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ECONOMIC UPDATE

Number 13 • JUNE 2021

EXECUTIVE SUMMARY

AMERICAS: U.S. FACTORY ACTIVITY INCREASED AGAIN IN MAY but the ISM survey found companies and their suppliers continue to struggle to meet increasing levels of demand due to record-long lead times, wide-scale shortages of critical basic materials, rising commodities prices and difficulties in transporting products. **Hiring in the U.S.** picked up in May, signaling a moderate improvement in the labor market as businesses struggled to fill job openings. **Durable goods orders** fell in April, but excluding a 6.7% decrease in the transportation component, new orders were up 1%. **U.S. industrial production** rose 0.7% in April as the shortage of semiconductors for auto manufacturing tempered gains. Production of motor vehicles and parts fell 4.3%. **Factory orders** fell in April, weighed down by a 6.1% decrease in orders for motor vehicles and parts. **U.S. import prices** rose sharply in April. They have climbed 10.6% over the past 12 months. The Administration is weighing concerns about commodity shortages and inflation as it reviews trade tariff policy. **American companies** borrowed \$9.8 billion for capital investments in April, up 19% from a year earlier, signaling additional recovery.

OVERSEAS: JAPAN'S ECONOMY CONTRACTED 5.1% IN THE 1ST QTR amid a resurgence of COVID-19 infections. **Eurozone business growth** in May accelerated at its fastest pace in over three years. **Royal Dutch Shell** was ordered to increase planned greenhouse gas emission cuts in a landmark ruling that could pave the way for legal action against energy firms around the world. **AMAG Austria Metall** began installation of the largest rooftop photovoltaic system yet installed in Austria at its new aluminum rolling mill in Ranshofen. **STEEL: THE U.S. AND THE EU BEGAN DISCUSSIONS TO RESOLVE THE CONFLICT OVER STEEL** and aluminum imports. The talks will focus on ways to reduce a global steel glut. **Steel industry groups and the USW union** urged President Biden to maintain steel tariffs, saying lifting the Section 232 tariffs now "would undermine the viability of our industry". **Steel prices** are at record highs and demand is surging, as businesses step up production and resume hiring amid an easing of pandemic restrictions.

MEDICAL: NEW SKIN PATCH DRAWS CLOSER TO WEARABLE, ALL-IN-ONE HEALTH MONITOR. UC San Diego engineers developed a skin patch to continuously track blood pressure, heart rate and the wearer's levels of glucose, lactate, alcohol or caffeine. It is the first wearable device that monitors cardiovascular signals and multiple biochemical levels at the same time. **AstraZeneca's \$39 billion takeover of U.S. biotech group Alexion** is being probed by the UK competition regulator. **The Administration** moved to sharply ramp up COVID-19 vaccine shipments to other countries. As of mid-May, the U.S. had produced more than 333 million doses of vaccine.

AEROSPACE: FLYING AT MACH 16 COULD BECOME REALITY WITH NEW PROPULSION SYSTEM. Researchers are building on a technology that could pave the way for hypersonic flight, such as travel from New York to Los Angeles in under 30 minutes. The technology stabilizes the detonation needed for hypersonic propulsion. **Europe's Airbus** urged suppliers to prepare industrially and financially for steep increases in jet output. **United Airlines purchased 15 Boom "Overture" supersonic aircraft**, with an option for an additional 35 jets. It is targeting the start of passenger service in 2029 with a plane that could fly at Mach 1.7 and cut flight times in half.

AUTOMOTIVE: LESSONS FROM 2011 DISASTER HELP TOYOTA RIDE OUT CHIP SHORTAGE, while other global car makers were forced to revise production plans. Toyota is exceeding its sales targets this year and expects to sell even more units in the next 12 months. **An all-electric Ford F-150 Lightning pickup** was debuted, aggressively priced for an EV, with the potential to supercharge the electric car market. **Used-car prices have surged** due to the global chip shortage that has damped production of new cars.

STAINLESS STEEL: ACERINOX REPORTED A 177% INCREASE IN 1ST QTR PROFITS VS. LAST YEAR. The company cited strong performance in the stainless steel sector for consumer goods, an order backlog 80% higher than in March 2020 and strong order intake in the high-performance alloys division. **JSW Steel USA signed a long-term agreement with Allegheny Technologies** for the toll conversion of steel slabs manufactured at its Mingo Junction mill into hot-rolled coils at ATI's rolling mill in Brackenridge, PA.

METALS: MORE THAN 90% OF THE WORLD'S MANGANESE PRODUCTS ARE PRODUCED IN CHINA. Dozens of Chinese manganese processors accounting for most of global capacity joined a state-backed campaign to establish a "manganese innovation alliance" that others in the industry say is a production cartel. The alliance succeeded this year in throttling the supply of key products, mainly steel-strengthening additives, sending their prices soaring more than 50% in 3 months. **Iron ore prices fell sharply** after China signaled that it would focus on efforts to cool soaring prices, warning of "excessive speculation", as concerns grow over rising inflation.

ENERGY: OLDER FOSSIL-FUEL POWER PLANTS are shutting down across the U.S. in favor of renewable energy, but some are getting a new lease on life—to mine bitcoin. **Wind power companies** will see the levelized cost of energy drop by as much as 35% by 2035, driven by bigger and more efficient turbines, lower capital and operating costs and other advancements. **Vistra Corp.**, which owns one of America's largest fleets of natural-gas power plants, intends to invest more than \$1 billion in solar farms and battery storage units.

THE AMERICAS

- **Durable goods orders** fell by 1.3% in April, but excluding a 6.7% decrease in the transportation component, new orders were up 1%. A drop in motor vehicles and parts orders drove the decline in the headline number, even as demand for vehicles has risen with the reopening of the economy. An accompanying drop in motor vehicle shipments, likely due to component shortages, suggests that auto prices will rise faster in the coming months.
- **U.S. retail sales** were flat in April as shoppers pulled back on goods purchases, while boosting spending on services. Sales were up at restaurants and bars by 3%, a positive sign for the hard-hit industry as the U.S. economy more fully opens. Excluding motor vehicles and gas stations, retail sales were up 43% vs. April 2020 when some sectors of the economy were shut down due to the pandemic.
- **Hiring in the U.S.** picked up in May, signaling a moderate improvement in the labor market as businesses struggled to fill job openings. U.S. employers added 559,000 jobs. The unemployment rate fell to 5.8% in May from April's 6.1%. Manufacturing employment rose, driven mostly by job gains in the auto sector, a sign that ongoing supply chain disruptions in the industry somewhat eased last month.
- **U.S. consumer confidence** was essentially unchanged in May. The Conference Board's present situation reading rose to 144.3 from 131.9, but the expectations reading fell to 99.1 from 107.9. The present situation reading reflects solid growth in the 2ndQtr; while the decline in the expectations index was due to concerns about softer labor market conditions, rising inflation and reduced stimulus.
- **U.S. import prices** rose sharply in April, advancing 0.7%. They have climbed 10.6% over the past 12 months, the fastest pace since 2011. U.S. export prices advanced 0.8% in April and are up 14.4% in the past year from pandemic lows. **Key Update:** *The Administration is weighing concerns about commodity shortages and inflation as it reviews trade tariff policy. The U.S. currently levies average tariffs of 19.3% on imports from China and 3% on those from the rest of the world. A bipartisan group of 40 U.S. senators requested a process to provide U.S. businesses relief from tariffs on Chinese goods imposed by the previous Administration.*
- **The U.S. trade deficit** narrowed in April from the record gap of \$75 billion in March. Disruptions in global supply chains and a slowdown in consumer spending contributed to a 1.4% drop in imports to \$273.9 billion, while exports grew 1.1% to \$205 billion. The deficit in trade of goods and services shrank by 8.2% to \$68.9 billion in April.

- **Consumer prices** increased 4.2% in April from a year ago to the highest level since 2008, raising inflation concerns as the economy revs up. The CPI rose 0.8% in April from March. Higher prices for used autos surged 10% in April vs. March, accounting for more than a third of the increase.
- | Year | CPI (All Items) | Core CPI (All items less food and energy) |
|------|-----------------|---|
| 2019 | 1.55% | 2.15% |
| 2020 | 1.55% | 2.15% |
| 2021 | 4.20% | 3.00% |
- **U.S. factory orders** dropped 0.6% in April after increasing 1.4% in March. Orders are up 14.2% on a year-on-year basis. Factory goods orders in April were weighed down by a 6.1% decrease in orders for motor vehicles and parts. Orders for electrical equipment, appliances and components fell 0.7%. **Key Update:** *Business spending on equipment surged 2.2% in April and enjoyed double-digit growth over the last three quarters, driven by massive fiscal stimulus to soften the blow to the economy from the public health crisis.*
 - **U.S. industrial production** rose 0.7% in April as the shortage of semiconductors for auto manufacturing tempered gains from a 2.6% rebound in utility output and a 6.7% increase in chemicals due to the restart of plants damaged by bad weather in February. Production of motor vehicles and parts fell 4.3%. The capacity utilization rate improved to 74.9% in April from 74.4% the prior month.
 - **The ISM index of national factory activity** increased to a reading of 61.2 in May from 60.7 in April. The ISM survey found companies and their suppliers continue to struggle to meet increasing levels of demand, noting that record-long lead times, wide-scale shortages of critical basic materials, rising commodities prices and difficulties in transporting products continue to affect all segments of manufacturing.
 - **Service sector activity** as measured by the ISM services index rose to a record 64 in May from 62.7 in April. There were index gains for prices and new orders, but a decline in the employment index and slower deliveries are indications that parts and labor issues are impacting businesses.
 - **U.S. producer prices** rose by 0.6% in April after a 1% gain in March as meat pushed up food prices (before the ransomware attack). Excluding those components and a drop in energy prices, core producer prices rose by 0.7% in April.
 - **American companies** borrowed \$9.8 billion for capital investments in April, up 19% from a year earlier, signaling additional economic recovery. The Commerce Department confirmed that 1stQtr GDP increased at a 6.4% annualized rate and followed a 4.3% growth rate in the 4thQtr. Before-tax corporate profits slipped \$0.2 billion in the quarter.



- **The U.S. Leading Economic Indicators** increased 1.6% in April, following a 1.3% gain in March. The Conference Board said that with April's large monthly gain to start the 2ndQtr, the U.S. LEI has now recovered fully from its COVID-19 contraction—surpassing the index's previous peak reached at the very onset of the global pandemic in January 2020.
- **Existing home sales** fell 2.7% in April as an acute shortage of properties drove prices to a record high. The median existing house price shot up 19% from a year ago. The inventory of previously owned homes on the market was down 20% from a year ago. New single-family home sales dropped 5.9%. Housing starts tumbled 9.5%, with the decline concentrated in single-family housing.
- **U.S. construction spending** rose 0.2% in April after surging 1.0% in March. Spending on private construction projects rose 0.4%, lifted by single-family homebuilding. Spending on public construction projects fell 0.6%. State and local government outlays slipped 0.2%, while federal government spending declined 6.2 percent.
- **U.S. consumer spending** climbed 0.5% in April. Spending on services rose 1.1%, while spending on goods fell 0.6%. Purchases of long-lasting goods such as motor vehicles rose 0.5%; spending on nondurable goods tumbled 1.3%. With outlays exceeding income, the savings rate dropped to a still-high 14.9% from 27.7% in March. Wages increased 1.0% in April, matching March's gain.
Key Update: Household income fell 13.1% in April, the biggest drop on record, though the decline followed a surge the prior month due to the effects of stimulus payments that went out earlier this year. Despite the April drop, household income was 11% higher than in February 2020.
- **Steel mills** in the U.S. shipped 7.950 million tons of steel in March, an 18% increase from the previous month. Shipments in the 1stQtr were 22.106 million tons, a 8.3% decrease vs. the 24.109 million tons shipped in the same period in 2020. (See **Appendix: Steel**, page 13)
- **JSW Steel USA** signed a long-term agreement with Allegheny Technologies for the toll conversion of steel slabs manufactured at its Mingo Junction mill into hot-rolled coils at ATI's rolling mill in Brackenridge, PA. By contract, ATI is expected to hot-roll a significant percentage of the volume of carbon steel slabs produced by JSW Steel USA.
- **A CRU case study** finds that the American steel industry is 75% to 320% more carbon efficient than global producers. The study makes the case that a strong and effective border carbon adjustment (carbon tariff) must be part of any effective U.S. climate policy to prevent an increase in higher carbon intensity, but cheaper, foreign steel imports.

- **The U.S. and the European Union** began discussions to resolve a conflict over steel and aluminum imports that was a major front in the Trump Administration's trade wars and a serious burden on trans-Atlantic relations. The talks will focus on ways to reduce the global steel glut, top U.S. and European trade officials said in a joint statement, which mentioned tariffs only in passing, a sign that the goal is not simply to return to the pre-Trump status quo.



Key Update: The tariffs are unpopular with automakers and other steel consumers because they raise prices, but in steel-making regions like Pennsylvania, the tariffs are seen as a justified response to unfair competition from abroad.

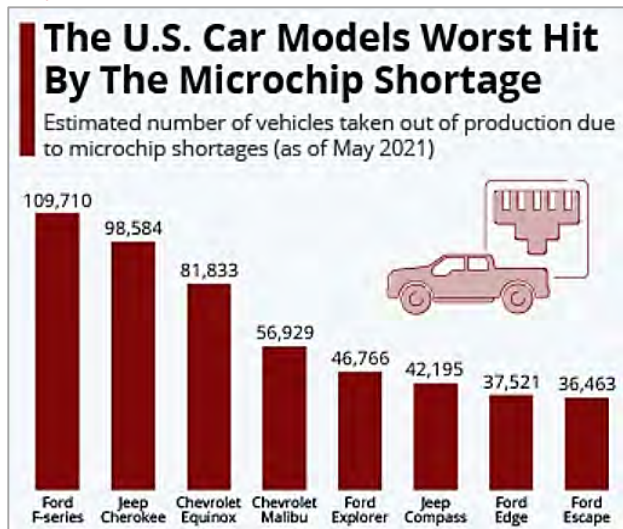
- **Steel industry groups and the USW union** urged President Biden to maintain the steel tariffs, saying that lifting the Section 232 tariffs now "would undermine the viability of our industry". In a letter to Biden after his chief trade negotiator confirmed a temporary tariff truce with the EU, the groups argued that the tariffs have been a success, leading to \$15.7 billion in new capacity investments.
- **Steel prices** are at record highs and demand is surging, as businesses step up production and resume hiring amid an easing of pandemic restrictions. Steel makers have consolidated in the past year, allowing them to exert more control over supply. Tariffs on foreign steel have kept cheaper imports out. In early May, futures prices for 20-ton coils of domestic steel, the benchmark for most steel prices nationwide, pushed above \$1,600/ton for the first time ever, and prices continue to hover there.



- **Steel imports into the U.S.** were 2.634 million tons (MT) in April, including 1.654MT of finished steel (up 14.1% and down 7.6% respectively vs. March final data). Total steel imports YTD through April compared to last year increased 0.8% to 9.263MT and finished steel imports rose 5.1% to 6.117MT. Finished steel import market share in the U.S. in April and YTD was estimated at 18%. The largest offshore supplier YTD is South Korea at 0.864MT, up 22% vs. 2020.

- **South Korean battery maker SK Innovation and Ford** are set to launch a battery joint venture in the U.S. to support the ramp-up of Ford's electric vehicle rollout. The deal may eventually include a jointly owned plant to make battery cells for rechargeable EV batteries. SKI is constructing a battery cell plant in Georgia, which is expected to be finished later this year. It will supply Ford and VW plants.
- **Hyundai Motors** plans to invest \$7.4 billion in the U.S. by 2025 to produce electric vehicles, enhance production and further its investment in smart mobility solutions. Hyundai will begin EV production at its Alabama plant, while affiliate Kia Motors plans to build EVs in Georgia. Hyundai will offer a suite of electric vehicles to consumers starting next year. Its plan also includes tapping into hydrogen energy.
- **General Motors** expects profits to be better in the first half of this year than it previously projected. GM said it has been able to pull ahead some future semiconductor deliveries into the second quarter to help lift production.
- **Used-car prices** have surged due to a global chip shortage that has dampened production of new cars. The average price paid for a used car exceeded \$25,000 in April for the first time in the history of research firm J.D. Power's tracking. Rental-car operators are taking the unusual step of buying used cars to fill holes in their fleets as the chip shortage dents new-vehicle stock.

Key Update: *The global semiconductor chip shortage will cost automakers \$110 billion in lost revenues this year, consulting firm AlixPartners said. It forecasts the crisis will hit the production of 3.9 million vehicles.*



- **Tesla** is set to pay in advance for chips to secure its supply and even is exploring buying a plant to overcome the shortage. Tesla needs the newest-generation mass-production chips made mainly in Taiwan and South Korea.

- **Samsung Electric** plans to invest \$17 billion in a new plant for chip contract-manufacturing in the U.S. Samsung is considering Austin, Texas, as one of the sites for the plant. The South Korean government has requested incentives from the U.S., such as tax deductions and infrastructure construction, to ease the U.S. investment of Korean firms.

- **An all-electric Ford F-150 Lightning pickup**, was debuted. Ford offered interested customers a place in line for a refundable \$100 deposit. In 48 hours it had more than 44,500 reservations. The Lightning is due out in 2022, and it's aggressively priced for an EV. The base model with 230 miles of range starts at \$39,974, while the extended range version starts in the mid-\$50,000s and can go about 300 miles.



Key Update: *The F-150 Lightning has the potential to supercharge the electric car market. The idea of taking a sales juggernaut such as the F-150 and offering it in an affordable, powerful and long-range electric variant offers a compelling roadmap for the rest of the industry to make meaningful inroads into the EV market.*

- **Ford** is developing two dedicated EV platforms, one for full-size trucks and SUVs, the other for cars and smaller SUVs, as part of a strategy to catch GM, VW and Tesla in the global electrification race. The dedicated platforms will give Ford common architectures on which to base many of its future EVs, simplifying and reducing the cost of logistics and manufacturing. (See **Appendix: Automotive**, page 12)
- **Convenience retailer 7-Eleven** plans to put at least 500 EV fast chargers at 250 stores in the U.S. and Canada by the end of 2022. 7-Eleven is working to reduce its own carbon emissions by 50% by 2030. The chain's plans underscore the ongoing market challenge in the transition to EVs in North America: range anxiety among potential EV buyers.

- **Virgin Galactic** conducted a successful test flight of its VSS Unity spacecraft after it was launched at 44,000 feet by the VMS Eve aircraft. From there, it climbed rapidly to the edge of space at three times the speed of sound. The flight puts the



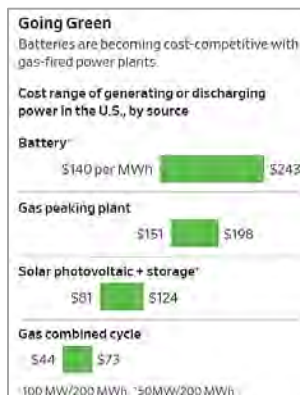
company one step closer to developing the space tourism industry. Virgin Galactic has about 700 customer reservations on its books, most of which were sold at a price of \$200K to \$250K per ticket several years ago. The company is currently gauging demand on its website, which allows users to register their interest in a future flight.

- **United Airlines** purchased 15 Boom “Overture” supersonic aircraft, with an option for an additional 35 aircraft. UA is targeting the start of passenger service in 2029 with a plane that could fly at Mach 1.7 and cut some flight times in half. A flight from New York to London that typically lasts 7 hours would take 3½ hours. The plane is expected to be the first large commercial aircraft to be net-zero carbon from day one, as it will run on 100% sustainable aviation fuel.



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

- **Boeing** received approval from U.S. air-safety regulators for fixes to an electrical problem that has grounded more than 100 of its 737 MAX jets, paving the way for airlines to return them to passenger service. Boeing has drawn up preliminary plans for a fresh sprint in 737 MAX output to as many as 42 jets a month in fall 2022 in a bid to extend its recovery from overlapping safety and COVID-19 crises. Higher production could inject much-needed cash into the supply chain and reduce Boeing's component costs.
- **Older fossil-fuel power plants** are shutting down across the U.S. in favor of renewable energy, but some are getting a new lease on life—to mine bitcoin. In upstate New York, an idled coal plant has been restarted, fueled by natural gas, to mine cryptocurrency. A once-struggling Montana coal plant is now scaling up to do the same. The lofty price of bitcoin and other cryptocurrencies has investors pouring money into power generation. A University of Cambridge index pegs the annual power consumption of bitcoin mining at around 130 terawatt-hours, more than the power consumption of Argentina.
- **Vistra Corp.** owns one of America’s largest fleets of natural-gas power plants but doesn’t plan to buy or build any more.



Instead, Vistra intends to invest more than \$1 billion in solar farms and battery storage units in Texas and California to survive in an electricity industry being reshaped by new technology, including cost-effective batteries charged with wind and solar energy. Batteries are most often paired with solar farms, rather than wind farms, because of their power’s predictability and because it is easier to secure federal tax credits for that pairing.

- **Vineyard Wind**, a \$2.8 billion project off the coast of Massachusetts, plans to start construction within a year and be operating in 2023. The Administration approved the project’s construction and operations plans for up to 84 turbines twelve miles off Nantucket. Vineyard Wind CEO Lars Pedersen said federal approval “is not about the start of a single project, but the launch of a new industry.” The project would generate as many as 800 megawatts for Massachusetts ratepayers, enough to power 400,000 homes and businesses. Vineyard Wind will deploy the world’s most powerful wind turbine, GE’s Haliade-X.

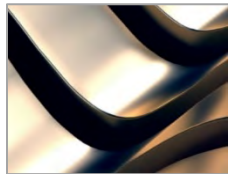


Key Update: *Vineyard Wind was just the first of roughly 10 offshore projects waiting for permit reviews at the Interior Department as investors seek to meet growing demand for zero-emissions energy.*

- **The Colonial Pipeline**, which carries 100 million gallons per day of gasoline, diesel and jet fuel, resumed supplying fuel to most regions along its 5,500 mile route after a six-day outage. The top U.S. fuel pipeline was crippled by a cyberattack that led to fuel shortages across East Coast states. The shutdown caused gasoline shortages and emergency declarations from Virginia to Florida, led two refineries to curb production and had airlines reshuffling some refueling operations.
- **AstraZeneca’s** \$39 billion takeover of U.S. biotech group Alexion is being probed by the UK competition regulator after raising potential antitrust concerns. In December, AstraZeneca agreed to buy Alexion, a biotech specializing in treatments for rare diseases. Alexion is based in Boston, books its largest sales in the U.S. and sells drugs in more than 50 countries, including the UK. (See **Appendix: Medical**, page 11)
- **The Administration** moved to sharply ramp up COVID-19 vaccine shipments to other countries, following calls for the U.S. to bolster efforts to curb the pandemic globally as it rages unchecked in developing nations. An earlier pledge to export 60 million doses from AstraZeneca came at little sacrifice because that vaccine has yet to be authorized for U.S. use. The U.S. now plans to share globally 20 million doses of vaccines produced by Moderna, Pfizer and J&J. The U.S. as of mid-May had produced more than 333 million doses of vaccine and exported about 3 million doses, far less than other major vaccine-producing nations.

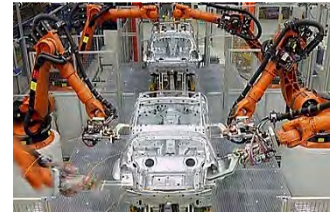
EUROPE, AFRICA & THE MIDDLE EAST

- **Eurozone business growth** accelerated at its fastest pace in over three years in May, but European Central Bank President Christine Lagarde said an uncertain recovery still needed emergency support from the ECB. IHS Markit's flash Composite PMI climbed to 56.9 in May from April's 53.8, its highest level since February 2018. Supply-side issues have made it a seller's market for purveyors of raw materials and factories faced a record increase in input costs.
- **ArcelorMittal** is among a number of companies poised to swoop for the French steel plants of metals tycoon Sanjeev Gupta. German producer Saarstahl and Italy's Beltrame Group are also in the running to buy the plants, Ascovall and Hayange. Liberty Steel, part of Gupta's conglomerate GFG Alliance, put the two plants in northeastern France up for sale after failing to refinance them. GFG is also selling three UK steel plants, as it seeks to stave off a wider collapse.
- **Acerinox** reported 1stQtr profits after taxes and minority interests of €78 million, representing an increase of 177% compared to a year ago. EBITDA was €161 million, 90% higher the 1stQtr of 2020. Group sales rose to €1.441 billion, a 24% improvement vs. the same period of 2020. Melt shop production totalled 668,454 tonnes, a 12% gain. Looking ahead, the company cited strong performance in the stainless steel sector for consumer goods, an order backlog 80% higher than in March 2020 and strong order intake in the high-performance alloys division, suggesting a recovery in VDM's results from June onwards.
- **The Swedish start-up H2 Green Steel** plans to start production in 2024 and produce 5 million tonnes of emissions-free steel by the end of the decade at its site just below the Arctic Circle. The mill will use hydrogen produced with renewable energy rather than the traditional way of burning coke. The Agnelli, Wallenberg and Maersk families, as well as Mercedes-Benz, helped H2GS raise US\$105 million in its first round of venture capital financing. H2GS is one of two high-profile green steel projects in Sweden. It faces competition from Hybrit, a collaboration between steelmaker SSAB, iron ore miner LKAB and utility Vattenfall. (See **Appendix: Steel**, page 13)



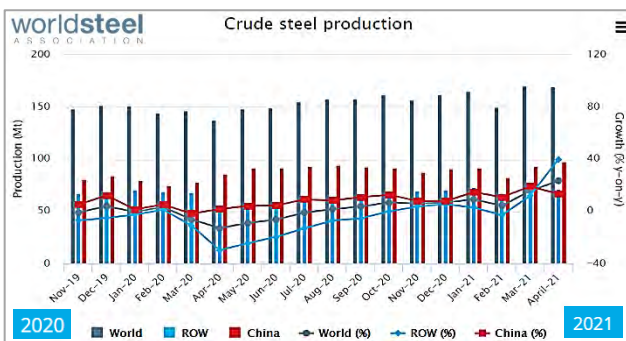
Key Update: Austria's Voestalpine and ArcelorMittal are developing similar projects, but the two Swedish efforts are further ahead. Other groups are working on technology to produce steel from molten oxides using electricity, which are at an earlier stage of development.

- **Aluminum producer Norsk Hydro** entered into a MoU with Danish green hydrogen infrastructure firm Everfuel to establish a partnership to develop and deliver renewable hydrogen. They intend to install and fuel hydrogen electrolyzers throughout Europe. The new firm would also aid switching from gas to renewable hydrogen at both Hydro plants on the continent and third-party buyers as well. The agreement contemplates installing electrolyzers adjacent to Hydro's aluminium smelters, which would fuel operations at the potlines and also supply the European transportation sector.
- **AMAG Austria Metall** began installation of the largest rooftop photovoltaic system installed in Austria at its new aluminum rolling mill in Ranshofen with Clean Capital Energy's support. The firm says the move is part of a larger push by Austria to convert to fully climate-neutral power production by 2030. The 13.6-acre installation at the mill is expected to produce about 6.7GWh of electricity annually.
- **Heidelberg Cement** plans to build the first carbon-neutral cement plant in Sweden by 2030 to capture 1.8 million tonnes of carbon dioxide produced annually at its Swedish plant in Slite. The 1.8 million figure is more than four times the volume the German company intends to store underground from its first big carbon capture plant in Norway, which gained final government approval last year.
- **Royal Dutch Shell** was ordered to significantly deepen planned greenhouse gas emission cuts in a landmark ruling that could pave the way for legal action against energy firms around the world. The court ordered Shell to reduce its absolute levels of carbon emissions, where Shell's intensity-based targets could allow Shell to increase its output.
Key Update: The ruling is a major victory for the environmental activists that brought the lawsuit, the first in which the groups have turned to the courts to try to force a major energy firm to change strategy. While only legally binding in the Netherlands, the ruling may have far-reaching consequences for the rest of the global fossil fuel industry.
- **Europe's Airbus** urged suppliers to prepare industrially and financially for steep increases in jet output. Airbus sees demand for single-aisle medium-haul jets gradually resuming a trajectory seen before COVID-19 triggered production cuts. Airbus firmed up plans for increased output in 2021 and issued a mix of firm targets and provisional scenarios that could almost double single-aisle output by 2025. (See **Appendix: Aerospace**, page 8)



ASIA/PACIFIC, JAPAN, AUSTRALIA & INDIA

- Japan's economy** contracted an annualized 5.1% in the 1st Qtr amid a resurgence of COVID-19 infections. Private spending was down 1.4%. The government declared a state of emergency in some areas during the quarter, including Tokyo and Osaka, forcing shops and restaurants to close or reduce hours. It was reimposed April. Capital expenditures also declined 1.4% after strong growth in the previous quarter. However, Japanese industrial output in April expanded 2.5% from the previous month.
 - Chinese factory activity** slipped in May on weaker export demand and higher commodity prices, but the country's non-manufacturing sector was bolstered by stronger construction and holiday spending. China's official manufacturing purchasing managers index slipped slightly to 51.0 in May from the previous month's 51.1 reading.
- Key Update: China's runaway economic recovery has caused power shortages in the south of the country. Factories known for producing global consumer and high-tech products have been ordered to use less power and even close for between one to three days a week to mitigate the shortfall.*
- Global crude steel production** was 169.5 million tonnes (MT) in April, a 23.3% increase compared to a year ago. China produced 98 MT of crude steel, an increase of 13% vs. April 2020. The United States cast 6.9 MT of crude steel, a 43% gain vs. the year prior. India's production was 8.3 MT, up 152%. Japan produced 7.8 MT, up 18.9%. South Korea made 5.9 MT, up 15.4%. (See **Appendix: Steel**, page 13)



- Major shipping companies** warned clients of worsening congestion at Shenzhen's Yantian port in southern China following the discovery of several asymptomatic cases of COVID-19 in the city. More than 40 container ships are anchored in open water outside the terminal.
- Tin prices** reached their highest level in 10 years at the end of May, driven by a boom in consumer electronics and sales of 5G smartphones. Tin has risen 133% since its low in March 2020, as sales of smartphones, laptops and iPads have surged due to people working and studying from home.

- A Chinese rover** successfully touched down on the Martian surface in May, making China the second nation, after the U.S., to achieve a soft landing on the red planet. The rover, named Zhurong after the Chinese god of fire, is part of China's Tianwen-1 mission, which launched in July 2020. The landing is a major milestone for China's space agency and establishes China as a principal contender in a new era of national space competition.



- Nissan** will invest more than US\$1.8 billion in building new electric-vehicle battery plants in the U.K. and Japan. The Japanese automaker and a Chinese-owned battery maker aim to start delivering batteries to power 700,000 electric vehicles a year from two plants as early as 2024. The plants will be operated by Envision, the world's 7th largest supplier of EV batteries and in which Nissan holds a 20% stake.
 - Chinese scientists** at the Hefei Institute set a new world record by achieving plasma temperature of 120 million degrees Celsius for 101 seconds, a key step toward the test running of a fusion reactor.
- Key Update: The ultimate goal is to create nuclear fusion like the Sun, using deuterium to provide a steady stream of clean energy. The deuterium in one liter of seawater can produce, through fusion reaction, the amount of energy equivalent to 300 liters of gasoline.*
- More than 90% of the world's manganese products** are produced in China. Since October, dozens of Chinese manganese processors accounting for most of global capacity have joined a state-backed campaign to establish a "manganese innovation alliance" that others in the industry say is a production cartel. The manganese alliance notched a success this year in throttling the supply of key products, mainly steel-strengthening additives, sending their prices soaring more than 50% in three months. The squeeze didn't target battery-grade sulfates critical for EV cathodes, but it heightened concern among car makers. (See **Appendix: Commodities**, page 15)
 - The price of iron ore** fell sharply in late May after China signaled that it would focus on efforts to cool soaring prices, warning of "excessive speculation" as concerns grow over rising inflation. China's economic planning agency said it would crack down on monopolies in commodities markets, the spread of false information and hoarding. The main futures contract for iron ore on China's Dalian exchange fell almost 20% from a record high in May.

ECONOMIC UPDATE: APPENDIX TO THE JUNE 2021 ISSUE**AEROSPACE: FLYING AT MACH 16 COULD BECOME REALITY WITH A NEW PROPULSION SYSTEM**

University of Central Florida researchers are building on a technology that could pave the way for hypersonic flight, such as travel from New York to Los Angeles in under 30 minutes. **The researchers have discovered a way to stabilize the detonation needed for hypersonic propulsion by creating a special hypersonic reaction chamber for jet engines.** Study co-author Kareem Ahmed, an associate professor in UCF's Department of Mechanical and Aerospace Engineering, said, "The discovery of stabilizing a detonation—the most powerful form of intense reaction and energy release—has the potential to revolutionize hypersonic propulsion and energy systems." The system could allow for air travel at speeds of Mach 6 to 17, which is more than 4,600 to 13,000 miles per hour. The technology harnesses the power of an oblique detonation wave, which they formed by using an angled ramp inside the reaction chamber to create a detonation-inducing shock wave for propulsion. Unlike rotating detonation waves that spin, oblique detonation waves are stationary and stabilized. The technology improves jet propulsion engine efficiency so that more power is generated while using less fuel than traditional propulsion engines, thus lightening the fuel load and reducing costs and emissions. The technology could also be used in rockets for space missions to make them lighter by requiring less fuel, travel farther and burn more cleanly. Detonation propulsion systems have been studied for more than half a century but had not been successful due to the chemical propellants used or the ways they were mixed. Previous work by Ahmed's group overcame this problem by carefully balancing the rate of the propellants hydrogen and oxygen released into the engine to create the first experimental evidence of a rotating detonation. However, the short duration of the detonation, often occurring for only micro or milliseconds, makes them difficult to study and impractical for use. In the new study, the UCF researchers were able to sustain the duration of a detonation wave for three seconds by creating a new hypersonic reaction chamber, known as a hypersonic high-enthalpy reaction (HyperREACT) facility. The facility contains a chamber with a 30-degree angle ramp near the propellant mixing chamber that stabilizes the oblique detonation wave. "This is the first time a detonation has been shown to be stabilized experimentally," Ahmed said. "We are finally able to hold the detonation in space in oblique detonation form. It's almost like freezing an intense explosion in physical space." Gabriel Goodwin, an aerospace engineer with the Naval Center for Space Technology and study co-author, said their research is helping to answer many of the fundamental questions that surround oblique detonation wave engines. Goodwin's role in the study was to use the Naval Research Laboratory's computational fluid dynamics codes to simulate the experiments performed by Ahmed's group. The next steps for the research are the addition of new diagnostics and measurement tools to gain a deeper understanding of the phenomena they are studying. If successful in advancing this technology, detonation-based hypersonic propulsion could be implemented into human atmospheric and space travel in the coming decades.

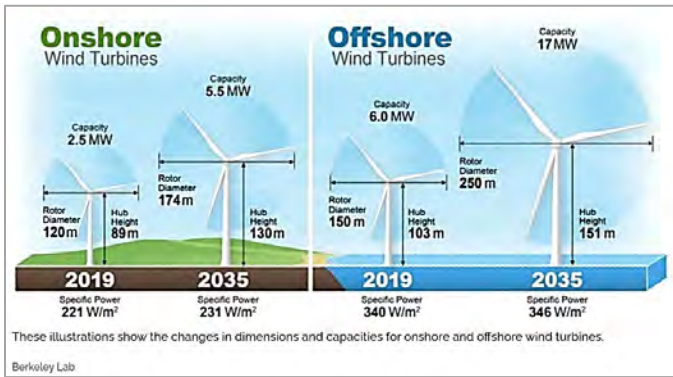
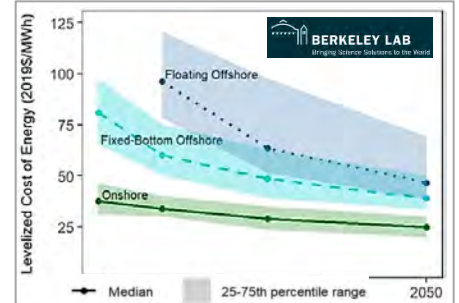
**AEROSPACE: HYDROGEN BEATS BATTERIES AS MORE FEASIBLE GREEN POWER SOURCE FOR AVIATION**

The past year has brought some vindication to those who see hydrogen as aviation's passport to a cleaner future. Airbus unveiled three hydrogen-powered aircraft concepts for 2035. More recently, U.K. startup ZeroAvia got backing from British Airways as part of a \$24 million funding round. Universal Hydrogen, led by former Airbus executive Paul Eremenko, has just raised \$21 million from heavyweights such as the venture-capital subsidiaries of JetBlue and Toyota. **The aviation industry has set itself a target of halving emissions by 2050, which would be roughly in line with the 2016 Paris Agreement to limit climate change.** Only a third of the reduction is expected to come from improvements in turbofans and airframes. Sustainable fuels can play a role, but production capacity is limited and the most affordable ones remain pollutive. Hydrogen packs an impressive 140 megajoules per kilogram of weight, compared with 40 MJ/Kg for jet fuel, and it is a relatively mature technology. Fuel cells, which are being used by Universal Hydrogen and ZeroAvia to convert light and regional aircraft, cost \$40 per kilowatt, 68% less than in 2006. Hydrogen isn't an environmental no-brainer yet. Turning electricity into hydrogen and then back into electricity is inefficient: Only about 45% of the energy ends up being used, compared with 90% for batteries and only 0.1% of global hydrogen production is currently carbon-free; most comes from natural gas and coal. Still, many analysts expect "green" hydrogen to become price-competitive relative to jet fuel in the next five years, making it a commercial option for airlines. Universal Hydrogen is spending \$100 million to get a re-engined regional aircraft certified by 2025 and to accelerate investments in hydrogen storage, distribution and refuelling, which are big hurdles to the technology's wider adoption.



ENERGY: PREDICTING WIND POWER COSTS — SIGNIFICANT REDUCTIONS BY 2035 AND 2050

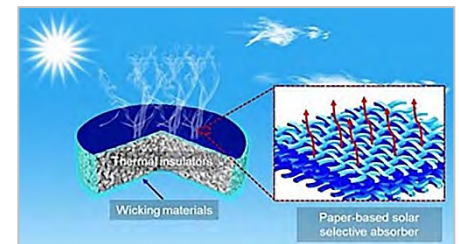
Wind power companies will see leveled cost of energy drop by 17 to 35% by 2035 and by 37 to 49% by 2050, driven by bigger and more efficient turbines, lower capital and operating costs and other advancements, according to a survey of 140 wind-power industry observers taken by researchers at Lawrence Berkeley National Laboratory. The survey also looked at leveled energy costs across three types of wind-power plants: onshore, fixed-bottom offshore and floating offshore. There are greater absolute reductions (and more uncertainty) in the leveled energy costs for offshore wind compared with onshore wind and a narrowing gap between fixed-bottom and floating offshore wind. Still, predicted future costs for all three types are half what a similar 2015 survey predicted. **The federal government is trying to maximize offshore wind potential and identifies wind power as a key component of the nation’s efforts against climate change.** Wind power could play an important role in reaching net zero carbon emissions by mid-century. Five key factors affect the leveled cost of energy: upfront capital cost, ongoing operating costs, capacity factor, project design life and cost of financing. Experts anticipate continued improvements across all these factors. **A key driver in these improvements is turbine size.** For onshore wind, growth is expected not only in generator ratings (to an average of 5.5 MW in 2035, up from 2.5 MW in 2019), but also in two other factors that increase capacity—rotor diameters and hub heights. Offshore wind turbines are expected to grow to an average of 17 MW in 2035, up from 6 MW in 2019. Floating offshore wind is predicted to gain market share, going from its current pre-commercial state to account for 25% of new offshore wind projects by 2035. Cost reductions have accelerated in recent years, faster than previously predicted by most forecasters and faster than historical rates of decline. “All else being equal, these trends will let wind play a larger role in global energy supply than previously thought while facilitating energy-sector decarbonization,” the Berkeley Lab wrote.



larger role in global energy supply than previously thought while facilitating energy-sector decarbonization,” the Berkeley Lab wrote.

INNOVATION/ENERGY: SOLAR-POWERED DESALINATION UNIT SHOWS GREAT PROMISE

Despite the vast amount of water on Earth, most of it is nonpotable seawater. Freshwater accounts for only about 2.5% of the total, so much of the world experiences serious water shortages. Scientists in China report the development of a highly efficient desalination device powered by solar energy. **The device consists of a titanium-containing layer, TiNO, or titanium nitride oxide, capable of absorbing solar energy. The TiNO is deposited on a special type of paper and foam that allows the solar absorber to float on seawater.** When sunlight strikes the titanium layer, it heats rapidly and vaporizes the water. By placing the unit in a transparent container with a sloped quartz roof, the water vapor can be condensed and collected, producing a copious amount of freshwater. In the solar energy field, TiNO is a common commercial solar absorbing coating, widely used in solar hot water systems and in photovoltaic units. It has a high solar absorption rate and a low thermal emittance and can effectively convert solar energy into thermal energy. The investigators developed a method for depositing a layer of TiNO using a technique known as magnetron sputtering. They used a special type of highly porous paper known as airlaid paper that acts as a wicking material to supply water from the seawater reservoir. Airlaid paper is made from wood fibers and is commonly used in disposable diapers. The evaporation unit included three parts: the TiNO layer on top, a thermal insulator and the airlaid paper on the bottom. The insulation layer is polyethylene foam, which has many air-filled pores that trap heat and allow the multi-layer unit to float on top of a reservoir of seawater, minimizing heat loss to the surroundings. The porous airlaid paper used as the substrate for the TiNO solar absorber can be reused and recycled more than 30 times. Salt precipitation on the TiNO surface could interfere with efficiency, but the investigators found even after a long time, no salt layer formed on the surface. They suggest the porous nature of the paper wicks away any salt that might form on the surface, returning it to the seawater reservoir. The salinity of ordinary seawater is over 75,000 milligrams of salt per liter. Ordinary drinking water has a salinity of about 200 milligrams per liter. The desalination unit was able to decrease the seawater salinity to less than 2 milligrams per liter. Low cost, high efficiency and lack of fouling for this desalination technology shows it has the potential to help solve the world's freshwater shortage.

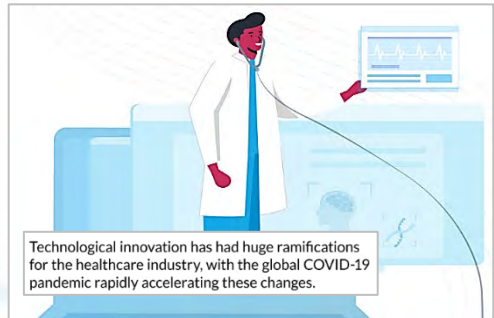




MEDICAL: SEVEN WAYS ARTIFICIAL INTELLIGENCE IS IMPROVING HEALTHCARE

The Patient-Centric Healthcare Revolution

AI has the potential to impact every step of a patient's journey—from prevention and early detection, to diagnosis and treatment.



Technological innovation has had huge ramifications for the healthcare industry, with the global COVID-19 pandemic rapidly accelerating these changes.

Prevention/ Early Detection

1

Prevention

Wearables, devices, and apps

Wearable devices like smart watches can track heart rate, activity, and sleep habits.

In the future, these devices could potentially monitor a user's body chemistry, such as glucose levels, which would significantly enhance diabetes treatment.



2

Early Detection

Wearables, devices

Because wearables can monitor heart and respiratory rates, they could catch health concerns early, before they become critical.



% of U.S. consumers using virtual visits



Diagnosis

3

Doctors Visit

Wearables, devices, and apps

Virtual assistants can support healthcare providers by:

- Automating patient data (no more paperwork)
- Enabling online billing services
- Monitoring patients



By 2027, the global healthcare virtual assistant market is projected to reach USD \$2.8 billion, at a CAGR of 27.2%.

Source: Reports and Data

Better Health for a Better World

In addition to revolutionizing the patient journey, technological advancements in healthcare could have major impacts on the industry as a whole:



4

Test Results

AI dashboard

AI assists with lab testing in several ways

- Speeds up the testing process (AI can measure data points faster than humans).



AI's ability to recognize patterns over time could provide more accurate test results.

Patient Empowerment

Through the use of AI and healthcare tech, the balance of power is shifting from traditional healthcare to connected patients.

In a recent survey, 41% of respondents were comfortable taking at-home diagnosis tests.

Source: Pathlight



Treatment

5

Surgery and Hospital Visits

Robotics

Robotic use in surgery can have a massive impact on patient well-being.



One study found that robot-assisted surgery experienced a 52% jump in success rate.

Source: Annals of Laparoscopic and Endoscopic Surgery

Less Stress on Healthcare Systems

AI and tech innovation will reduce pressure on healthcare systems and improve outcomes, allowing healthcare providers to focus on more preventative measures.

Source: Deloitte

Positive Impact on Chronic Illnesses

Personalized apps and adaptable treatment plans have the potential to reduce the impact of chronic illnesses—the leading driver of \$3.5 trillion in annual healthcare costs in the U.S.

Source: Health Leaders

6

Rehabilitation

Personalized apps and real world data

AI apps tailored specifically to individuals could track information, measure patient



experience, and adjust treatment plans based on patient-generated feedback.

7

Follow-ups and Remote Monitoring

Personalized apps and real world data

AI-enabled applications have the potential to support patients through their treatment, and help them stay accountable through consistent monitoring.



For example, to track progress, a patient might upload a picture of themselves taking their medication, and to keep track of dosage levels.

Source: MedTech Europe

Potential Cost Savings

Technological innovations can help governments scale their healthcare systems faster, ultimately providing more affordable and accessible healthcare for all.

Source: World Economic Forum



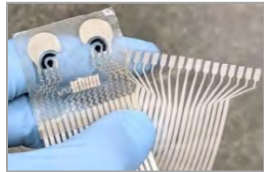
MEDICAL: NEW SKIN PATCH DRAWS CLOSER TO WEARABLE, ALL-IN-ONE HEALTH MONITOR

Engineers at the University of California San Diego developed a soft, stretchy skin patch that can be worn on the neck to continuously track blood pressure and heart rate, while measuring the wearer's levels of glucose, lactate, alcohol or caffeine. **It is the first wearable device that monitors cardiovascular signals and multiple biochemical levels in the human body at the same time, which could benefit individuals managing high blood pressure and diabetes—individuals who are also at high risk of becoming seriously ill with**

COVID-19. It could also be used to detect the onset of sepsis, which is characterized by a sudden drop in blood pressure accompanied by a rapid rise in lactate level. One soft skin patch that can do it all would also offer a convenient alternative for patients in intensive care units who need continuous monitoring of blood pressure and other vital signs. These procedures currently involve inserting catheters deep inside patients' arteries and tethering patients to multiple hospital monitors. One team was developing wearables capable of monitoring multiple signals simultaneously—chemical, physical and electrophysiological—in the body. Meanwhile, in the lab of UC San Diego nanoengineering, a second team of researchers was developing electronic skin patches that monitor blood pressure deep inside the body.



By joining forces, the researchers created the first flexible, stretchable wearable device that combines chemical sensing (glucose, lactate,

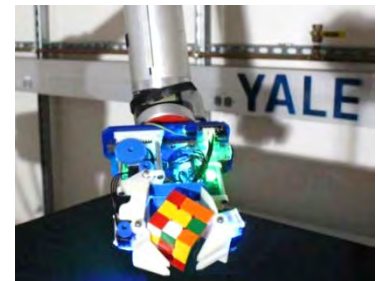


alcohol and caffeine) with blood pressure monitoring. The patch is a thin sheet of stretchy polymers that can conform to the skin. It is equipped with a blood pressure sensor and two chemical sensors—one that measures levels of lactate (a biomarker of physical exertion), caffeine and alcohol in sweat, and another that measures glucose levels in interstitial fluid. The patch is capable of measuring three parameters at once, one from each sensor: blood pressure, glucose, and either lactate, alcohol or caffeine. The blood pressure sensor sits near the center of the patch. It consists of a set of small ultrasound transducers that are welded to the patch by a conductive ink. **A voltage applied**

to the transducers causes them to send ultrasound waves into the body. When the ultrasound waves bounce off an artery, the sensor detects the echoes and translates the signals into a blood pressure reading. The chemical sensors are two electrodes that are screen printed on the patch from conductive ink. The electrode that senses lactate, caffeine and alcohol is printed on the right side of the patch; it works by releasing a drug called pilocarpine into the skin to induce sweat and detecting the chemical substances in the sweat. The other electrode, which senses glucose, is printed on the left side; it works by passing a mild electrical current through the skin to release interstitial fluid and measuring the glucose in that fluid. The researchers were interested in measuring these particular biomarkers because they impact blood pressure. In tests, subjects wore the patch on the neck while performing various combinations of the following tasks: exercising on a stationary bicycle, eating a high-sugar meal, drinking an alcoholic beverage and drinking a caffeinated beverage. Measurements from the patch closely matched those collected by commercial monitoring devices. The team is working on a new version connected to a power source and a benchtop machine to display its readings. The ultimate goal is to make everything wireless.

INNOVATION/MANUFACTURING: A HIGHLY DEXTEROUS ROBOT HAND WITH A CAGING MECHANISM

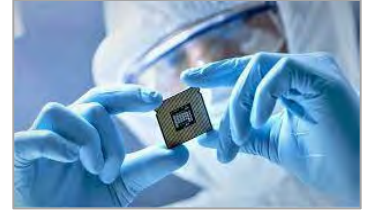
A team of researchers at Yale University's Department of Mechanical Engineering and Materials Science has developed a robot hand that employs a caging mechanism. In their paper published in the journal *Science Robotics*, the group describes their research into applying a caging mechanism to robot hands and how well their demonstration models worked. Most robot hands do their work by manipulating objects with their fingertips, which allows for a certain degree of dexterity but is still far from that demonstrated by the human hand. **In this new effort, the team at Yale noted that one of the factors that make the human hand able to handle objects with such dexterity is the use of the palm in conjunction with the fingers.** They refer to such manipulations as caging—in which fingers on both sides of an object make use of a palm to form a cage of sorts when grasping an object. To add caging to a robot's capabilities, the researchers built a hand with two fingers situated opposite of two other fingers—all of the fingers also featured mid-finger knuckle joints that allowed them to bend around an object. The base of the hand served as a palm. The overall design is highly reminiscent of clam



grapplers used by loggers, but with much more dexterity. The fingers are moved using six servo motors combined with wheels and pulleys. The researchers tested the capabilities of the robot with tasks that grew increasingly difficult. One test involved using three cylinders and a cube to test the ability of the hand to hold and change the position of an object it was holding. They then moved on to more difficult tasks, such as grasping a mustard bottle, spinning it upside down and squeezing it to eject a small amount of the condiment. They also tested the ability of the hand to transfer power from grasping to pinching an orange without losing its grip. The researchers conclude by suggesting their design opens the door to new kinds of robotic hands that will provide more capabilities than those now in use.

AUTOMOTIVE: LESSONS FROM 2011 DISASTER HELP TOYOTA RIDE OUT CHIP SHORTAGE

The global microchip shortage hobbling the auto industry has put barely a dent in production at Toyota, the world's biggest automaker, due to lessons it learned after Japan's 2011 tsunami disaster. **While the latest crisis caused by skyrocketing demand for semiconductors has forced global car makers to revise production plans, Toyota exceeded its sales targets this year and expects to sell even more units in the next 12 months.** Its success lies in part to its decision to prepare extensively for disruptions after the experience of Japan's devastating earthquake, tsunami and nuclear crisis 10 years ago. The catastrophe left parts of Japan's industry on its knees for months, especially vehicle makers, whose domestic supply chains were thrown into turmoil. Toyota suffered like its rivals and took six months to return to normal production, but the firm resolved not to let the same thing happen again. The Japanese giant reviewed all its suppliers, even the most indirect, giving it a better understanding of its supply chain, allowing it to react quicker in times of crisis. Faced with a global semiconductor shortage this year, the company was better prepared than any other automaker in the world, experts say. The global auto industry has faced serious headwinds during the pandemic, with lockdowns fuelling declining sales, and a shortage of the chips used in modern vehicles has only compounded the woes. A surge in demand for home electronics that use semiconductors, as well as a U.S. cold snap, a drought in Taiwan and a fire at Japan's Renesas manufacturer have created a perfect storm throttling chip supplies. Toyota was a pioneer of the widely used "just-in-time" production model—where stockpiling is kept to a minimum to reduce costs, but as soon as it spotted the first signs of a chip shortage, the firm changed tactics. "Toyota was the first automaker to adjust its supply chain management system from a purely 'just-in-time' model to a hybrid model where it stockpiles more of the critical components such as semiconductors," said Joshua Cobb, an auto analyst at Fitch Solutions. Toyota has always been a leader in developing supply chain management systems, and other automakers tend to follow Toyota's lead. **German auto giants Volkswagen, BMW, Daimler, and their U.S. rival General Motors, have all recently announced that they will change their supply and stockpiling systems to build up more reserves.** Still, Toyota had a head start, and another crucial advantage: most of its suppliers, including chipmakers, are Japanese companies, which prioritize supplying Toyota. Toyota often holds shares and sometimes controlling stakes in these firms, so it has greater influence over the situation. This differs from other automakers, specifically European and American automakers which source most of their components from Asian companies. Toyota also prioritizes good relations with suppliers, ensuring consistently solid sales and pledging not to renegotiate fees after a contract has been signed. All these factors mean Toyota often comes out on top. "If we receive orders from several clients at the same time, we have to prioritize the most powerful and stable," said one supplier. Toyota could point to the fruits of its preparations, surpassing its sales target with 9.9 million vehicles sold by all its brands in the financial year to March. It is now targeting total sales of 10.5 million units in 2021-22.

**AUTOMOTIVE: ELECTRIC VEHICLES CHEAPER THAN FOSSIL FUEL BY 2027, CONCLUDES NEW STUDY**

Electric cars will be cheaper to build than fossil fuel vehicles across Europe within six years and could represent 100% of new sales by 2035, according to a study published in May. Carmakers are shifting en masse to electric and hybrid models in order to bring average fleet



emissions under a European Union limit of 95 grams of carbon dioxide per kilometer or face heavy penalties. **The study by Bloomberg New Energy Finance found that electric sedans and sport-utility vehicles will be as cheap to make as combustion vehicles starting in 2026.** Small cars will have to wait until 2027 to match the cost of fossil fuel models, according to the study, which was commissioned by Transport and Environment, a European clean transport campaign group. Light electric vans will be less expensive than diesel models by 2025 and heavy electric vans by 2026. "EVs will be a reality for all new buyers within six years," said Julia Poliscanova, senior director for vehicles and e-mobility at Transport and Environment. "They will be cheaper than combustion engines for everyone, from the man with a van in Berlin to the family living

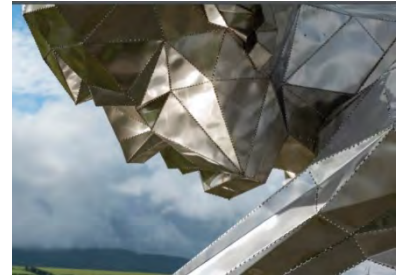
in the Romanian countryside," Poliscanova said. **A drop in the cost of batteries and the use of production lines dedicated to making electric vehicles will make them cheaper to buy, on average, even before subsidies, according to the study.** An electric sedan, which cost nearly €40,000 (US\$49,000) pre-tax in 2020, is expected to sell at the same price as a combustion model—around €20,000—in 2026, the study showed. Electric cars will represent 50% of new sales by 2030 and 85% by 2035 if policies remain the same. However, they could reach 100% by 2035 if lawmakers increase vehicle CO₂ targets and ramp up other policies to stimulate the market such as a faster roll-out of charging points, the NGO said.

STEEL: STAINLESS STEEL SCULPTURE CELEBRATES THE SHIPBUILDERS OF SCOTLAND'S RIVER CLYDE



John McKenna at the test build. The figures were made in sections in the studio and assembled outdoors with the aid of cranes and elevators.

Port Glasgow on Scotland's River Clyde is celebrating its industrial heritage with a colossal new stainless steel sculpture which has been six years in the making. The artist, John McKenna, is known for his lifesize sculptures of people at work and has been commissioned by the local council to produce the *Shipbuilders of Port Glasgow* as part of a regeneration project for the town. **The sculpture of two hammer-wielding shipbuilders is made from Type 304 tube and clad with Type 316L with a 2B finish.** Each of the various sized sheet facets has been formed separately, the edges folded and then welded together using plug spot welds to give the impression of thousands of rivets. The welds have been meticulously electropolished to remove heat tint and to enhance corrosion resistance. As well as being a work of art, the *Shipbuilders* has also presented a structural engineering challenge. At 11 meters tall and weighing in at around 20 tonnes, the sculpture will have to withstand the winds of the west coast of Scotland when placed in its new home in Coronation Park near the site of the former quays of Port Glasgow. The *Shipbuilders of Port Glasgow* is set to be a new visitor attraction when installed later this year.



STEEL/AUTOMOTIVE: ARCELORMITTAL LAYS OUT ITS ROUTE TO CARBON-NEUTRAL STEEL

The automotive industry is under stong pressure to decarbonize. Electric vehicles are the most public-aware component in this mission, but companies in the sector are looking for sustainability gains throughout their supply chains. **One key area is steel production, a critical material for OEMs and suppliers, but producing steel emits high levels of pollutants, accounting for roughly 8% of the world's total CO₂ emissions.** In March, ArcelorMittal unveiled its XCarb initiative to tackle the issue. XCarb combines all the different innovative steps the steel manufacturer will have to take to reach carbon-neutral steel production by 2050. XCarb launched with three 'labels'—the XCarb innovation fund, XCarb 'recycled and renewably produced' and XCarb green steel certificates—and more could be added. Of the three labels, 'recycled and renewably produced' and the green steel certificate are the most pertinent for ArcelorMittal's automotive customers, offering both immediate active and passive sustainability benefits. The former could have a significant impact in the emission output from electric arc furnaces (EAFs), which emit between 600kg and 900kg of CO₂ per tonne of crude steel. That figure could be brought to under 300kg per tonne with a combination of 100% scrap and renewable steel. The green steel certificates offer an intermediate solution, allowing ArcelorMittal's customers to reduce the emissions associated with the steel used in their vehicles and components. Customers can purchase certificates generated through green steel production. These processes make use of substances such as bio-coal (made from waste wood) and bio-ethanol (created from captured carbon emitted during steel production). The CO₂ savings from these projects are then accumulated and issued in the form of green steel certificates. When a customer buys such a certificate they invest in CO₂ saving projects which they then own. ArcelorMittal has generated roughly 30,000 tonnes of green steel certificates from its 2020 operations, with 120,000 tonnes available this year and expects to reach more than a million tonnes by 2025. **Part of that scale-up process will be an XCarb launch in North America; currently XCarb is only available to its European customers due to differences in these markets' steel sectors. ArcelorMittal's North American customers may soon gain access to XCarb 'recycled and renewably produced'.** ArcelorMittal has also established its XCarb innovation fund which will invest \$100 million annually in innovative companies and technologies in the steel sector, part of a drive to bolster it's in-house expertise for its sustainability transition. March saw two announcements: a partnership with Air Liquide aimed at decarbonizing steel production in Dunkirk, and a widescale decarbonization effort across ArcelorMittal's Bremen and Eisenhuettenstadt operations in Germany. This will include building a new plant with direct reduction of iron ore (DRI) and EAF-based steel making, and a DRI pilot plant and EAF in Eisenhuettenstadt, allowing ArcelorMittal to take advantage of Germany's planned hydrogen infrastructure installation. These plans will require an investment of \$1.18 billion but using green hydrogen could save more than five million tonnes of CO₂ emissions by 2030. ArcelorMittal is also supporting the development of a Gigawatt-scale hydrogen electrolysis project in the Dutch-Belgian North Sea. Danish utility company Orsted's SeaH2Land facility is aiming to have 1GW of hydrogen electrolyser capacity by 2030 as well as 2GW of offshore wind farm capacity to aid sustainable hydrogen product. The company hopes all these efforts and partnerships will aid it across the next decade and onto 2050.





COMMODITIES: THE WORLD MAY BE ON THE BRINK OF A NEW COMMODITY SUPERCYCLE



FROM BUST TO BOOM:

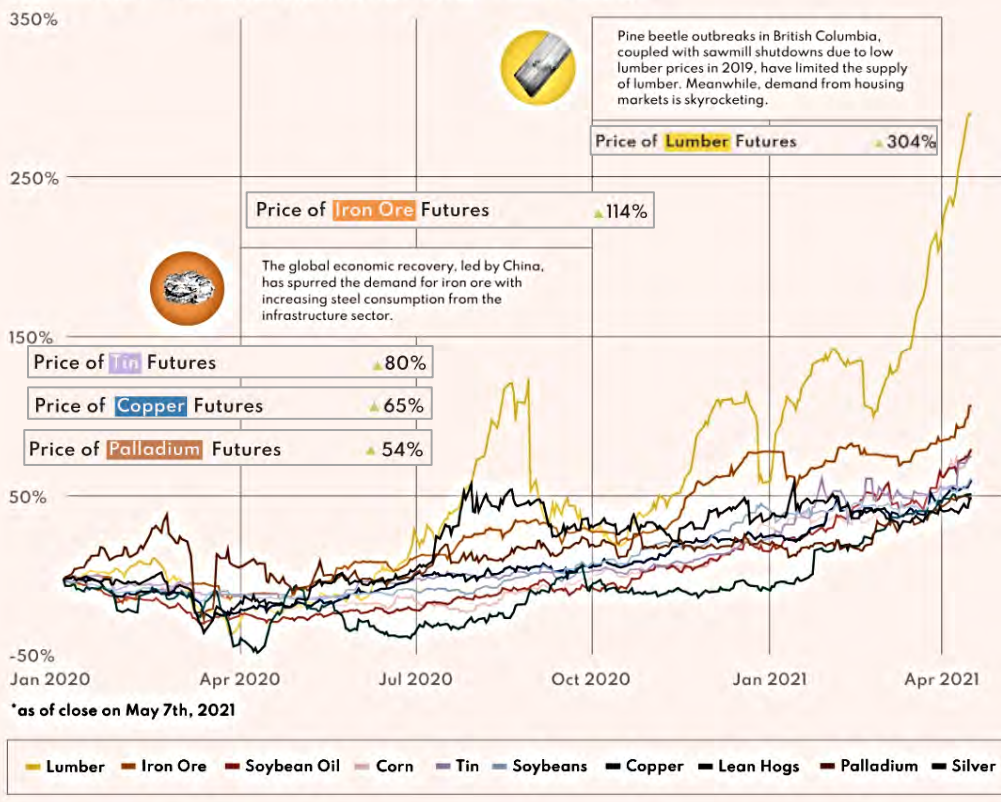
THE RISE IN COMMODITY PRICES

As the global economy rebuilds, commodity prices are surging.

From lumber for home renovations to the metals needed for electronics and green technologies, commodities across the board are rallying on rising demand.

Here are 10 commodities that have seen significant price increases over the last year.

PERCENTAGE CHANGE IN PRICES OF SELECT COMMODITY FUTURES (JANUARY 2020 - MAY 2021)



The Stuff that Makes Everything:

Commodities are important. From the wires in electronic devices to the tables in offices, raw materials are everywhere. Commodity prices have been surging as the global economy recovers, with rising demand from various industries including infrastructure, construction and livestock. This infographic tracks futures prices of 10 commodities that have seen significant price increases since January 2020.

Commodity Prices, Bust to Boom:

From lumber for home construction to metals for electronics, commodities across the three categories—agriculture, metals, and energy—have rallied since hitting pandemic lows around March 2020.

Iron Ore and Tin: The global economic recovery, led by China, is fueling the demand for steel, and in turn, for iron ore. On the supply side, the industry is facing a shortage, with a decline in output from top producer Vale following a disaster at its tailings dam in Brazil. Tin prices are soaring due to rising demand from consumer electronics amid tightening supply. Pandemic-induced supply disruptions led to a 10% decline in refined tin output in

2020. Additionally, shipping disruptions and low stocks at the London Metal Exchange are intensifying tin's supply squeeze.

Copper: Copper's story is similar to that of iron ore, where rebounding economies are boosting demand for the red metal. However, investors are particularly bullish on copper due to its critical role in green technologies, with looming concerns over its long-term supply.

Palladium: Many countries are imposing stricter auto emission standards which are driving the demand for palladium. The precious metal is a key ingredient in catalytic converters that turn toxic emissions from gas-powered vehicles into less harmful gases. Palladium prices have been rising for five years straight, and the palladium market has seen an annual deficit since 2012, a trend likely to continue with flooding at palladium mines in Russia expected to cut global supply by 5% in 2021.

The Start of a Commodity Supercycle?

While it's difficult to predict the sustainability of these high prices, the increase in commodity prices across the board has investors gearing up for a potential commodity supercycle. Commodity supercycles are decade-long periods during which commodity prices trend above their long-term averages. The last supercycle lasted from 1996 to around 2016, driven by rapid industrialization in Brazil, India, Russia and China (BRIC economies). Today, governments around the world are adopting mineral-intensive clean energy technologies, which will likely increase the demand for minerals for years to come.

COMMODITIES: VISUALIZING THE SIZE OF THE WORLD'S MINE TAILINGS

The Size of the World's Mine Tailings: In 2019, a 10-meter tall wave traveling 120 km/h washed 10 million m³ of mining waste from the Brumadinho tailings dam over the Brazilian countryside, killing somewhere between 270 and 320 people. This was a manmade disaster, made from mining the materials we use daily. Every copper wire in your house, steel frame in an EV or any modern appliance comes from mining. Mining leaves behind waste in the form of tailings stored in dams or ponds around the world. This infographic takes a look at the estimated size of one part of this waste, tailings, visualized next to the skyline of New York City as a benchmark.

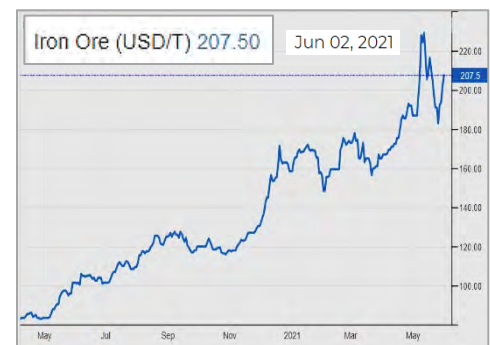
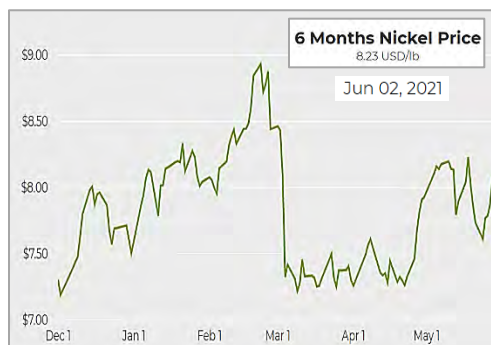
Quantifying Mining's Material Impact: In the wake of the Brumadinho tailings failure, the International Council on Mining and Metals (ICMM) began a review with institutional investors and the UN Environment Program to survey tailings facilities around the world. The Global Tailings Review tracked a total of 1,743 unique facilities containing 44.5 billion m³ of tailings, representing only 30.2% of global commodity production. However, the review estimated the total number of active, inactive and closed facilities at 8,500. Using the assumptions for the 1,743 estimate to calculate for the 8,500 closed facilities, a total of 217.3 billion m³ of tailings are in storage globally.

Turning a Liability into an Asset: Miners find, remove and refine rocks that carry a small amount of metal we need. According to the USGS, 72 billion tonnes of material produced just over 10 billion tonnes of ore. Only 14% of mined material makes it to processing for metals. Tailings are what is left over after mills separate the metal from the



mined rock. The processed material “tailings” comes from the tail-end of a mining mill and comprise fine particles mixed with water forming a slurry. Mining companies will store this waste in dams or ponds. Tailings are waste but there remains economic value in tailings. Natural Resources Canada estimated that there is \$10 billion in total metal value in Canadian gold mining waste. Rio Tinto has produced borates from a mine in the Mojave Desert which has left behind more than 90 years’ worth of tailings. The company was probing the tailings for gold and discovered lithium at a concentration higher than other U.S. projects under development. The mining industry may help society store carbon with a process in which tailings naturally draw CO₂ from the air and trap it in tailings.

METALS/COMMODITIES: PRICE INDEX TRENDS TO JUNE 2021



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