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ECONOMIC UPDATE

Number 14 • JULY 2021

EXECUTIVE SUMMARY

AMERICAS: U.S. NONFARM PAYROLLS GAINED 850,000 JOBS IN JUNE, as U.S. companies hired the most workers in ten months. **The IMF's growth projection for the U.S.** for 2021 was increased sharply to 7.0% from a 4.6% forecast issued in April, due to unprecedented fiscal and monetary support. **Durable goods orders** rebounded 2.3% in May after falling 0.8% in April, lifted by a sharp 7.6% rise in orders for transportation equipment. Orders for motor vehicles and parts rose 2.1% after decreasing 8.1% in April. **U.S. consumer confidence** increased in June to its highest level since the COVID-19 pandemic started more than a year ago, bolstering expectations for strong economic growth in the second quarter. **Consumer prices** continued to climb strongly in May, surging 5% from a year ago, the highest annual inflation rate in nearly 13 years. **The Federal Reserve** signaled it expects to raise interest rates by late 2023, sooner than it anticipated in March, as the economy recovers rapidly from the effects of the pandemic and inflation heats up.

OVERSEAS: EXPANSION IN CHINA'S FACTORY SECTOR SLOWED IN JUNE, as export demand weakened and supply bottlenecks held back production. **The Aussie government** rejected an application to build the world's biggest renewable energy project, warning that the A$50bn green hydrogen export project threatened sensitive wetlands and migratory bird species. **EU legislation** is being prepared that would jolt the rules of international trade by taxing imported goods based on the greenhouse gases emitted to make them.

STEEL: NORTH AMERICAN STAINLESS DECLARED FORCE MAJEURE AT ITS GHENT MILL due to insufficient supplies of the industrial gases it needs to operate. The company declared a suspension of all performance obligations as well as indefinite delay of any and all further deliveries from the Kentucky plant. **Stainless steel** was already in short supply. Mill delivery lead times are out several months and service centers have been unable to secure enough material to meet demand. **ATI and the USW** reached tentative agreement on a four-year contract covering 1,300 workers at nine facilities who have been on strike since March 30.

AUTOMOTIVE: GM WILL BOOST SPENDING ON EVS TO $35 BILLION THROUGH 2025, an increase of 75% from March 2020 before the COVID-19 pandemic shut down the industry. GM will also pull ahead plans for completing two U.S. battery plants. **Volvo Cars** will be the first carmaker to secure SSAB steel made from hydrogen-reduced iron from the HYBRIT pilot plant in Luleå, Sweden.

ENERGY: A CANADIAN FIRM WILL BUILD A DEMONSTRATION FUSION REACTOR 70% the size of a full-blown commercial one. Existing nuclear power plants rely on fission—the splitting of heavy atoms, usually of uranium, into lighter ones. Fusion plants attempt to do the opposite, generating heat by combining light atoms to make heavier ones. **First Solar Inc**. will invest $680 million in a new Ohio factory in one of the largest bets on domestic solar manufacturing since China began dominating the industry a decade ago.

MEDICAL: RESEARCHERS DEVELOP A WIRELESS IMPLANTABLE SENSOR SMALL ENOUGH TO BE INJECTED. The device was made to be injected into humans and monitor various biological parameters. To keep it small (less than 0.000006 in.^{3} making it the smallest such system ever made), the team designed it to communicate and be powered wirelessly by ultrasound. **The Biden administration** will pump $3.2 billion into developing antiviral treatments that have the potential to combat COVID-19 and other virus-borne diseases. The money is to be put towards speeding up clinical trials, as well as the manufacture of medicines.

INNOVATION: MANY SENIOR EXECUTIVES FEEL THREATENED BY AI – "TOO NEW TO BE TRUSTED". According to a new Pactum survey of 100 senior executives, 97% said they plan to invest significantly in artificial intelligence this year, with 83% of respondents saying they will spend over $500,000 on the technology. Of that group, 10% anticipate spending over $50 million. However, according to a recent Forrester study, more than half of respondents (52%) said AI is too new to be trusted.

AEROSPACE: CHINESE ROVER ON DUSTY, ROCKY MARTIAN SURFACE TAKES GROUP PHOTO. The Martian surface and a Chinese rover and lander bearing small national flags were seen in photos that the rover took on the red planet. The four pictures also show the upper stage of the Zhurong rover and the view from the rover before it rolled off its platform. **United Airlines** will purchase 200 Boeing 737 MAX jets and 70 larger Airbus A321neos, a deal worth $33 billion at the most recently published list prices.

INNOVATION/STEEL: INFLATABLE STEEL FURNITURE PAVES WAY FOR EVEN LIGHTER INFRASTRUCTURE. A design team has perfected a method of creating inflatable steel furniture which could revolutionize the wind-energy, space and construction sectors. The technique as a way of making steel-built products lighter and less expensive without compromising on strength.

COMMODITIES: HIGH-QUALITY COKING COAL DELIVERED TO CHINA ROSE ABOVE $300 A TONNE for the first time since 2017, up 150% since October, due to a supply squeeze that has left steel mills scrambling. **China** will sell major industrial metals from state stockpiles to squelch price increases that have hit a 13-year high and are stoking fears of global inflation. China's latest move targets copper, aluminum and zinc with public auctions to domestic buyers.

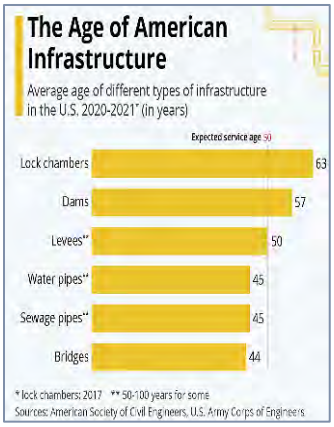
THE AMERICAS.

- **The IMF's growth projection for the U.S.** for 2021 was increased sharply to 7.0% from a 4.6% forecast issued in April, due to unprecedented fiscal and monetary support. The revised forecast represents the fastest pace of growth in a generation for the U.S gross domestic product.
- **Durable goods orders** rebounded 2.3% in May after falling 0.8% in April, lifted by a sharp 7.6% rise in orders for transportation equipment. Orders for civilian aircraft increased 27.4%. Boeing reported that it had received 73 aircraft orders vs. only 25 in April. Orders for motor vehicles and parts rose 2.1% after decreasing 8.1% in April.

  Key Update: *Business investment for equipment has enjoyed double-digit growth over the last three quarters due to a shift in demand toward goods and away from services during the COVID-19 pandemic and massive fiscal stimulus to ease the blow to the economy from the public health crisis.*
- **U.S. retail sales** dropped 1.3% in May, marking a shift in consumer spending from big-ticket items to services related to going out amid business reopenings and higher vaccination rates. Retail spending in May was up about 28% vs. a year ago, when widespread restrictions were in place.
- **Nonfarm payrolls** gained 850,000 jobs in June, as U.S. companies hired the most workers in ten months. Manufacturing added a modest 15,000 jobs, with employment at auto assembly plants declining 12,300. Construction payrolls fell for the third-straight month. The unemployment rate rose to 5.9% from 5.8% in May, as more Americans became available for work.
- **U.S. import prices** rose 1.1% in May as the cost of petroleum products rose and supply chain bottlenecks boosted prices of other goods. The seventh-straight monthly gain lifted the year-on-year increase to 11.3%, the largest rise since September 2011. Export prices surged 17.4% YOY, the largest rise since the series started in September 1983, after advancing 14.9% in April.
- **The U.S. trade deficit** increased 3.1% in May to $71.2 billion, as efforts by businesses to rebuild inventories amid booming demand pulled in imports. Goods imports rose 1.2% to $234.7 billion. Exports of goods gained 0.3% to $145.5 billion, a record high. The trade deficit has subtracted from GDP growth for three-straight quarters.
- **U.S. factory orders** rebounded sharply in May, up 1.7% from April and 17.2% YOY. Business spending on equipment remained solid, despite bottlenecks in the supply chain. Factory goods orders in June were boosted by a 7.7% surge in orders for transportation equipment.
- **U.S. consumer confidence** increased in June to its highest level since the COVID-19 pandemic started more than a year ago, bolstering expectations for strong economic growth in the second quarter. The Conference Board's index of consumer confidence jumped to 127.3 from 120.0 in May.

- **U.S. manufacturing activity** grew moderately in June. The ISM index of national factory activity slipped to 60.6 from 61.2 in May. Factories are struggling to keep up as the pandemic fractured supply chains and disrupted the global shipping industry. The scarcity of raw materials is driving up costs for both manufacturers and consumers, contributing to an acceleration in inflation in recent months.
- **U.S. industrial production,** which includes factory, mining and utility output, increased 0.8% in May compared with April. Manufacturing output climbed 0.9%, supported by a 6.7% rebound in motor vehicle and parts production following a sharp fall in April. Utilities output increased 0.2%; mining output rose 1.2%. Capacity utilization for manufacturing rose by 0.7 to 75.6%.
- **Service sector activity** as measured by the ISM services index fell to 60.1 in June from a record 64 in May. Restaurants, retailers and other businesses that compose the huge service side of the U.S. economy simply cannot find enough people to fill open jobs or obtain enough supplies to keep up with exploding sales.
- **U.S. producer prices** rose 0.8% in May from April and core prices climbed 0.7%. Most of the increase in overall producer prices came from a rise in goods prices, which leapt 1.5% in May. The goods prices that jumped the most included beef and veal, up 10.5%, and mobile homes, which climbed 3.5%. Prices for furniture, new autos, machinery and equipment also picked up sharply.
- **Consumer prices** continued to climb strongly in May, surging 5% from a year ago, the highest annual inflation rate in nearly 13 years. Prices for used cars and trucks leapt 7.3%, driving one-third of the rise in the overall index. The core-price index jumped 3.8% in May from the year before.

- **The Federal Reserve** signaled it expects to raise interest rates by late 2023, sooner than anticipated in March, as the economy recovers rapidly from the effects of the pandemic and inflation heats up. The Fed's median projection showed they see lifting their benchmark rate to 0.6% from near zero by the end of 2023. The Fed expects inflation this year to rise 3.4%, 2.1% next year and 2.2% in 2023.
- **The U.S. Leading Economic Indicators** improved for the third-consecutive month in May, as the economy continues to recover from the COVID-19 recession. The Conference Board's index of leading economic indicators rose 1.3% to 114.5, topping its previous peak reached in January 2020.
- **Median existing-home prices** rose 23.6% in May from a year earlier to $350,300, a record high. Existing-home sales fell 0.9% but were up 45% from a year earlier, when home sales fell due to lockdowns. It was the fourth-consecutive monthly decline. New home sales dropped 5.9% to the lowest level since May 2020. Housing starts rose 3.6%. Though lumber prices dropped from a record high in early May, lumber prices were higher by 154.3% YOY in May. Tariffs on steel imports are also adding to building costs.
- **U.S. construction spending** fell 0.3% in May as gains in private homebuilding were offset by persistent weakness in outlays on nonresidential structures and public projects. Meanwhile, an Infrastructure deal was agreed between the administration and a group of bipartisan senators. The agreement features $579 billion of spending above expected federal levels and a total $973B of investment over five years or $1.2 trillion if continued over eight years. Congressional passage is not assured.



- **U.S. consumer spending** paused in May as shortages hurt motor vehicle purchases, but the supply constraints and increased demand for services helped to lift prices, with the Fed's main inflation measure rising by the most in 29 years. Spending on services rose 0.7%, led by recreation, hotels and restaurants. Spending on goods fell 1.3 percent.

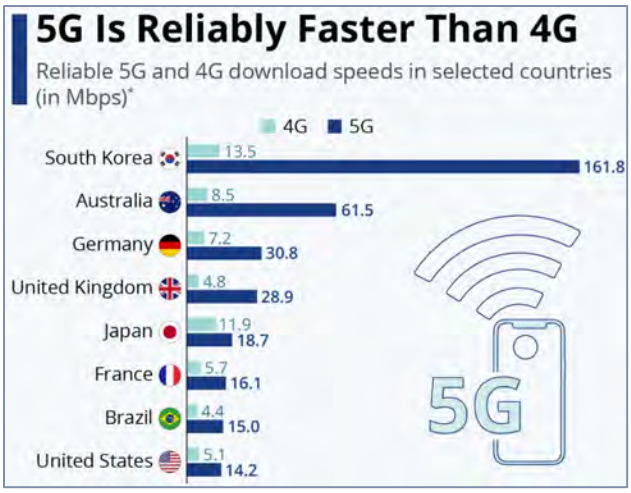
  Key Update: *Inflation will probably remain high in the near term because of the supply constraints and worker shortages. Oxford Economics forecasts increased inflation stickiness, with core inflation hovering around 3.0% in the 2nd Half of the year but does not foresee runaway inflation.*

- **Steel mills** in the U.S. shipped 7.845 million tons of steel in April, a 1.3% decline from the previous month, but it was a 39.5% improvement from April a year ago. Shipments YTD through April were 29.951 million tons, a 0.7% increase vs. the 29.732 million tons shipped in the same period in 2020. (See **Appendix: Steel**, page 15)
- **Record-high steel prices** aren't luring steelmakers to put shuttered older mills back into operation. U.S. Steel and Cleveland-Cliffs have seven million tons of production capacity out of service. The high cost of restarting the plants and com-petitive threats make the mills a poor financial proposition. The idled capacity amounts to roughly 10% of U.S. domestic consumption and exacerbates a shortage of steel that is contributing to higher prices for cars, appliances and machinery. USS Great Lakes Works

  Key Update: *The decisions of the steel companies are the latest signs of caution across the industrial world among companies that remain wary of restoring capacity after facing pandemic-driven demand shocks over the past year. That's proving tough on buyers as new mills are still months or years away from operating even as growing consumer demand has factories pressing for more steel.*

- **Stainless steel** remains in short supply, while demand is stable or improving in some segments such as automotive and construction. Mill delivery lead times are out several months and service centers have been unable to secure enough material to meet demand. These conditions supported the year's third base price increase that took effect in June. Surcharges have reached their highest level in nine years. From a low in May 2020, the grade 304 surcharge has risen over 77%, from 52¢ to over 96¢/lb. Service center shipments for YTD May were up 10.2%, while inventories were down 18.1% compared to a year ago.
- **North American Stainless** declared force majeure at its Ghent mill due to insufficient supplies of the industrial gases it needs. One of the reasons is a shortage of trucking, a problem seen across a number of industries. The company declared a suspension of all performance obligations as well as indefinite delay of any and all further deliveries from the Kentucky plant. NAS said it is working to make alternative arrangements to meet its obligations. NAS, a subsidiary of Spain's Acerinox, accounts for about 40% of total stainless steel supplies in the U.S.
- **Hot-rolled steel coil prices** have more than tripled over the past year to reach an all-time high of $1,801/ton on 6/28 in New York, gaining 2.7% after President Biden said he reached the $1.2T infrastructure deal the prior week.

- **Steel imports into the U.S.** were 2.513 million tons (MT) in May, including 1.845MT of finished steel (down 4.8% and up 11.3% respectively vs. April's final data). Total steel imports YTD through May compared to last year increased 7.1% to 11.780MT and finished steel imports rose 8.8% to 7.966MT. Finished steel import market share in the U.S. in May was estimated at 20% for the month and 19% YTD.
- **Mobile network specialist Opensignal** examined "reliable download speed", i.e. the average download speed that 90% of a country's users exceed, gauging the real-world advantage of 5G over 4G. The study also reveals the huge differences in network speeds across different countries. While 90% of South Korean users enjoy average download speeds above 161.8 Mbps, the reliable 5G speed in the U.S. is only fractionally higher than South Korea's 4G speed at 14.2 (vs. 13.5).



- **A new microscopy technique** has been invented by scientists that allows them to peer inside batteries and potentially optimize them so that phones and laptops could fully charge in five minutes. It would also expedite the development of next-generation Li-ion batteries, that could soon help power a sustainable future.
- **General Motors** boosted its spending on electric and autonomous vehicles and pulling ahead plans for two U.S. battery plants. GM will now spend $35 billion through 2025 on EVs, an increase of 75% from March 2020 before the COVID-19 pandemic shut down the industry.

  Key Update: *GM's additional spending accelerates a global arms race among automakers and technology companies to expand EV offerings. Consulting firm AlixPartners said investments in EVs by 2030 could total $330 billion, a 41% increase from its forecast a year ago. EVs are 2% of total global vehicle sales now and will be 24% of total sales by 2030, but EV sales would need to be 34% of total global sales by 2030 to absorb the expected increase in production.*

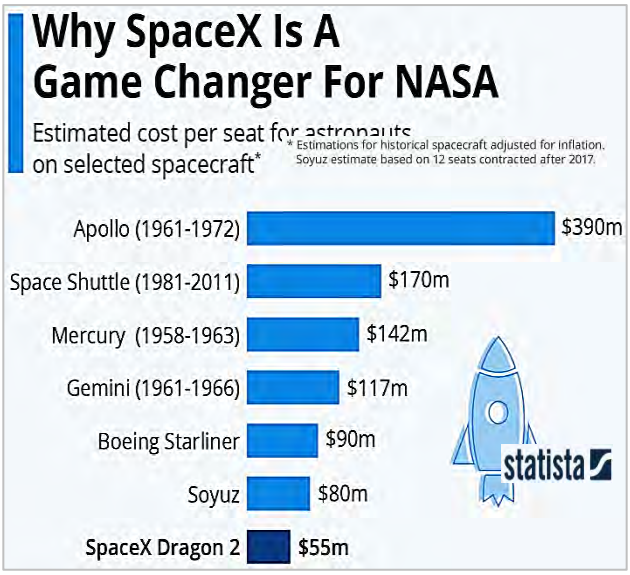
- **New U.S. light vehicle sales** in June are projected to reach 1.3 million units, a 19.5% increase compared with the same period in 2020, according to J.D. Power and LMC Automotive. Average transaction prices are expected to rise 14.9% to $40,206, the highest on record, while the average incentive spending per unit is expected to fall to $2,492 from $4,349 last year. The total annualized rate for the month will be 15.8 million vehicles, up 2.6 million units from 2020. (See **Appendix: Automotive**, page 12)
- **Ford** said the computer-chip shortage will force it to cut output across more than a half-dozen U.S. factories in July, a sign that the supply-chain troubles could take longer to ease than auto-industry executives previously believed. Ford's pickup truck factories in Michigan, Kentucky and Missouri will reduce or stop production for much of July, while an Explorer plant in Chicago will be idled for the entire month. Production of several other popular models also will be reduced or stopped, including the Mustang sports car.
- **United Airlines** will purchase 200 Boeing 737 MAX jets and 70 larger Airbus A321neos, a deal worth $33 billion at the most recently published list prices, but airlines typically pay less than half price for deals of this size. United is looking to replace most of its 50-seat jets and other smaller, older aircraft with these larger planes that can carry more passengers and allow it to sell more premium seats.

  Key Update: *United lost more than $7 billion last year and accepted billions of dollars in government aid to continue paying workers. Now the airline expects to make money in July, its first profitable month since January 2020.*
- **Northrop Grumman** was awarded a $287 million propulsion contract by the U.S. Air Force to provide engineering services to assist in sustaining the Minuteman III missile system. The contract has a ceiling of $2.3 billion over 18.5 years, and supports the Air Force's Minuteman III Systems Directorate at Hill AFB, Utah. The ICBM will remain on alert and ready until its end-of-life later next decade. Minuteman III was originally manufactured in 1970 and has undergone multiple refurbishments to ensure viability.

- **A $500 million U.S. victim compensation fund** for the relatives of 346 people killed in two fatal Boeing 737 MAX crashes opened in June. The fund is part of a $2.5 billion Justice Department settlement reached in January with Boeing after prosecutors charged the company with fraud over the certification of the 737 MAX following the Lion Air and Ethiopian Airlines crashes in 2019.

- **Vertical Aerospace** has pre-orders for up to 1,000 eVTOL aircraft with launch customers Avolon and American Airlines, along with a pre-order option from Virgin Atlantic, all valued at up to $4 billion. AA and Avolon, as well as Honeywell and Rolls-Royce, have invested in Vertical. The VA-X4 is a manned electric vertical takeoff and landing aircraft that can fly at speeds in excess of 200 miles/hour with a pilot and four passenmgers over distances of 96 miles. (See **Appendix: Aerospace**, page 8)

- **Boeing** is finding new homes for unclaimed 737 MAX jets whose buyers walked away during the pandemic. Some airlines are buying the orphaned jets amid a vaccine-fueled travel rebound in the U.S. and other parts of the world. The purchases have left Boeing with around 10 stored MAX aircraft needing buyers. Last July, it counted around 100.
  Key Update: *Flights in the U.S. are 84% full, on average, amid a surge of summer travel. The number of people passing daily through airport security checkpoints has neared 2 million recently—a level last reached in March 2020.*



- **The U.S. and the European Union** have agreed to a truce in their 17-year conflict over aircraft subsidies, suspending for five years one set of Trump-era tariffs which had soured relations between them. After agreeing in March to a four-month suspension of tariffs on $11.5 billion of goods, from EU cheese and wine to U.S. tobacco and spirits, they will suspend the tariffs, while still working on the overarching agreement on aircraft subsidies. They would also work to counter investments in aircraft by "non-market actors", referring specifically to China.

- **The rapid rise in prices for raw materials** has reversed a decades-long decline in the cost of solar energy, as companies face higher steel, polysilicon and freight costs. The cost of solar energy fell by 80% between 2010 and 2020, but those dramatic decreases have come to an end, according to S&P Platts. The U.S. price of hot-dipped galvanized steel coils, which are used in solar panel frames and structures, has more than doubled from early 2020 to record levels. Prices for monocrystalline silicon cells, modules that allow for the conversion of light into power, have risen by a quarter from this time last year.
- **Imports of a key solar panel material** from Chinese-based Hoshine Silicon Industry Company were banned by the U.S., but it stopped short of imposing a ban on all imports of silica from Xinjiang. The White House said the import bans on polysilicon and solar products made with forced labor would not hamper the administration's clean energy goals and cited the G7's recent pledge to clean up the global supply chain as part of its actions.
- **First Solar Inc.** will invest $680 million in a new Ohio factory in one of the largest bets on domestic solar manufacturing since China began dominating the industry a decade ago. The factory, near Toledo and the company's third in Ohio, is expected to open in 2023 and initially produce enough solar panels to generate 3 gigawatts of power/year. Combined, the three First Solar plants by 2025 would produce panels that could generate 6 gigawatts of power annually
- **The natural-gas glut** has evaporated, driving costs of the power plant fuel to twice what they were at the start of last summer, portending higher utility bills and manufacturing costs. Demand for the fuel is picking up as the world's economies reopen and as Americans dial down their thermostats for what is expected to be a hot summer.
  Key Update: *U.S. natural gas producers have stuck to the skimpy drilling plans they sketched out when prices were lower, eliminating the glut keeping them depressed.*
- **Canada's TC Energy Corp.** and the Alberta provincial government scuttled the Keystone pipeline. Protesters are taking aim at other Canadian pipelines. In Minnesota, there were demonstrations against Enbridge's construction of its crude oil Line 3 artery through the state. Michigan's governor wants to revoke a permit that allows the company to transport oil and natural gas under the Great Lakes.
- **The administration** will pump $3.2 billion into developing antiviral treatments that have the potential to combat COVID-19 and other virus-borne diseases. The money will be put towards speeding up clinical trials and the manufacture of medicines. (See **Appendix: Medical**, page 11)

EUROPE, AFRICA & THE MIDDLE EAST

- **European factories** continued to ramp up their post-lockdown recovery in June. Euro zone manufacturing activity expanded at its fastest pace on record last month. The IHS Eurozone Manufacturing PMI reached a new record high of 63.4. Supply-side constraints again placed some restrictions on production and average lead times deteriorated to the 2nd-greatest degree in the survey history. Input and output costs rose at an unprecedented rate.
- **ArcelorMittal,** looking to achieve carbon neutrality by 2050, has invested an initial $10 million in Heliogen, a renewable energy technology company focusing on "unlocking the power of sunlight to replace fossil fuels". Heliogen's technology will harness solar energy by using a field of mirrors to capture sunlight for conversion into heat, electricity or clean fuels. ArcelorMittal has also signed an agreement for evaluating the potential of Heliogen's products in several of its steel plants.
- **Nissan Motors** bet on Britain to supercharge its European electric automotive future, pledging US$1.4 billion with its Chinese partner to build a giant battery plant. It will power 100,000 vehicles a year, built at Nissan's Sunderland plant, which exports 70% of its vehicles to the European Union.
- **Northvolt and Volvo** will form a joint venture to build a battery gigafactory in Europe and develop energy cells for the Swedish premium carmaker. The partnership will aim to build a plant with capacity of up to 50GWh hours a year (equivalent to batteries for 500,000 cars) to start production in 2026. Volvo will buy an additional 15GWh of batteries from Northvolt starting in 2024 out of its first gigafactory, to be built just south of the Arctic Circle in Sweden.
- **Volvo Cars** will be the first carmaker to secure SSAB steel made from hydrogen-reduced iron from the HYBRIT pilot plant in Luleå, Sweden. This steel will be used for testing purposes and may be used in a concept car. In 2026, SSAB aims to supply the market with fossil-free steel at a commercial scale. Volvo Cars aims to also be the first carmaker to use fossil-free steel for its own actual car production. (See **Appendix: Steel**, page 15)

Key Update: *The collaboration with SSAB is the latest initiative that supports Volvo Cars overall climate action plan, one of the most ambitious in the car industry. The centerpiece of the plan is Volvo Cars' ambition to be a fully electric car brand by 2030, with only pure electric cars in its line up.*

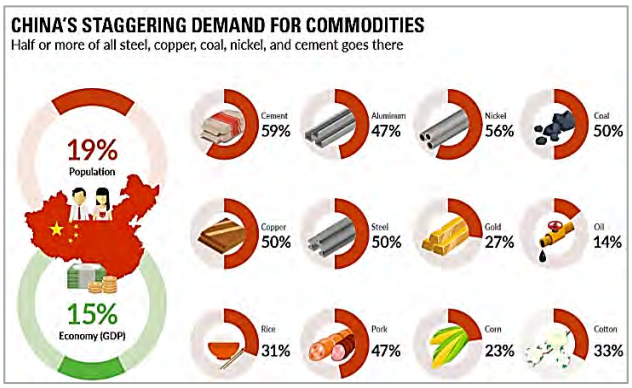
- **Volkswagen** plans to use a new 3D printing process called binder jetting to manufacture components at its main plant in Wolfsburg, Germany, in the coming years. Conventional 3D printing uses a laser to build a component layer-by-layer from metallic powder, but the binder jetting process uses an adhesive. The resulting metallic component is then heated and shaped. VW is the only car maker using this 3D printing technology. HP is providing the high-tech printers, Siemens the special software for additive manufacturing.

Key Update: *Using the binder jetting component reduces costs and increases productivity, e.g., the components weigh only half as much as those made from sheet steel.*

- **The Ikea and Rockefeller foundations** are making their biggest ever investment, starting a fund to finance "distributed" renewable energy projects to lift more than a billion people out of energy poverty. Each foundation will provide $500 million of risk capital to attract $10 billion of additional funds from international development agencies and then open up the projects to institutional investors.
- **OPEC and its allies** failed to agree on increasing oil production, although most of the energy cartel's members want to pump more. The UAE is holding out for an increase to its allocated share of OPEC's overall output. The price of oil is currently hovering around a three-year high.
- **Airbus** is betting air travel and jet demand will rebound faster than its competitors currently expect. The company announced plans to lift production of its best-selling A320 narrow body to 64 per month by the 2ndQtr of 2023. So far this year, Airbus has secured orders for 87 aircraft, including 25 of the largest A320 model for Delta Airlines.
- **EU legislation** is being prepared that would jolt the rules of international trade by taxing imported goods based on the greenhouse gases emitted to make them. The proposal opens a new front in the fight against climate change by setting the world's first limits on carbon in traded goods. The bloc wants to stop polluting industries from shifting production outside Europe and then exporting back into the EU. Experts say it would add urgency to manufacturers' efforts to pull carbon out of their supply chains.
- **Liebherr-Aerospace and GM** signed an agreement covering the development of an electrical power generation system to demonstrate hydrogen fuel cell-based power systems for aircraft application. The construction and testing will take place in Toulouse. The demonstrator will incorporate GM's fuel cells, controls/models and HYDROTEC power cube and fuel cell system. (See **Appendix: Aerospace**, page 8)

ASIA/PACIFIC, JAPAN, AUSTRALIA & INDIA

- **Expansion in China's factory sector** slowed in June, as export demand weakened and supply bottlenecks held back production. Chip shortages kept auto manufacturing in contractionary territory for a second-straight month. Recent COVID cases in the southern province of Guangdong, an economic and export stronghold, have added strains to supply bottlenecks for manufacturers. China's services sector also softened due to new coronavirus outbreaks.
- **The prices of goods leaving China's factories** have risen at the fastest pace since the financial crisis. China's PPI added 9% in May, pushed higher by commodities and raw materials, which form a core part of the index. Prices in the ferrous metal smelting industry rose 38% year-on-year, while those for coal mining added 30 percent.



Key Update: *While consumer price rises remain low in China, the soaring producer prices are set to increase costs for businesses and exporters at a time of mounting concerns over higher inflation in the U.S. and the rest of the world.*

- **Global crude steel production** was 174.4 million tonnes (MT) in May, a 16.5% increase compared to a year ago. China produced 99.5 MT of crude steel, up 6.6% vs. May 2020. The U.S. cast 7.2 MT of crude steel, a 48% gain vs. the year prior. India's production was 9.2 MT, up 47%. Japan produced 8.4 MT, up 42%. South Korea made 6 MT, up 10.5%. Russian output was 6.6, up 14%. (See **Appendix: Steel**, page 15)
- **Alcoa** is preparing a "step change" in the production of alumina that would eliminate 70% of the emissions generated in the process by adapting renewable energy as a power source. Alcoa Australia's energy-intense exports of alumina and aluminum would be harmed by the carbon border tariffs which may soon to be erected by the EU.
- **Three Chinese astronauts** were launched into space to begin what is expected to be a continuous Chinese presence in Earth's orbit for the next decade. China also intends to send crewed missions to Mars over five missions from 2033 to 2043, directly challenging the U.S. in a new space race.
- **Toyota** pledged to make its vehicle production carbon-neutral by 2035, replacing the previous target date of 2050. One of the ways the company hopes to realize its goal is by introducing new technologies for painting vehicles (one of auto production's most power-gobbling procedures), for example, by replacing paint with adhesive film.
- **The global chip shortage** disrupting the auto industry and threatening the supply of consumer technology products will last at least another year, one of the world's largest electronics contract manufacturers warned. The forecast from Singapore's Flex, the world's third-biggest electronics contract manufacturer, is one of the gloomiest yet for a crisis that is forcing auto and consumer electronics companies to re-examine their global supply chains.

Key Update: *The chip shortage is spreading to TVs, smartphones and home appliances, as chipmakers prioritize more complex, high-margin processors. Chipmakers are investing heavily in new production capacity, but it can take up to two years to fully set up the complex facilities.*

- **The world's biggest renewable energy project** was rejected by the Australian government, which warned that the A$50 billion green hydrogen export project threatened sensitive wetlands and migratory bird species. The decision represents a U-turn by Canberra, which last year supported fast tracking construction of the Asian Renewable Energy Hub on a 6,500 sq/km site in a remote region in Western Australia. The consortium behind the hub said it would revise its proposal to build solar and wind farms.
- **China will sell major industrial metals** from state stockpiles, an effort to squelch factory-gate price increases that have hit a 13-year high and are stoking fears of global inflation. China's latest move targets copper, aluminum and zinc, among other metals, with auctions for domestic metal processors and manufacturers. Metal prices had already begun to decline in recent weeks, amid market sentiment that global supply levels didn't warrant such rallies.
- **China's top economic planning agency** launched a review in late June into record iron ore prices, saying it would investigate "malicious speculation" in the iron ore market and "severely punish" any wrongdoing.
- **High-quality coking coal** delivered to China rose above US$300 a tonne for the first time since 2017, up 150% since October, due to a supply squeeze that has left steel mills scrambling and paying a much higher price than international rivals. (See **Appendix:Commodities**, page 14)

ECONOMIC UPDATE: APPENDIX TO THE JULY 2021 ISSUE

AEROSPACE: VOYAGE 2050 — EUROPEAN SPACE AGENCY CHOOSES FUTURE SCIENCE MISSION THEMES

The European Space Agency's (ESA) large-class science missions for the timeframe 2035-2050 will focus on moons of the giant Solar System planets, temperate exoplanets or the galactic ecosystem and new physical probes of the early universe. The top three priorities for future large-class missions are described below.

Moons of the giant planets: Investigating the habitability potential of worlds in the Solar System is essential for understanding the emergence of life and is of particular relevance in the search for Earth-like planets beyond our Solar System. Building on the legacy of the international Cassini-Huygens mission to Saturn and ESA's upcoming Jupiter Icy Moons Explorer, a future outer Solar System mission with advanced instrumentation would focus on the study of the connection of ocean-bearing moon interiors with their near-surface environments and searching for possible biosignatures. The mission profile might include an in-situ unit, such as a lander or a drone. **From temperate exoplanets (those outside our solar system) to the Milky Way**: The Milky Way contains hundreds of millions of stars and planets along with dark matter and interstellar matter but our understanding of this ecosystem, a stepping-stone for understanding the workings of galaxies in general, is limited. A detailed understanding of our Galaxy's formation history, including its "hidden regions," is key to our understanding of galaxies. At the same time, the characterization of temperate exoplanets in the mid-infrared, through a first spectrum of direct thermal emission from exoplanet atmospheres to better understand if they harbor truly habitable surface conditions, would be an outstanding breakthrough. While the exoplanet topic is considered to have a high scientific priority, solidifying Europe's leadership in the field of exoplanets beyond the lifetime of Cheops, Plato and Ariel, an informed choice between a study of the less accessible regions of our Galaxy and the study of temperate exoplanets needs to be made involving the interested scientific community to assess the likelihood of success and feasibility of missions within the large mission boundary conditions. **New physical probes of the early universe**: How did the universe begin? How did the first cosmic structures and black holes form and evolve? These are questions in fundamental physics and astrophysics that could be addressed by missions exploiting new physical probes, such as detecting gravitational waves with high precision or in a new spectral window, or by high-precision spectroscopy of the cosmic microwave background—the relic radiation left over from the Big Bang. This theme would leverage advances made in instrumentation to open a huge discovery space.

AEROSPACE: CHINESE ROVER ON DUSTY, ROCKY MARTIAN SURFACE TAKES GROUP PHOTO

The dusty, rocky Martian surface and a Chinese rover and lander bearing small national flags were seen in photos that the rover took on the red planet. The four pictures released by the China National Space Administration also show the upper stage of the Zhurong rover and the view from the rover before it rolled off its platform. **Zhurong placed a remote camera about 33 feet from the landing platform, then withdrew to take a group portrait (at right).** China landed the Tianwen-1 spacecraft carrying the rover on Mars in May after it spent about three months orbiting the red planet. China is the second country to land and operate a spacecraft on Mars after the U.S. The orbiter and lander both display small Chinese flags and the lander has outlines of the mascots for the 2022 Beijing Winter Olympics and Paralympics. The six-wheeled rover is surveying an area known as Utopia Planitia, especially searching for signs of water or ice that could lend clues as to whether Mars ever sustained life. At 6 feet in height, Zhurong is significantly smaller than the U.S.'s Perseverance rover which is exploring the planet with a tiny helicopter. NASA expects its rover to collect its first sample in July for return to Earth as early as 2031. In addition to the Mars mission, China's ambitious space program sent the first crew to its new space station. The three crew members plan to stay for three months on the Tianhe, or Heavenly Harmony, station, far exceeding the length of any previous Chinese mission. They will perform spacewalks, construction and maintenance work and carry out science experiments. Subsequent launches are planned to expand the station, send up supplies and exchange crews. China has also has brought back lunar samples, the first by any country's space program since the 1970s, when it landed a probe and rover on the moon's less explored far side.

INNOVATION: DEFENSE ADVANCED RESEARCH PROJECTS AGENCY (DARPA) AND INVENTING THE FUTURE

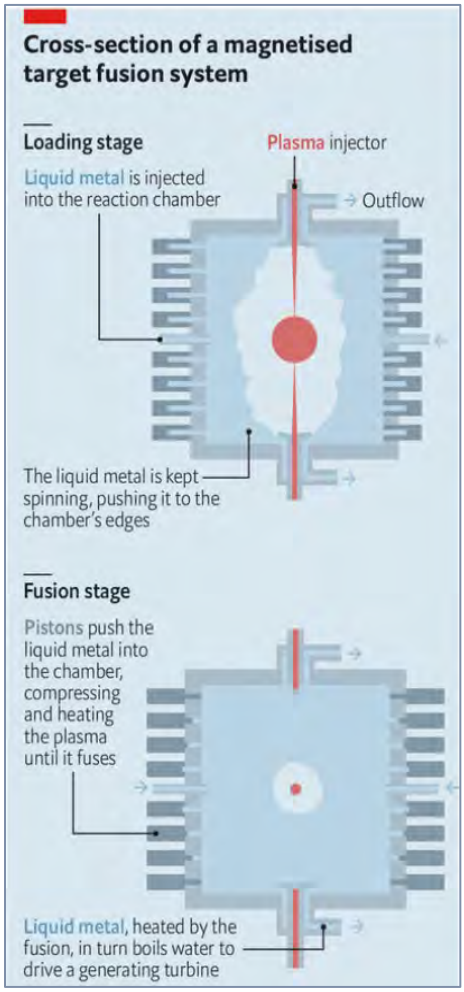
Using messenger RNA to make vaccines was an unproven idea, but if it worked the technique would revolutionize medicine by providing protection against infectious diseases and biological weapons. In 2013, America's Defense Advanced Research Projects Agency (DARPA) gambled by awarding a small, new firm called Moderna $25 million to develop the idea. **Eight years and more than 175 million doses later, Moderna's COVID-19 vaccine sits on the list of innovations for which DARPA can claim at least partial credit, alongside weather satellites, GPS, drones, stealth technology, voice interfaces, the personal computer and the Internet.** It is the agency that shaped the modern world. In America there are ARPAs for homeland security, intelligence and energy, as well as the original defense one. President Biden has asked Congress for $6.5 billion to set up a health version and another to tackle climate change. The approach is straightforward. Take enormous, reckless gambles on things so beneficial that only a handful need work to make the whole venture a success. As Arun Majumdar, founding director of ARPA-E, America's energy agency, puts it, "If every project is succeeding, you're not trying hard enough." The people making these gambles can come from industry, academia or elsewhere, but must be at the frontier of knowledge. These people are then given the resources to assemble brilliant researchers united by a common goal, and permission—even encouragement—to fail. The result is a mirror image of normal R&D agencies. Whereas most focus on basic research, DARPA builds things. Whereas most use peer review and carefully selected metrics, DARPA strips bureaucracy to the bones. **(The conversation in 1965 which led the agency to give out $1 million for the first cross-country computer network, a forerunner to the internet, took just 15 minutes).** All work is contracted out. DARPA has a boss, a small number of office directors and fewer than 100 program managers, hired on fixed short-term contracts, who act in a manner akin to venture capitalists, but with the aim of generating specific outcomes rather than private returns. Current (unclassified) projects include ones to mimic the nervous systems of insects in order to reduce the computation required for artificial intelligence and to work out how to protect soldiers from the enemy's use of genome-editing technologies. DARPA's budget in 2020 was $3.6 billion, equivalent to just 8% of the NIH's. If all goes to plan, ARPA-H will emerge on a similar scale, but none of the others receive such funding (ARPA-E got $425 million last year, roughly as much as one of DARPA's six offices). Since the model works by making lots of bets in the hope that a few will come off, stingier funding means fewer wagers, reducing the chance of success and thus of continued political support. This is especially true given the inherent difficulties in measuring progress. Pierre Azoulay of MIT notes, "It is impossible to accurately measure the incidence of one-in-a-thousand ideas, much less one-in-a-million ideas, on a timescale relevant to political decision-making."

INNOVATION: MANY SENIOR EXECUTIVES FEEL THREATENED BY AI – "TOO NEW TO BE TRUSTED."

According to a new Pactum survey of 100 senior executives, 97% said they plan to invest significantly in artificial intelligence this year, with 83% of respondents saying they will spend over $500,000 on the technology. Of that group, 10% anticipate spending over $50 million. "Over the past year there has been a shift in attitudes towards AI and its uses," Martin Rand, CEO of Pactum, said in a statement. "Many companies around the world have turned to technology to help bolster its business processes. It is great to see this positive shift in attitudes towards the use of AI within business and see how organizations can succeed by combining the right technology solutions with the right people." Most of the respondents (77%) said the COVID-19 pandemic improved attitude toward the technology. Only 8% said it had the opposite effect. **While interest may be high, other AI research indicates business executives need to learn more about how AI works, how to implement it in their organizations, and what it takes to make it work.** According to a recent Forrester study, to be successful, business leaders need to look for projects that build AI capabilities and knowledge slowly, over time. AI-related jobs also are in-demand. Based on a search of open positions, the jobs board *Indeed.com* found that AI has been good for creating high-paying jobs—most over six figures per year. These include data scientists, software engineers, developers and software architects. The Pactum survey also found that most respondents (80%) said their organizations were already using AI. IT, technology and telecoms (30%) as well as financial services (24%) will see the biggest growth in AI. This is followed by manufacturing (13%), business and professional services (6%), distribution and transport (5%) and retail (5%). More than three-quarters (77%) of respondents said AI is being developed responsibly, 9% said it wasn't and 10% said it was too soon to tell. Most respondents (84%) said AI is improving "all the time." While most senior executives support the use of AI, reservations remain. Many respondents (59%) said they feel threatened by AI and can see it taking over jobs. More than half of respondents (52%) said AI is too new to be trusted.

ENERGY: CANADIAN FIRM PLANS A DEMONSTRATION FUSION REACTOR MACHINE IN THE UK

No one doubts sustained fusion is possible in principle. It powers every star in the universe. Making it work on Earth has proved harder. Engineers have tried since the 1950s, so far without success**. In June, a Canadian firm, General Fusion, said it would build a demonstration reactor, 70% the size of a full-blown commercial one, near the Culham Center for Fusion Energy, Britain's national fusion-research laboratory.** The company hopes its reactor will be running by 2025. On paper at least, fusion is attractive. Existing nuclear plants rely on fission—the splitting of heavy atoms, usually of uranium, into lighter ones. The energy thus liberated is used to boil water into steam, which then turns turbines that make electricity. Fusion plants attempt to do the opposite, generating heat by combining light atoms to make heavier ones. Unlike coal or natural gas, fusion would produce no planet-heating carbon dioxide. Unlike solar panels and wind turbines, fusion plants could operate in any weather. Unlike fission plants, they pose no risk of spreading nuclear-weapons technology and should generate much less radioactive waste. They offer safety, too. "I like to say that fission is easy to start and hard to stop," said Christofer Mowry, General Fusion's boss. "Fusion is the opposite." Fusion is hard to start because it requires extreme conditions. Most Earthly fusion reactors aim to combine deuterium with tritium. (Both are isotopes of hydrogen, in which the single proton in that element's nucleus is joined by either one or two neutrons.) Protons have a positive electrical charge and like charges repel. Therefore, persuading two atoms to join forces means overcoming this repulsion and that requires a great deal of energy. **General Fusion's idea is to forge a middle path between two existing approaches, magnetic-confinement fusion (mcf) and inertial-confinement fusion (icf), with less need for heroic engineering than either.** General Fusion calls its approach "magnetised target fusion".

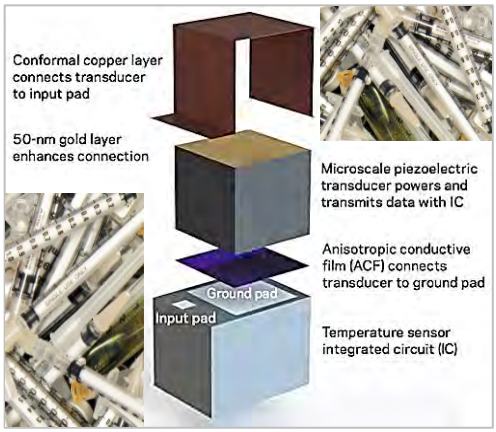


The basic concept dates back to the 1960s. The firm's reactor uses powerful electric pulses to create self-stabilizing blobs of plasma that are injected into the reactor's core. This compares to blowing a smoke ring, in which the air currents within the ring allow it to maintain its shape for a few seconds before it dissipates. The puffs of plasma actually last around 20 milliseconds, long enough for them to be compressed. The core of General Fusion's British reactor will be lined with molten lithium and lead. Once a puff of plasma has been injected, ranks of gas-driven pistons will compress the core, changing it from a cylinder to a sphere and drastically boosting the fusion rate (see diagram). **General Fusion's compression takes thousandths of a second—comparable with the timescales on which internal-combustion engines operate, and well within the capabilities of digital electronics to fine-tune.** The upshot, the firm hopes, is a reactor which should be cheaper and simpler to build and operate than either an mcf or icf machine.

Besides compressing the plasma, the liquid-metal jacket serves to capture the energy from the reaction. Heated metal will be piped to a heat exchanger and used to raise steam. Neutrons from the fusion reaction will transform some of the lithium into more tritium fuel, which would otherwise be rare and expensive. Or at least, it will one day. General Fusion's demonstration reactor will only fuse deuterium with deuterium, to keep things simple. Still, the firm hopes that a full-fledged commercial reactor—which might be built in the early 2030s—could compete with other forms of electricity. It is aiming at a cost of $50 per megawatt-hour, which ought to make it competitive with coal**. Renewable energy may prove cheaper, but it is hampered by intermittency. The plant will have one more advantage over existing fission plants, the electricity production of which cannot quickly be raised or lowered.** General Fusion's reactor can increase or decrease power output ten-fold by changing the speed at which the core cycles. That should allow it to "load-follow", ramping up production when electricity prices are high and cutting back when they are low.

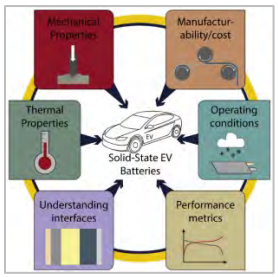
MEDICAL: RESEARCHERS DEVELOP A WIRELESS IMPLANTABLE SENSOR SMALL ENOUGH TO BE INJECTED

Researchers at Columbia University have built a single-chip device that takes up less than 0.000006 in.^{3} (0.1 mm^3), making it the smallest such system ever made. **The device was made to be injected into humans and monitor various biological parameters. To keep it small, the team designed it to communicate and be powered wirelessly by ultrasound.** The goal is to replace larger implantable sensors that require several chips, packaging, wires, external transducers and batteries. The team also wanted an implant that could be injected, and it is small enough to do that (it takes a microscope to see the implantable sensor). Ken Shepard, the team leader and a professor of electrical and biomedical engineering, said, "This is a new idea of 'chip as system.' This is a chip that alone, with nothing else, is a complete functioning electronic system. It should be revolutionary for developing wireless, miniaturized implantable medical devices that can sense different things, be used in clinical applications and eventually be approved for human use." The schematic representation of the wireless implantable sensor shows the various components and how they are packaged. The chip was fabricated in Taiwan and then modified at the Columbia Nano Initiative cleanroom and City University of New York Advanced Science Research Center. The modifications included adding piezoelectric materials (piezoelectric materials act as energy harvesters because of their properties, which can convert mechanical energy into electrical energy, and vice versa) onto the standard complementary metal-oxide-semiconductor to convert acoustic energy to electrical energy. **The team chose ultrasound as the best way to send energy and communications to the chip because the wavelengths needed for RF communication links are too large to work with devices as small as the new single-chip device.** Ultrasound wavelengths are much smaller at a given frequency because the speed of sound is much less than the speed of light. The researchers built an ultrasound "antenna" for communications and power and mounted it directly on top of the chip. The team's goal is to develop chips that can be injected into the body with a hypodermic needle and then communicate back out of the body using ultrasound, providing information about something being measured locally. Current versions of the device measure body temperature, but there are many more possibilities.



AUTOMOTIVE: NEXT-GEN ELECTRIC VEHICLE BATTERIES, QUESTIONS THAT STILL NEED ANSWERS

The next generation of electric vehicle batteries, with greater range and improved safety, could be emerging in the form of lithium metal, solid-state technology, but key questions about this promising power supply need to be answered before it can make the jump from the laboratory to manufacturing facilities. University of Michigan researchers Jeff Sakamoto and Neil Dasgupta have been leading researchers on lithium metal solid-state batteries. In an article, Sakamoto and Dasgupta lay out the main questions facing the technology developed in close collaboration with leaders in the auto industry. Major automakers are going all-in on electric vehicles, announcing plans to phase out internal-combustion engine cars in the coming years. Lithium-ion batteries enabled the earliest EVs and they remain the most common power supply for the latest models coming off assembly lines. Those lithium-ion batteries are approaching their peak performance in terms of the EV range on a single charge and they come with the need for a heavy and bulky battery management system—without which there is risk of onboard fires. **By utilizing lithium metal for the battery anode along with a ceramic for the electrolyte, researchers have demonstrated the potential for doubling EV range for the same size battery, while dramatically reducing the potential for fires.** "Tremendous progress in advancing lithium metal solid-state batteries was made over the last decade," Sakamoto said, "But several challenges remain on the path to commercializing the technology, especially for EVs." Questions that need to be answered to capitalize on that potential include: (1) How can we produce brittle ceramics in the massive, paper-thin sheets lithium metal batteries require? Do lithium metal batteries' use of ceramics, which require energy to heat them up to more than 2,000°F during manufacturing, offset their environmental benefits in EVs? (2) Can the ceramics and the process used to manufacture them be adapted to account for defects, such as cracking, in a way that does not force battery manufacturers and automakers to drastically revamp their operations? (3) A lithium metal solid-state battery would not require the heavy and bulky battery management system that lithium-ion batteries need to maintain durability and reduce the risk of fire. How will the reduction in mass and volume of the battery management system—or its removal altogether—affect performance and durability in a solid-state battery? (4) The lithium metal needs to be in constant contact with the ceramic electrolyte, meaning additional hardware is needed to apply pressure to maintain contact. What will the added hardware mean for battery pack performance?



AUTOMOTIVE: WHO MAKES THE CAR - 2021, A REPORT FROM BANK OF AMERICA SECURITIES

Executive Summary: In June, BofA Securities Global Research issued its annual *Who Makes the Car* report and schematics, which summarizes research of the global automotive supplier industry by highlighting the 16 major component systems, their average dollar content per vehicle (CPV), the top five suppliers for each system, the major trends in the supplier industry and investment implications. This year's report focuses on the component content estimates for a traditional global ICE (internal combustion engine vehicle), ICE-comparable U.S. battery electric vehicle and U.S. autonomous electric vehicle, as well as near- and long-term trends and developments. The estimated $ value of the content in a traditional global internal combustion engine (ICE) light vehicle has grown at an approximate 1.6% CAGR since the initial estimate of $11,000 in 2000 to $15,100 in 2020. This includes all potential component value in a vehicle, but excludes original equipment manufacturer (OEM) final assembly costs and profits. **The $15,100 global component content estimate translates into a total potential automotive supply market of roughly $1.4+ trillion in annual sales, assuming a 90 million+ unit trend market.** The report identifies the Engine, Transmission, and Electronics & Electrical component systems as those with the greatest opportunity for content expansion and growth for suppliers.

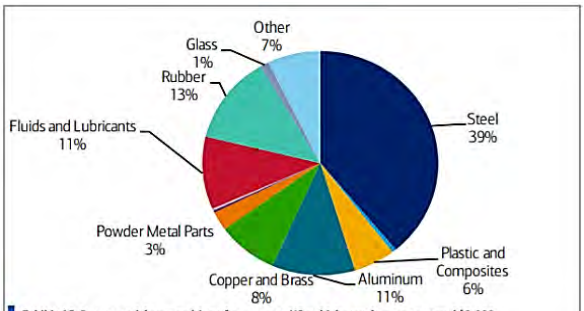
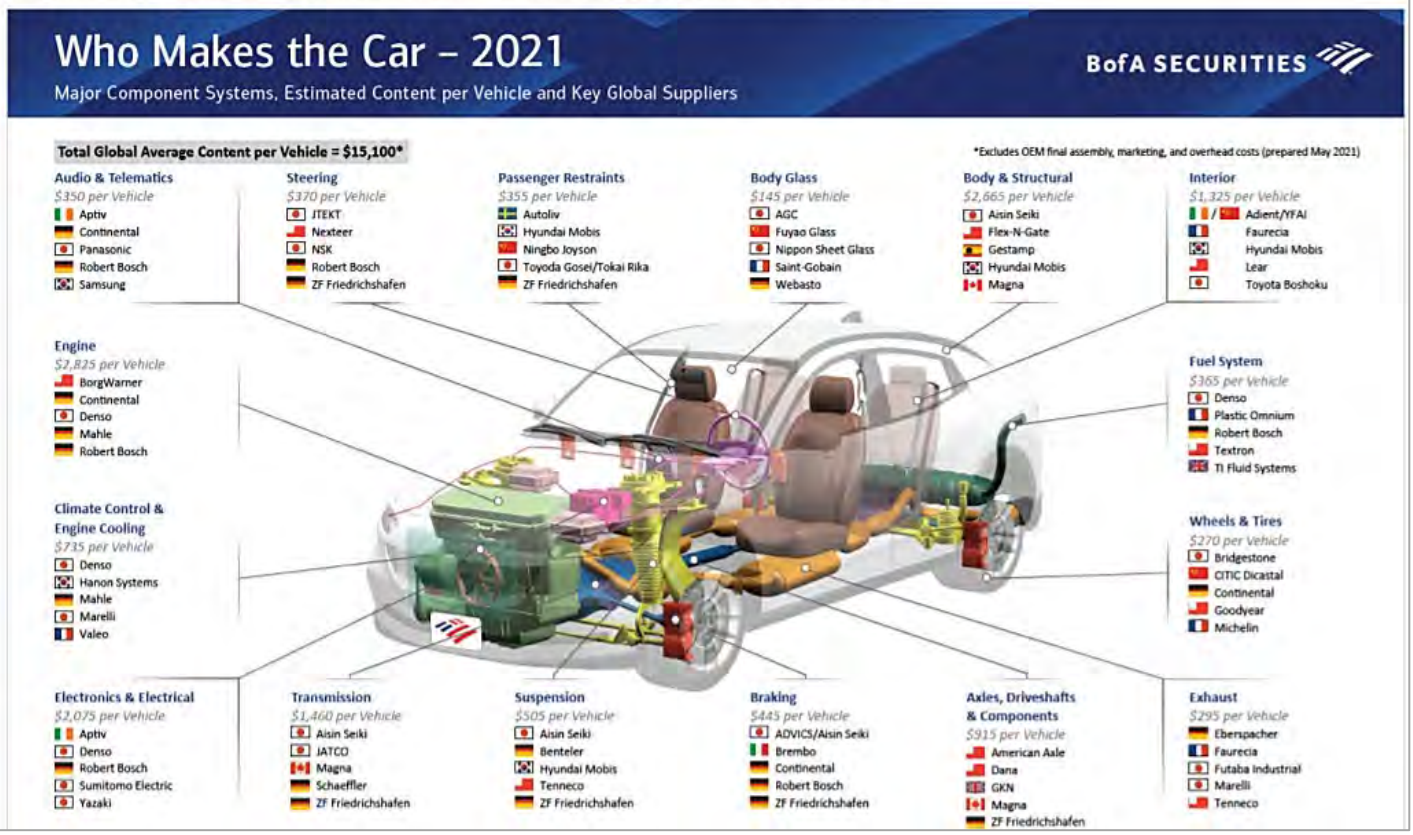


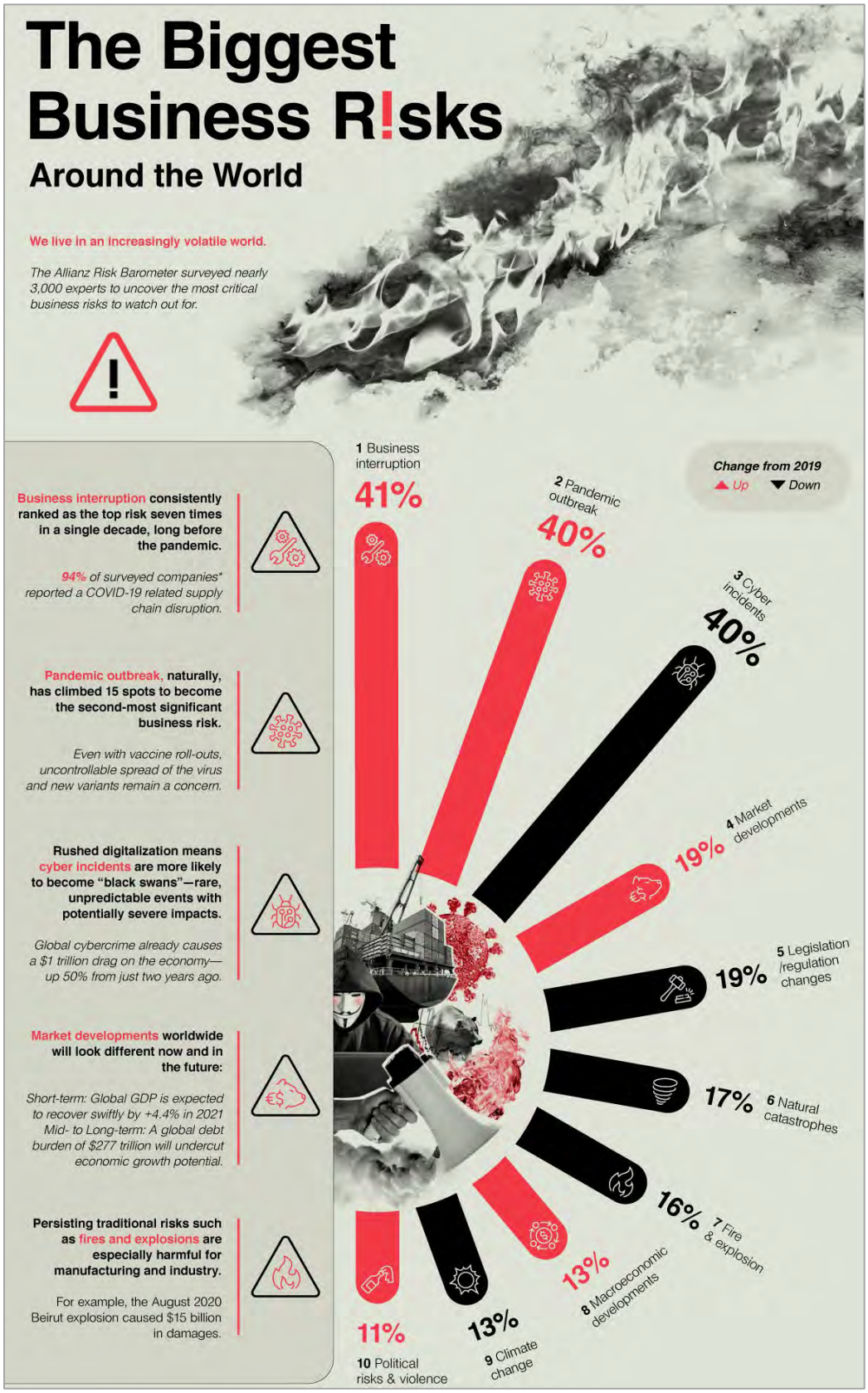
Exhibit 15: Raw material composition of an average US vehicle; total average around $3,900
Steel currently comprises ~40% of $ raw materials cost per average vehicle

Exhibit 17: Who Makes the Car – 2021 – Major component systems, estimated content per vehicle, and key global suppliers
Below we outline the 16 major component systems, estimated $ content per vehicle, and key global suppliers for a *global* ICE vehicle



There are five drivers of supplier revenue growth outside of vehicle production and mix: 1) global market expansion; 2) new customer penetration; 3) increased component content/technology; 4) consolidation; and 5) OEM outsourcing. **Over the past decade, Asian automotive suppliers have generally gained share at the expense of North American and European suppliers, which reflected underlying growth trends in their respective markets, although this shift has stalled in more recent years.** From 2019 to 2020, there were negligible share shifts between regions in the automotive supply base, driven in part by the pandemic that pressured the entire industry, although many large Tier 1 suppliers are now true multinational companies.

FORECASTING: THE BIGGEST BUSINESS RISKS AROUND THE WORLD IN 2021



An Increasingly Volatile World

Businesses face rapidly changing environments and associated risks that they need to adapt to, or risk falling behind. These can range from supply chain issues due to shipping blockages, to disruptions from natural catastrophes. As countries and companies continue to grapple with the effects of the pandemic, nearly 3,000 risk management experts were surveyed for the Allianz Risk Barometer, uncovering the top 10 business risks that leaders must watch out for in 2021.

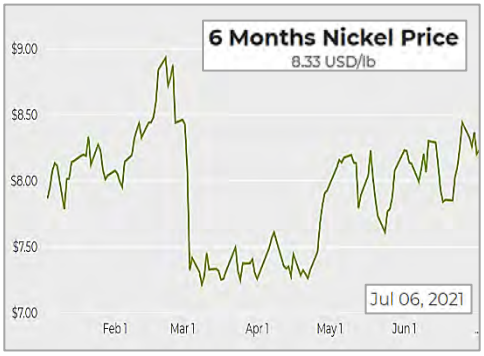
The Top 10 Business Risks: The Pandemic Trio Emerges

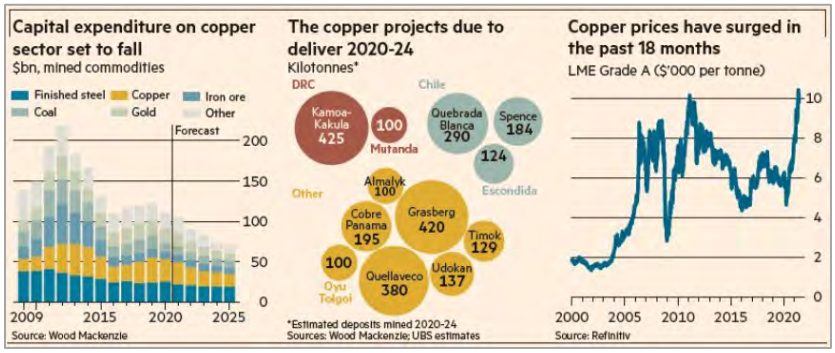
Business Interruption tops the charts consistently as the biggest business risk. This risk has slotted into the #1 spot seven times in the last decade of the survey, showing it has been on the minds of business leaders well before the pandemic began. However, that is not to say that the pandemic hasn't made awareness of this risk more acute. In fact, 94% of surveyed companies reported a COVID-19 related supply chain disruption in 2020. Pandemic Outbreak has climbed 15 spots to become the 2nd-most significant business risk. Despite vaccine roll-outs, the uncontrollable spread of the virus and new variants remain a concern. The third most prominent business risk, Cyber Incidents, are also on the rise. Global cybercrime already causes a $1 trillion drag on the economy, a 50% jump from just two years ago. In addition, the pandemic-induced rush towards digitalization leaves businesses increasingly susceptible to cyber incidents.

INNOVATION/STEEL: INFLATABLE STEEL COULD REVOLUTIONIZE THE WIND ENERGY, SPACE SECTORS

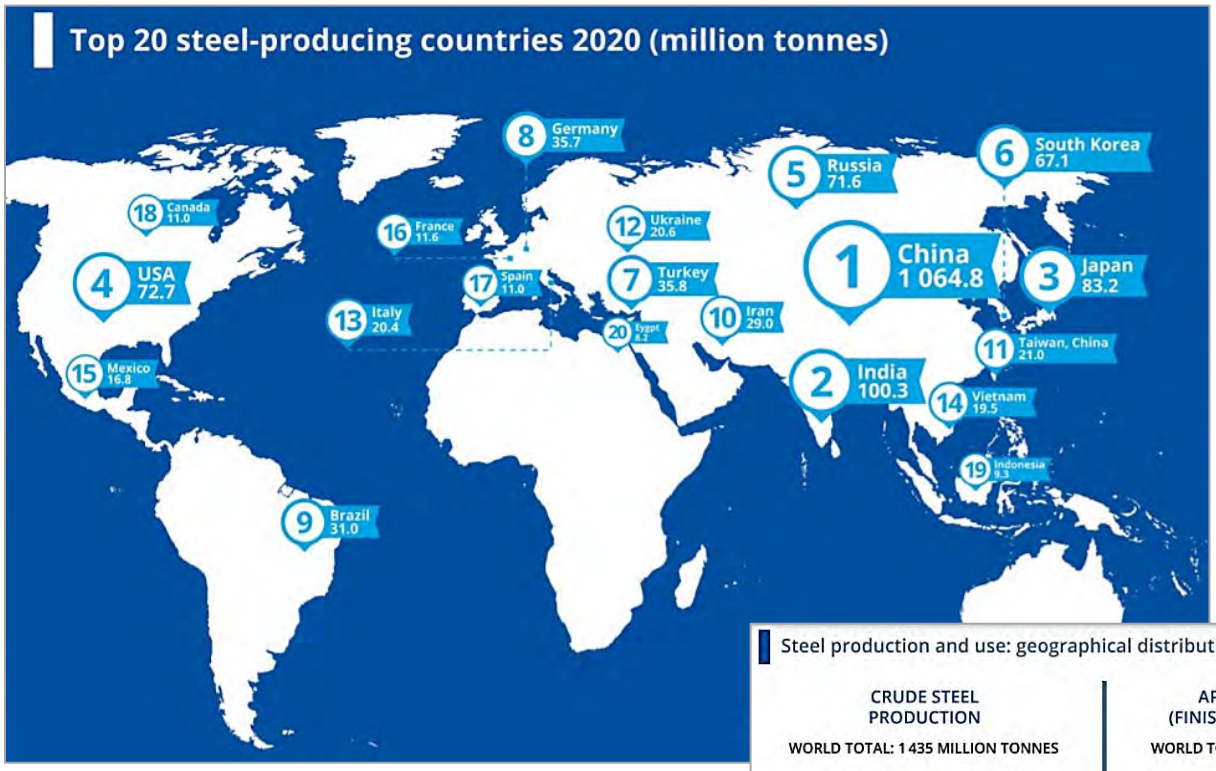
A Polish and Swiss design team have perfected a method of creating inflatable steel furniture which could revolutionize the wind energy, space and construction sectors. **The designers created the engineering technique as a way of making steel-built products lighter and less expensive without compromising strength. Called free inner pressure deformation (FiDU), the technique requires laser cut sheets of steel that are precision shaped to plus or minus 0.1mm of error.** These thin sheets of high-strength steel are then robot welded to ensure the utmost exactness of production. The concept was initially tested with the manufacture of ladders, chairs and stools. The three-legged stools are produced as rolled up tubes of thin steel sheet which are inflated via a simple valve to form a solid, lightweight and stylish seat. As the pressurized air only needs to range between 0.1-50 Bar, the furniture made using this method can even be inflated using a bicycle pump. Unlike existing hydroform methods used in the automotive sector, FiDU doesn't rely on a mold to shape the steel during inflation, so this can even be done at home. Due to steel's inherent strength and the innovative FiDU technique, the stool can hold more than two tonnes. This means that the metal will deform as it inflates according to its natural characteristics, making each piece's individual contours unique, even though they all come from the same identical design. The FiDU method offers even more convenience at a fraction of the weight. Transporting flat uninflated stools takes up almost no space compared with a fully formed piece, significantly lowering costs and emissions associated with transport. The choice to go with steel was based on a number of factors. Strength was a key aspect, but accessibility and cost were also crucial. The design team experimented with other materials, but steel's flexibility meant that it could be easily cold formed, unlike aluminum. **The FiDU technique has applications that range from infrastructure, to renewable energy, to space travel.** With the design team's experience in architecture, their research is focusing on construction and housing applications. The team also designed and built a small wind turbine. Many current wind turbine blades are made of plexiglass or carbon-fiber, with each two-meter-long blade costing €600. Steel blades made using FiDU, cost only €25 and have greater durability. The application of steel-built technology could significantly lower the cost of adopting renewable wind power. A crash barrier is being developed that would run alongside highways. It's possible that this FiDU technology, powered by the qualities of steel, has the flexibility to the applied almost anywhere. The team's dream is to utilize FiDU for constructions in space, where its ultra-light and compact design would make it uniquely suited.

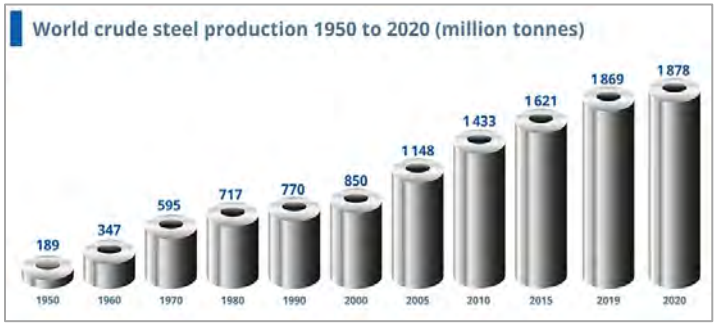
COMMODITIES: COPPER SHORTFALL EMERGING BY 2030; LUMBER PRICES PLUNGE; METALS HEATING UP

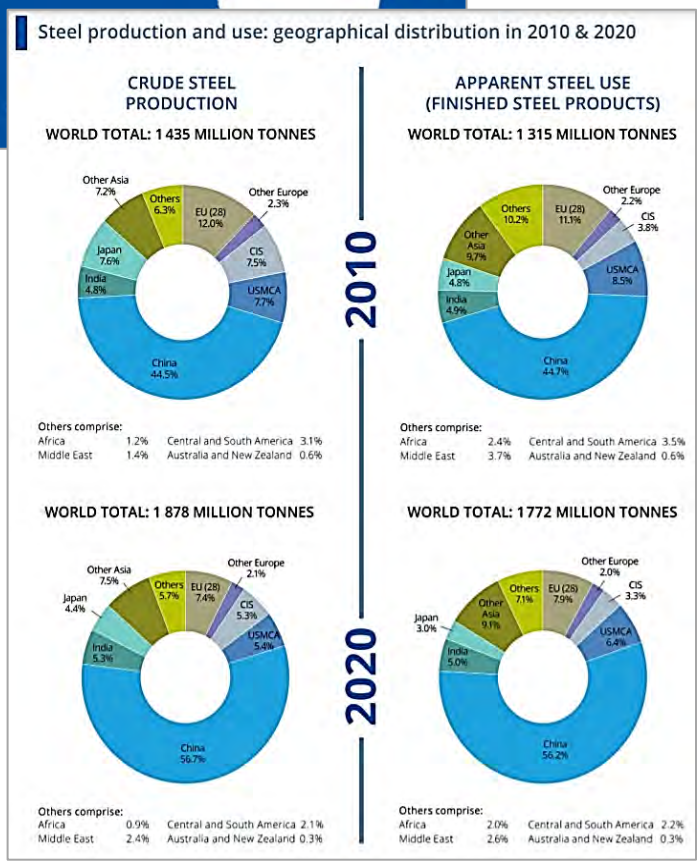




STEEL: WORLD STEEL PRODUCTION, CONSUMPTION IN FIGURES (ISSUED JUNE 2021)







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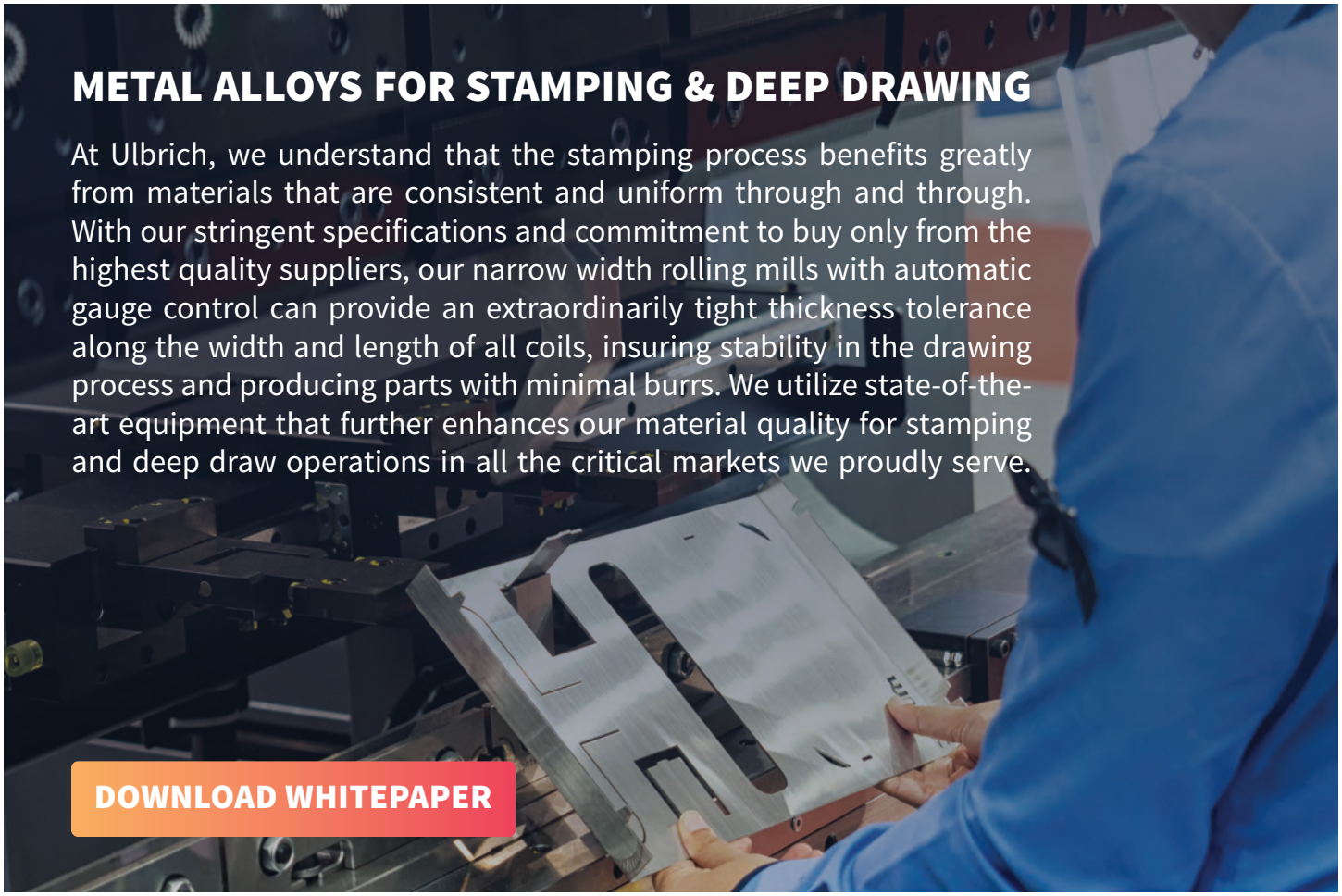

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Charles was a Senior Vice President of procurement in the metal container industry, with a career spanning nearly four decades. He specializes in steel and aluminum procurement and utilizes his expansive knowledge of the steel and aluminum industry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

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