*

- **Lockheed Martin's Sikorsky unit** was awarded a U.S. Navy contract to build six VH-92A helicopters for the presidential helicopter replacement program. All six aircraft from the first low rate initial production contract are undergoing modifications at Sikorsky's Stratford, CT, plant and are on schedule to begin deliveries in 2021. The Navy plans to replace the current fleet of 19 helicopters with 23 new aircraft. (See **Appendix: Aerospace**, page 8)

- **GE Hitachi Nuclear Energy and TerraPower** are jointly pursuing an opportunity to design and build the Dept. of Energy's Versatile Test Reactor (VTR), an experimental fast neutron nuclear reactor that could start up by 2026. The VTR Program was launched for U.S. companies developing advanced reactors that require different testing facilities than commercial nuclear power technology in use. There is currently no fast neutron testing capability in the U.S.

Medical equipment and supplies production in the 12 months through December was up 4.0% from the year ago level. Production is expected to peak imminently before declining through the remainder of 2020 and the first half of 2021. (See **Appendix: Medical**, page 9)

EUROPE, AFRICA & THE MIDDLE EAST

- **Eurozone manufacturing** picked up in February from a deep slump, particularly in Germany's big industrial sector, despite disruption from the new coronavirus. IHS Markit PMI index expanded in February at its fastest rate in six months as services grew and trouble in manufacturing eased. The group's PMI index, a gauge of business activity, rose to 51.6 points from 51.3 in January.
 
- **Global economic growth** will slow sharply this year as governments attempt to contain the coronavirus epidemic, although the scale of the setback is highly uncertain. The OECD best case scenario forecast the global economy would grow by 2.4%, weaker than the 2.9% expansion projected before the viral outbreak. That lost growth is roughly equivalent to \$400 billion.
- **ThyssenKrupp's steel division** swung to a loss in the first quarter, raising doubts over Europe's second-biggest steelmaker. Imports from China and weak demand from the car industry have pummeled steelmakers across the continent. TK's steel division posted an adjusted operating loss of €164 million euros in the 1stQtr versus a profit of €38 million a year earlier, blaming a significant drop in demand from the auto industry. (See **Appendix: Steel**, page 8)
- **Global crude steel production** was 154.4 million tonnes (Mt) in January, an increase of 2.1% from a year ago. China's crude steel production was 84.3 Mt, up by 7.2%. The U.S. produced 7.7 Mt of crude steel, an increase of 2.5% compared to January 2019. South Korea's crude output was 5.8 Mt, a drop of 8.0% from January 2019. Brazil's production was 2.7 Mt, down 11.1% vs. the prior year.

Key Update: *Steel's high carbon footprint could shred the industry's profits. The world's 20 largest steel companies could on average lose 14% of their value if they fail to improve their emissions reduction efforts (based on the assumption of a \$100 per tonne carbon price (tax) being applied to steel production by 2040).*
- **Acerinox's stainless production** declined in 2019 due to reduced consumption in Europe and the U.S., as well as global overcapacity. During 2019, the company's cold-rolled coil output fell 8.3% to 1.607 million tonnes. Crude steel and hot-rolled steel production were down 8.6% and 8.0% respectively. Acerinox net sales were 5.1% lower at €4.75 billion, while the group's net profits fell to €176 million in 2019, down 25.6% from 2018.

ASIA/PACIFIC, JAPAN, AUSTRALIA & INDIA

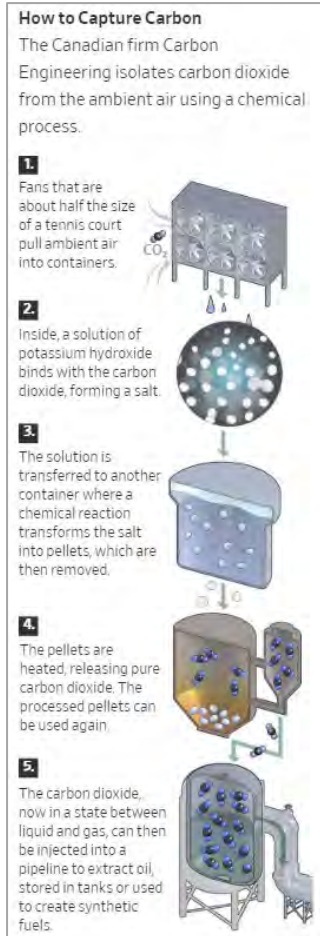
- **China's factory and services activity** plunged to record lows in February as the nation's economy struggled to resume normal production as it faced the coronavirus epidemic. The official manufacturing PMI tumbled to 35.7 in February from 50 in January. China's nonmanufacturing PMI sank to a record low of 29.6 in February from 54.1 in January. The 50 mark separates expansion from contraction.
- **About 90% of the 109 U.S. manufacturers** in the Yangtze River Delta Economic Zone expected to resume production by March, but 78% of them didn't expect to have enough staff to run at full speed due to travel restrictions and quarantine requirements. Nearly 60% of the firms expect demand to be lower than normal over the next few months, about half said their global supply chain had already been affected by the business shutdown, while almost a third of them will consider moving operations out of the country.
- **Japan's economy** contracted at an annualized rate of 6.3% in the 4thQtr due to a sharp drop in private consumption after the national sales tax rose to 10% on October 1st from 8%. Japan's economy is facing the risk of a recession because the coronavirus outbreak is hurting tourism and production in the 1stQtr. The virus has limited Chinese tourism in Japan and disrupted some Japanese manufacturing that depends on Chinese parts.
 
- **The Chinese steel sector** is experiencing acute uncertainty over fears the coronavirus spreading from Wuhan is still not under control. It is increasingly apparent steel demand is going to be down for some time to come. Steel mills kept producing in the expectation the bounce back would be dramatic, but there are signs a combination of an uncertain demand outlook and falling prices compressing margins will hasten steel mill cutbacks in March.
- **China's auto sales** fell 18% from a year earlier in January and crumbled 92% in the first 16 days of February. Part of the decline was due to the Lunar New Year holiday beginning in January this year, compared with February last year, but measures to control the spread of the coronavirus also contributed.
- **Rio Tinto** reported its highest annual profit in eight years, aided by a rise in iron-ore prices. However, it warned that the drop in the price of raw materials due to the spread of COVID-19 would hit revenues and profits this year. (See **Appendix: Commodities**, page 10)



ECONOMIC UPDATE: APPENDIX TO MARCH 2020 REPORT

STEEL: CARBON CAPTURE MACHINES REMOVE CO2 FROM THE AIR, RELYING ON STAINLESS

The Climeworks project has set up a carbon capture and storage facility at a remote site in Iceland that is drawing CO2 from the atmosphere and safely storing it in the ground. While the planet is increasingly transitioning away from fossil fuels, there remains the



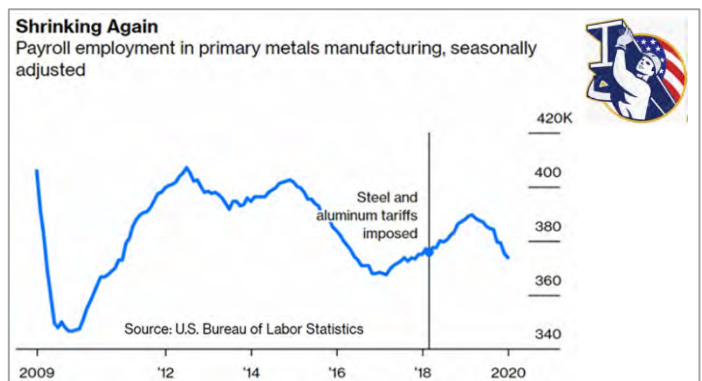
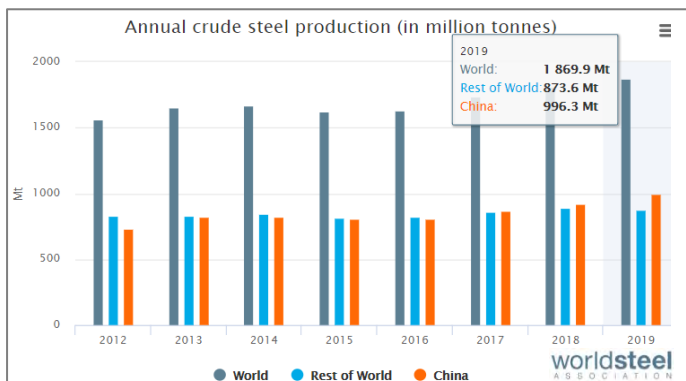
problem of what to do about the increased levels of CO2 already present in the earth's atmosphere. The search for workable decarbonization tech has been ongoing for some time and the engineers at Climeworks have come up with a potentially workable solution. The company is the first to operate a commercial carbon capture program from ambient air, and steel is central to the technology's design. **The huge machines which perform the carbon capture process resemble jet engines and use steel and stainless steel throughout their structure.**



The remote nature of Climeworks' site locations and the extreme weather and natural wear from the process of carbon capture make steels perfect for the job due to their endurance and corrosion resistance. The CO2 collectors have been through many design stages to reach their current iteration, but the model in operation relies on massive fans to draw ambient air through the collector. This air is then filtered to remove CO2 as the molecules adhere to a specialised material contained within. Once the filter is saturated with carbon dioxide, the collector is sealed and heated to around 100 degrees centigrade, causing the CO2 molecules to detach and be collected in a container. This concentrated CO2 can then be put to use in the commercial sector or seeded deep underground, locking it away. **The gas can be employed in an array of sectors, including carbonated beverages and agriculture. Climeworks' facility in Switzerland pipes CO2 to a nearby greenhouse and the company also has a deal in place with Coca-Cola.** The central idea, however, is to inject the CO2 into basalt rock where over the course of a few years it will mineralize, sealing it away for millennia. Climeworks plans to provide this service to industries and governments looking to lessen their climate impacts. A site in Iceland has been operating for a couple of years, already mineralizing more than 50 tonnes of CO2, with plans to install further collectors down the line. A key aspect of success is bringing down the costs, which is difficult without a proven market for the service. Energy companies and governments are not currently incentivized to operate emissions reversal technology and Climeworks is working hard to reduce operating costs in a bid to reach a commercially viable price per tonne of CO2.

Currently, it costs the company between \$500-\$600 to remove a tonne of CO2 from the atmosphere, with \$100 per tonne the target. As things stand, full scale operation of Climeworks' tech is too expensive, but the company is confident it can reduce costs significantly over the next five years. With solar energy 100 times cheaper than 50 years ago and wind energy around 50 times cheaper, it is highly possible that efficiencies can be found. If this carbon capture program is to achieve success, it's likely that steel will remain a key enabling factor.

STEEL: GLOBAL CRUDE STEEL OUTPUT 2019; PRIMARY METALS MANUFACTURING PAYROLLS SHRINKING





STEEL: UNINTENDED CONSEQUENCES OF STEEL TARIFFS THREATEN ATI'S MIDLAND STEEL PLANT

U.S. Sen. Pat Toomey (R,PA) is urging the federal government to grant Allegheny Technologies Inc. an exemption from the administration's-foreign steel tariffs amid news that without which the company's Midland plant could close. Toomey wrote Secretary of Commerce Wilbur Ross on Feb. 5 asking Commerce to approve ATI's tariff exemption requests submitted in October. Toomey noted that the 25% tax on imported steel has cost ATI more than \$30 million since March 2018 and "threatens the livelihood of hundreds of Pennsylvanians". He continued, "As a result of paying the punitive tariffs, ATI has been forced to operate certain facilities at unsustainable levels. I am concerned that if ATI's exclusion requests are denied or decisions are not made until early this spring, ATI may be forced to announce the closure of the Midland mill." ATI CEO Robert Wetherbee said the plant is "hemorrhaging money". **ATI employs 100 workers directly and another 200 indirectly, specializing in cold-rolling 60-inch stainless steel sheet used in products ranging from kitchen appliances to car parts.**



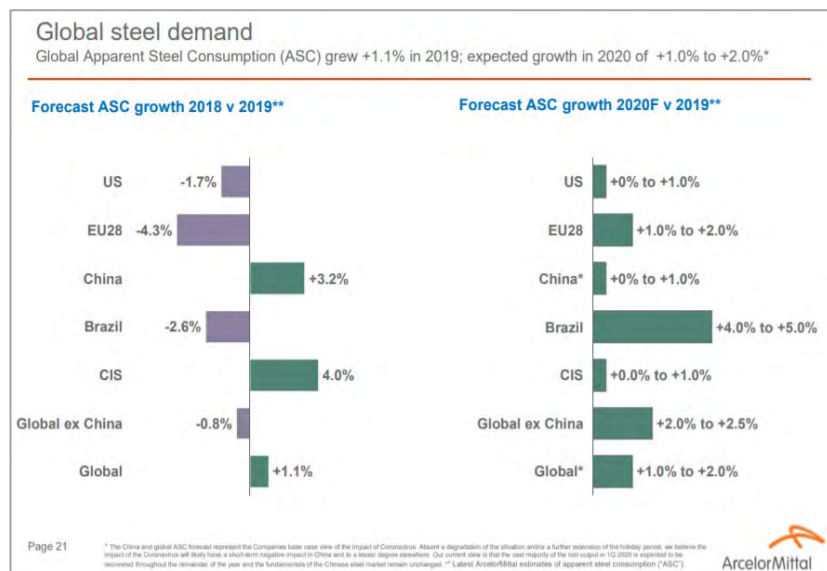
The administration's economic policies encouraged ATI to reopen the Midland plant two years ago, but new tariffs made the 60" slabs, imported from Indonesia, too expensive. ATI melts most steel at its Brackenridge hot-rolling mill, but isn't able to melt the specialty slabs



at that site. The joint venture has drastically curtailed production capacity and paid closer to \$40 million in penalties, said plant manager Danielle Carlini. In 2019, the company's first request seeking an exemption on the 300,000 metric tons of low-cost Indonesian steel the venture imports annually was denied. Slabs were available from other domestic supply sources, the administration said, forcing ATI to rely on direct competitors. ATI's decision to reduce the exemption request by half — from 300,000 tons to 150,000 tons — was made as a last resort. The venture will still have to supplement with high-cost

domestic suppliers. "Only three companies in the entire country can produce the slabs we need, and all three are direct competitors, which import raw material from Russia and elsewhere," Wetherbee said. "They have zero interest in helping us prosper." **ATI cutbacks have cost the U.S. Department of Defense, too, Toomey argued. The company manufactures tank armor titanium and nickel alloys for military vehicle engines locally, so a reduction in efficiency goes all the way to the top.** Toomey has repeatedly raised concerns about the growing backlog of exclusion requests at the Department of Commerce, urging prompt and fair consideration of requests. Unless the administration approves this newest exclusion request to bring in 150,000 tons of penalty-free stainless steel (6% of the total U.S. stainless-steel market) the plant could shutter within months.

STEEL: ARCELORMITTAL'S GLOBAL STEEL DEMAND FORECAST



"Overall world ex-China ASC (apparent steel consumption) in 2020 is expected to grow in the range of +2.0% to +2.5% (versus -0.8% contraction in 2019). In China, overall demand is expected to grow in 2020 within a range of zero to +1.0% (versus estimated growth of +3.2% in 2019) driven by robust real estate activity and reflect our current view on Coronavirus. The China and global ASC forecast reflect the Company's base case view of the impact of Coronavirus. **Absent a degradation of the situation and/or a further extension of the holiday period, we believe the effect of the Coronavirus will likely have a short-term negative demand impact in China and to a lesser degree elsewhere.** Our current view is that the vast majority of the impact on 1Q 2020 demand is expected to be recovered throughout the remainder of the year.

Our perspective on the fundamentals of the Chinese steel market remain unchanged." ArcelorMittal

AEROSPACE: U.S. NAVY ‘ALL AHEAD FULL’ ON HYPERSONIC WEAPONS IN 2020

The Navy will focus in 2020 on developing hypersonic weapons at breakneck speed, with testing to occur throughout the year, according to Acting Secretary of the Navy Thomas Modly’s message to the fleet. Modly’s memo likens the need to develop hypersonic weapons today to 1957, when the Soviet Union launched Sputnik. The U.S. scrambled to respond to the new reality: the Soviet Union was in space, and the U.S. was not. Two years ago, Russia claimed to have already deployed hypersonic missile systems. “This historic hindsight should heighten our awareness that major technological breakthroughs such as hypersonic weapons can destabilize the global security environment and pose an existential threat to our nation,” Modly wrote. “In fact, the possible applications of hypersonic technologies have already changed the nature of the battlespace, much as nuclear technology did in the past century. That is why when it comes to hypersonic weapons, our command today must be ‘All Ahead Full.’” **The Navy is leading the current U.S. military effort to develop hypersonic weapons, which means the defense industry will start playing a more significant role in programs.** Marilyn Hewson, the chief CEO of Lockheed Martin, said that “development work on new hypersonic and classified programs” was one of the reasons why the company’s Missiles and Fire Control segment reported strong growth in 2019. “Our hypersonics portfolio experienced tremendous growth during 2019, with the total potential value the corporation has received now exceeding \$4 billion,” Hewson said. In June 2018, Northrop Grumman paid \$9.2 billion to purchase aerospace and technology company Orbital ATK. The acquired company, renamed Innovation Systems, expanded the Northrop Grumman portfolio into hypersonics. Last summer, United Technologies Corp. announced a plan to buy Raytheon in an all-stock deal that will create a defense industry giant. The new company, to be named Raytheon Technologies, will have estimated annual revenues of \$74 billion, surpassed by only Boeing among U.S. defense aerospace and defense industry companies. Cash flows from the combined operations are intended to fuel the development of directed energy weapons, hypersonic weapons and counter-hypersonic missile systems.



AUTOMOTIVE: MARKET FOR AI IN CARS WILL GROW 1200% IN NEXT SIX YEARS – A GMI PREDICTION

The market for artificial intelligence in the automotive industry will go from \$1 billion today to \$12 billion by 2026, according to a report from Global Market Insights. The increase is due to the push for more assistive and autonomous features for improved driving



comfort, safety and to reach the goal of self-driving cars and trucks. AI-powered features are already being developed, tested and offered on consumer vehicles, including lane assistance, adaptive cruise control and automated parking. Toyota announced the launch of driver assistance for future cars that will get to level 4 of self-driving (High Automation). One such feature is automatic valet parking, jointly developed by Toyota and Panasonic. Many companies are currently developing AI for vehicles,

primarily focused on long-term contracts and strategic collaborations. **Technology providers are constantly upgrading and introducing new features and energy-efficient hardware that will function in cars and consume little power.** AI can support situational intelligence with the help of several next-generation sensors and onboard computers to detect and classify parameters such as traffic, road infrastructure and pedestrians. It is predicted that this “context awareness” segment will see 35% annual growth between 2019 and 2026 based on the high demand for semi-automated cruise control and driver-assistance features. To support context awareness, computer companies are investing in many innovative technologies. For example, Intel invested \$250 million into key technologies such as deep learning, security and connectivity — technologies that will likely be broadly used if AI succeeds. Another area of development for AI is in image/signal recognition that will let cars “recognize and understand” traffic signs and speed limit indicators so the car can lower its speed without human intervention. Several government initiatives are promoting traffic sign recognition that would ensure adherence to speed limits, which would also help bump up demand for artificial intelligence in automotive markets. For example, the European Commission last year mandated that all vehicles manufactured after 2021 have built-in image or signal recognition to reduce speeding and bad driving while promoting on-road safety. The image/signal recognition segment accounted for more than 65% of AI’s automotive market share last year, thanks to the widespread adoption of the idea that speed control is needed to reduce accidents. Europe has several major market leaders such as Audi, Daimler, Bentley, BMW and Mercedes who are major players in autonomous mobility. Automotive manufacturers are focusing mainly on AI technologies to make self-driving cars widely accepted and sold, particularly companies in the U.K. and Germany where the use of AI has been encouraged.



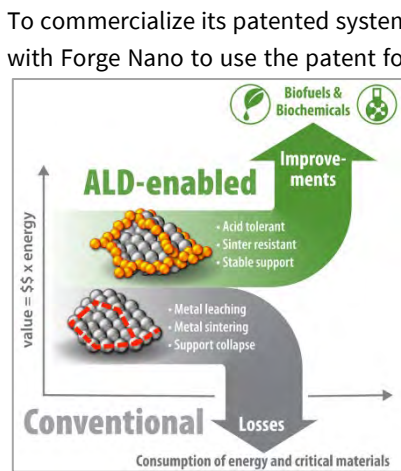


INNOVATION: THE WORLD NEEDS BETTER BATTERIES AND AMPRIUS TECHNOLOGIES PROVIDES THEM

Battery performance has evolved much more slowly than electronics and computers. The main reason for the slow pace in batteries is due to chemistry. Electronics improve by shrinking physical circuits enabling manufacturing technology to evolve rapidly. Batteries improve by making advances in chemistry and materials science. **Many of the chemical processes used in modern batteries have reached their limit. The main limiting factor of Lithium Ion (Li-ion) batteries is the amount of lithium that can be held in the battery's electrodes.** In conventional batteries, the negative electrode or anode is made of carbon in the form of graphite. Silicon has about 10 times the storage capacity as graphite, but it swells dramatically when it is charged, and this expansion causes the silicon to fracture and the battery fails. In 2007, researchers at Stanford University discovered a solution to the problem associated with silicon in batteries. Using new techniques in nanotechnology, they were able to store lithium in tiny silicon nanowires. These nanowires are about one-thousandth the thickness of a sheet of paper. The silicon nanowires still swell when they take-up lithium, but the nanotechnology keeps the silicon from fracturing and breaking apart. The result is the world's first 100% silicon nanowire anode for lithium-ion batteries. **Amprius Technologies was formed to bring this revolutionary battery technology to the world.** The benefits of using nanowires include: they tolerate volume expansion and are rooted to the substrate; they have micro and macro porosity that accommodate swell; they improve solid-electrolyte-Interphase and cycle life; and anode thickness is reduced to half of a graphite electrode thickness. Amprius says its 100% silicon nanowire batteries are a breakthrough technology that is revolutionizing the battery industry. With the highest energy density in the world, Amprius Technologies says its batteries can improve the performance of electric vehicles, aircraft, drones and just about anything that uses a rechargeable battery. Last October, Airbus partnered with Amprius' current equity funding. This financing will further boost the development of new generation batteries based on Silicon Nanowire Anode technology. Airbus' investment will help drive the development of higher volume production capacity and higher-energy density cells for Airbus Defense and Space aerospace programs, including the Zephyr High Altitude Pseudo Satellite and Urban Air Mobility.



MEDICAL: ATOMIC LAYER DEPOSITION TECHNOLOGY CAN IMPROVE THE BIO-COMPATIBILITY OF IMPLANTS

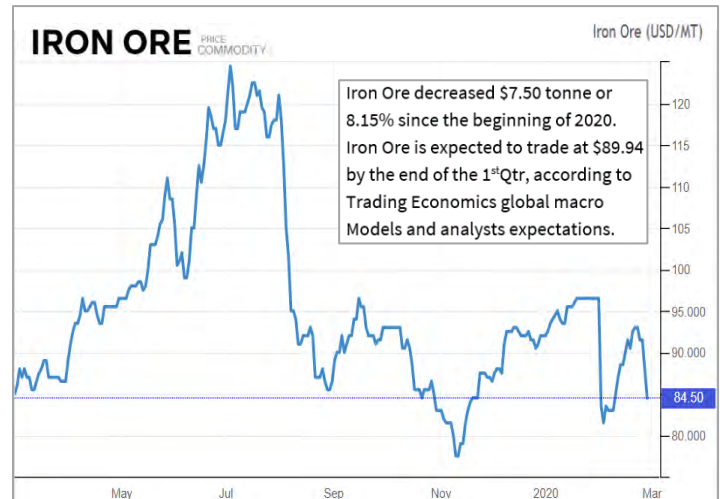
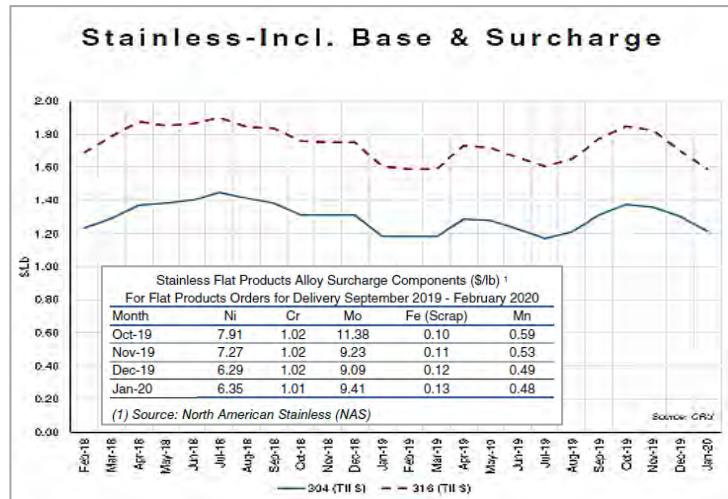


To commercialize its patented system for continuous Atomic Layer Deposition (ALD), Argonne National Labs signed an exclusive license with Forge Nano to use the patent for ALD at Forge's manufacturing plant. Forge Nano recently expanded its coating capacity ten-fold with the opening of a new production plant. Its proprietary, high-throughput ALD coating technologies are used to create safer, more reliable lithium-ion batteries. **ALD applies monolayers to material surfaces varying in intrinsic properties and textures. It can be applied to coat discrete particles in powders as well. ALD may be used to make strategic changes to materials based on the application without significantly altering its other properties.** It is achieved through alternating gaseous and solid precursors that react with sites on the material. Cycle reactions are self-limiting—meaning that they continue until the precursor has reacted with or adsorbed to all the available reaction sites. Typically, each cycle is carried out until completion before the scientists begins the next cycle. Years of development have led to ALD being used in various industries. It is becoming an increasingly practical method to improve the performance of semiconductors, especially those used in miniaturized electronics and photovoltaic cells, by offering innovative doping methods. **In healthcare, ALD can improve the bio-compatibility of implants or change the rate of slow- release drugs into the body.** In chemical processing, it can increase the thermal stability of catalysts, leading to more stable chemical reactions that would otherwise not be possible. Forge Nano's ALD processes are targeted toward both solids and powders. One of its high-throughput ALD coating processes is used to coat the particles of powders that coat the electrodes of Li-ion batteries. By coating individual particles with monolayers of metal oxides, manufacturers can create electrodes with coatings that are resistant to corrosion and improve the service life, safety, and cost of their Li-ion batteries. Forge Nano also reached an exclusive license agreement with the National Renewable Energy Lab to commercialize the national lab's patented battery materials and systems. ALD is a large market that is expected to grow from \$1.5 billion in 2016 to almost \$3.7 billion in 2021 with a compound annual growth rate (CAGR) of 19.1%. With continued research and development, the technology will address needs in energy, healthcare, and electronics.

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METALS: COMMODITY PRICES – NICKEL, ALUMINUM, COPPER, IRON ORE; STAINLESS BASE & SURCHARGE



COMMODITIES: IRON ORE FUTURES RISE AS CHINA KEEPS CHURNING OUT STEEL THAT NO ONE WANTS

The collapse in economic activity amid China's unprecedented measures to contain the coronavirus outbreak means there are **few buyers of steel, which has sent prices tumbling and put margins under intense pressure.** However, it's difficult for most steelmakers in China to cut output drastically because blast furnaces are designed to run constantly, and reducing production to zero is usually a last resort. The result is millions of tons of steel piling up at mills.



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