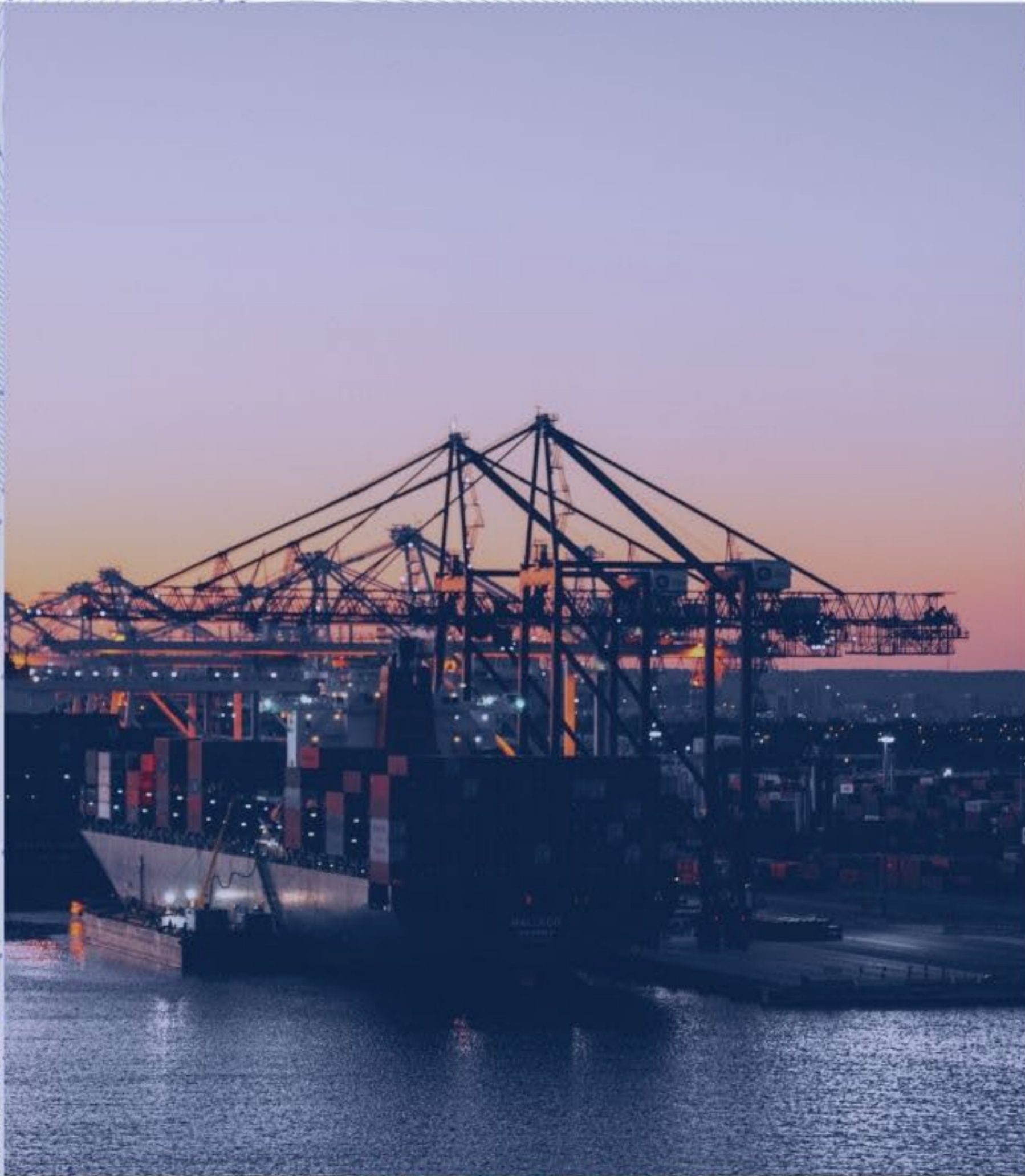




Market Intelligence Report Q2, 2022

Issued By USI & Asteelflash

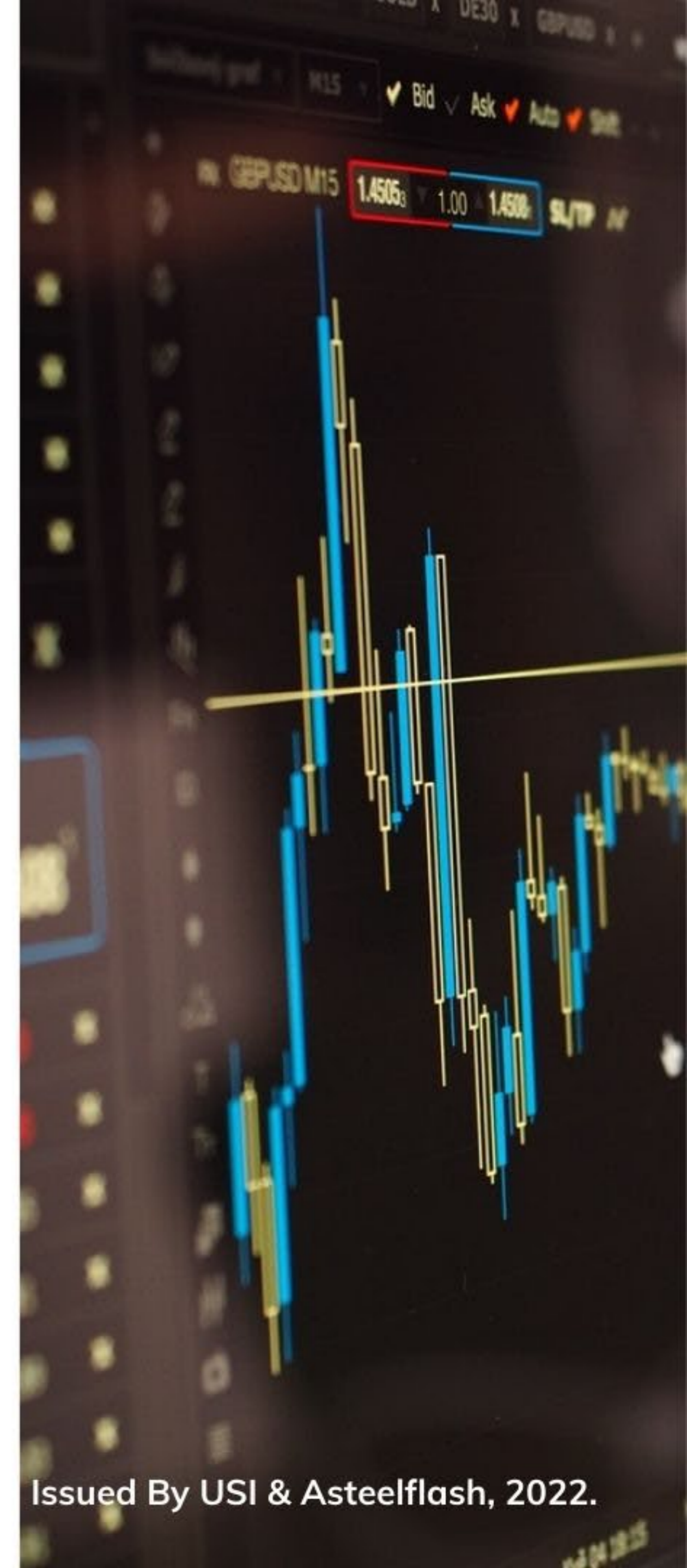


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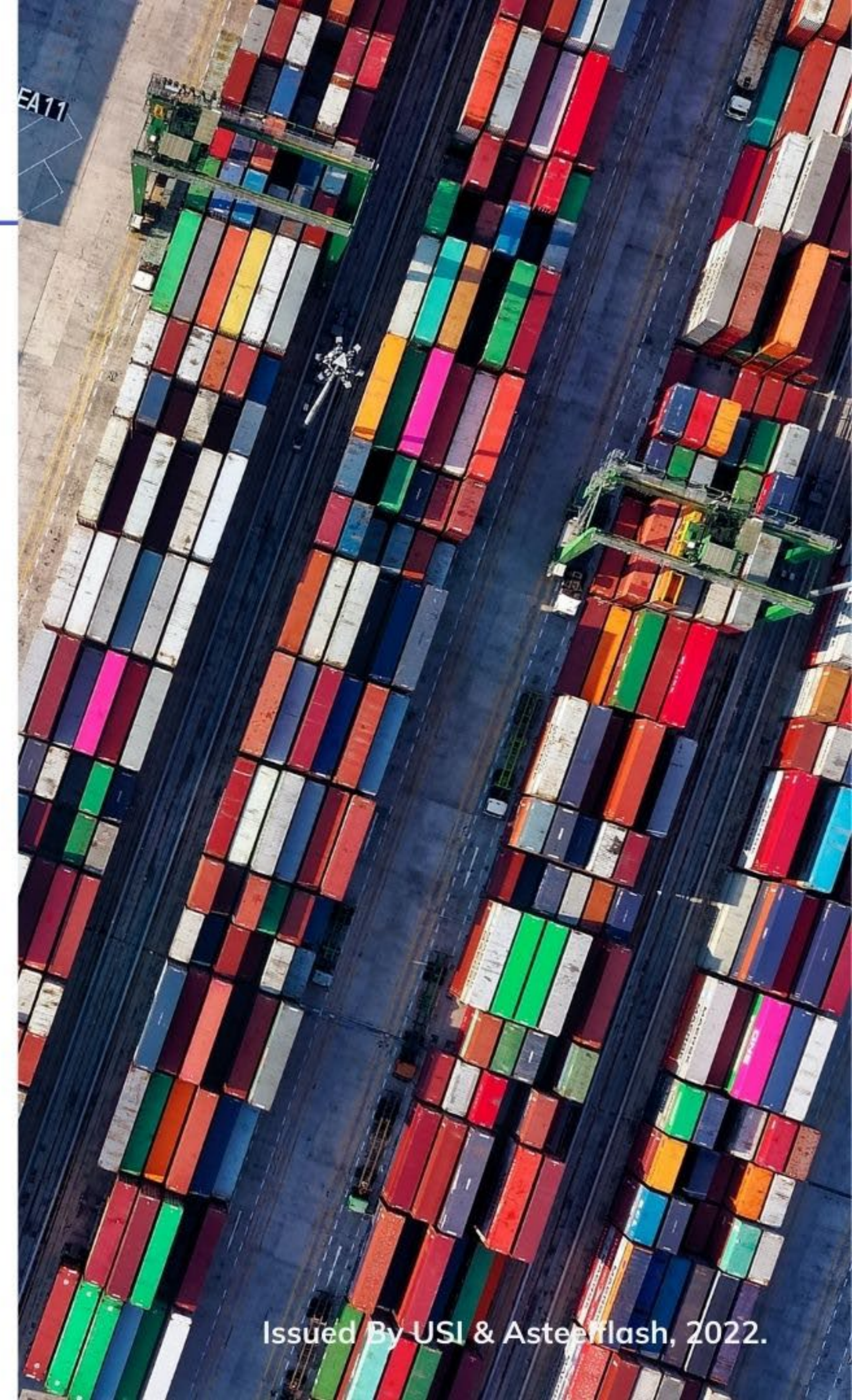
Supply Chain Overview

- Semiconductor Shortages are expected to continue through 2023
 - Across-the-board shortages for mature technology nodes
 - More cancellation/rescheduling restrictions imposed by big players
- No price reduction to be expected in 1H 2022
 - Semiconductor prices will keep increasing through 2022
 - Inflation starts to bite on commodity prices
- Covid-19 leads to lockdowns and then impact the production in China
- Russia-Ukraine War
 - There is an impact on the export of C₄F₆, neon, and palladium(Pd) which are materials needed to manufacture semiconductors
 - Price increase on commodities such as oil and natural gas, leading to an increase in freight costs which are already at an all-time high.



• Supply Chain Overview •

- Transportation continues to be challenging
 - The rates are still over the roof for air, sea & ground.
 - Capacity continues to be constrained.
 - Extended lead-time of transportation.
- Average lead times are running anywhere from 105 days to 495 days, so the only thing that is going to help is forecast and orders through the year.



Quick Summary

Consumer & Industrial

Category		
	Lead Time	Price
Processor/ MCU/ Main Chips	Increasing	Increasing
Logic/ Analog	Increasing	Increasing
Discrete	Increasing	Increasing
Frequency Parts	Stable	Increasing
MLCC	Stable	Stable
Memory	Stable	Stable
PCB	Stable	Stable
LCD	Stable	Stable
Cable	Stable	Stable
Connector	Stable	Stable

Automotive Application

Category		
	Lead Time	Price
Processor/ MCU/ Main Chips	Increasing	Increasing
Logic/ Analog	Increasing	Increasing
Discrete	Increasing	Increasing
MLCC	Increasing	Stable
Cable	Increasing	Stable
Resistor	Stable	Stable
PCB	Stable	Stable

Semiconductor Segment Status and Trends

2022F Rank	Company	Headquarters	2019 (\$M)	2020 (\$M)	20/19 % Change	2021 (\$M)	21/20 % Change	2022F (\$M)	22/21 % Change
1	Winbond	Taiwan	433	284	-34%	352	24%	1,645	367%
2	GlobalFoundries	U.S.	773	592	-23%	1,766	198%	4,500	155%
3	Nanya	Taiwan	178	291	63%	404	39%	1,000	148%
4	Renesas	Japan	351	209	-40%	333	59%	800	140%
5	Analog Devices	U.S.	251	174	-31%	372	114%	800	115%
6	ONsemi	U.S.	535	384	-28%	445	16%	935	110%
7	ST	Europe	1,174	1,278	9%	1,828	43%	3,500	91%
8	Vanguard	Taiwan	279	128	-54%	477	273%	865	81%
9	UMC	Taiwan	566	952	68%	1,755	84%	3,000	71%
10	Intel	U.S.	16,213	14,259	-12%	18,733	31%	27,000	44%
11	TI	U.S.	847	649	-23%	2,462	279%	3,500	42%
12	Infineon	Europe	1,279	1,067	-17%	1,637	53%	2,300	41%
13	TSMC	Taiwan	14,937	17,240	15%	30,043	74%	42,000	40%
—	Total	—	37,816	37,507	-1%	60,607	62%	91,845	52%

Source: IC Insights, Company Reports

2022/3/1

- Thirteen companies are expected to increase their capital investment by more than 40% this year. In total, these companies will spend \$91.8 billion combined this year; 52% more than in 2021.
- The pure-player foundries (TSMC, UMC, and GlobalFoundries) are more aggressive than the top leading IDM* (TI, Analog Devices, Infineon, and ST).

We foresee the mitigation of shortages in late 2022 or early 2023.

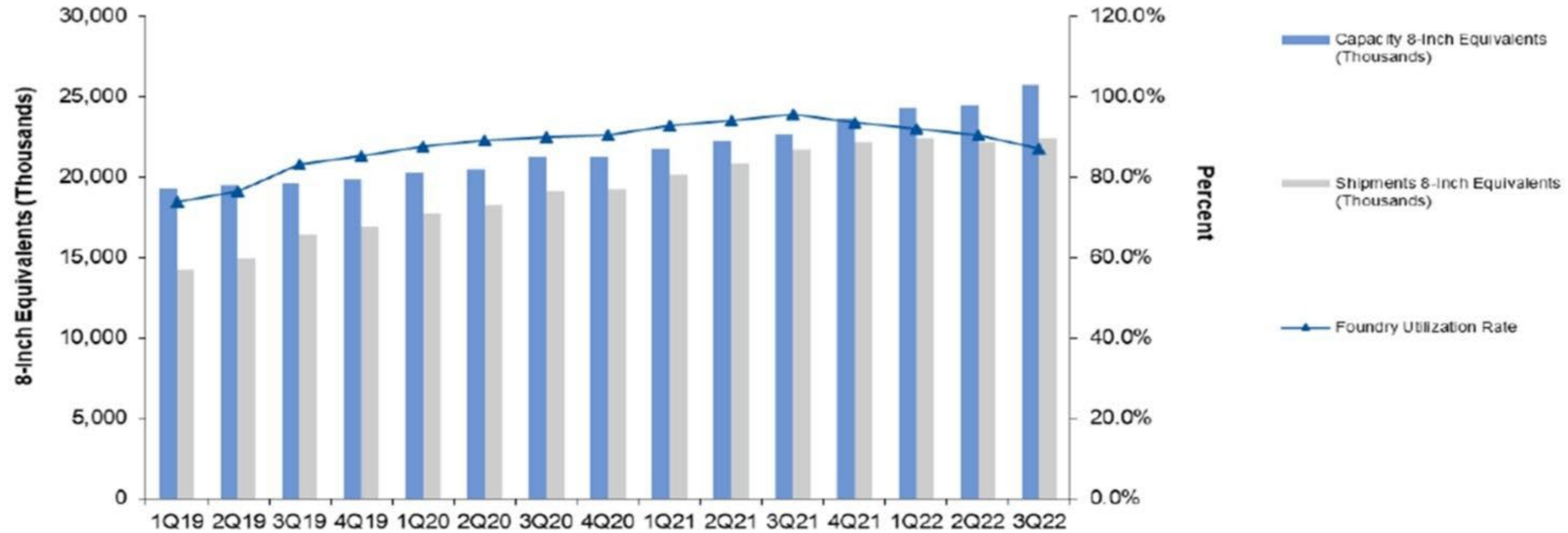
*Integrated Device Manufacturer

• Semiconductor Segment Status and Trends

- Estimates are that supply shortage will start to mitigate in 2H'22.
- Gartner says MCU and Components ASPs are about 15% higher in 2021 compared to 2020 and predicts ASPs will continue to rise.

Segment	Who	Shortage Ends	Comments
IDM	Toshiba	2022	Stated in Sept.'21
	TI	2023	Stated in Mar.'22
	NXP	2023	Stated in Feb.'22
	onsemi	2023	Stated in Mar.'22
	Renesas	2022	Stated in Sept.'21
	Infineon	2023	Stated in Aug.'21
	ST	Demand is much more than capacity in 2022	Stated in Jan.'22
	AMD	2H22	Stated in Sept.'21
	Intel	2023	Stated in Sept.'21
Foundry	TSMC	No Date	
	UMC	2023	Stated in Sept.'21
	Global Foundries	2023	Stated in Sept.'21
Researcher	Gartner	2022 late	Stated in Sept.'21

Semiconductor Segment Status and Trends



Worldwide Foundry Quarterly Capacity, Shipments and Utilization Rate

	1Q19	2Q19	3Q19	4Q19	1Q20	2Q20	3Q20	4Q20	1Q21	2Q21	3Q21	4Q21	1Q22	2Q22	3Q22	4Q22
Capacity 8-Inch Equivalents (Thousands)	19,291	19,518	19,646	19,875	20,254	20,462	21,256	21,246	21,766	22,205	22,690	23,665	24,301	24,457	25,736	26,369
Shipments 8-Inch Equivalents (Thousands)	14,224	14,922	16,358	16,931	17,761	18,250	19,090	19,207	20,170	20,877	21,694	22,147	22,389	22,144	22,403	22,701
Foundry Utilization Rate	73.7%	76.5%	83.3%	85.2%	87.7%	89.2%	89.8%	90.4%	92.7%	94.0%	95.6%	93.6%	92.1%	90.5%	87.0%	86.1%
Leading-Edge Utilization Rate	86.8%	88.8%	94.6%	96.9%	89.1%	89.3%	86.3%	84.4%	87.1%	87.4%	92.4%	86.8%	88.9%	87.3%	87.7%	85.4%

Leading edge is defined as 45nm and beyond.

Source: Gartner (December 2021)

The utilization curve is telling us that shortages will mitigate in late 2022 or early 2023.

• 2022 Semiconductor Segment Status and Trends

Major Players Status

- Infineon announced the price increase around 20% since Mar.21st'22.
- Microchip announced the price increase since Mar 1st '22.
- ST's capacity in 2022 of the automotive application has been fully booked

Processor/ MCU/ Analog/ Discrete

- Record high Capex since 2021 and expect to increase 12% wafer capacity(8" Eqv.) in 2022. Larger capacity expansion begins to come online in late 2022 and in 2023.
- IDMs with a high automotive/industrial focus, face more challenges than in 2021.

2022 Semiconductor Segment Status and Trends

CONTINUE

Processor/ MCU/ Analog/ Discrete

- MCU, Power, Analog, Discrete, specific SoC are the top critical shortages.
- TI, On Semi, ST, NXP, ADI, Renesas, Infineon, and Nexperia have huge backlogs which are not likely to be fulfilled in the short-term.
- Price hikes for the parts made with mature nodes, expect double-digit up in Q2.
- The lead time of the Logic and Analog devices are already up to 52+ wks, no relief in H1, and the Logic & Mosfet of On Semi will be up to 70 wks.

2022 Semiconductor Segment Status and Trends

CONTINUE

Memory

- Expect DRAM prices almost flat in Q2'22 except for DDR3 due to the capacity transferred to CMOS sensor by Samsung.
- 3D TLC NAND Flash is mainstream and est. price to increase slightly. The SLC & MLC prices will remain flat or increase slightly since the supply decreases.
- NOR Flash with the density greater than 128MB, est. the lead time will be up to 30-40 wks and the price will increase slightly

2022 Frequency Parts Segment Status and Trends

Frequency Parts

- MHz X'tal. JP size 3225 ceramic package with a Lead time of 12 ~ 42 wks+ and the allocation of this size continues; suggest adopting downsizing =< 2016 size from new projects
- 32.768KHz X'tal tight supply situation continues, the lead time keeps at 34~57 wks for parts allocation and price increase double-digit are predicted
- Oscillator, the lead time remains as 52 wks+ with allocation and the price will increase double-digit due to IC shortages

2022 MLCC & Connector Segment Status and Trends

MLCC

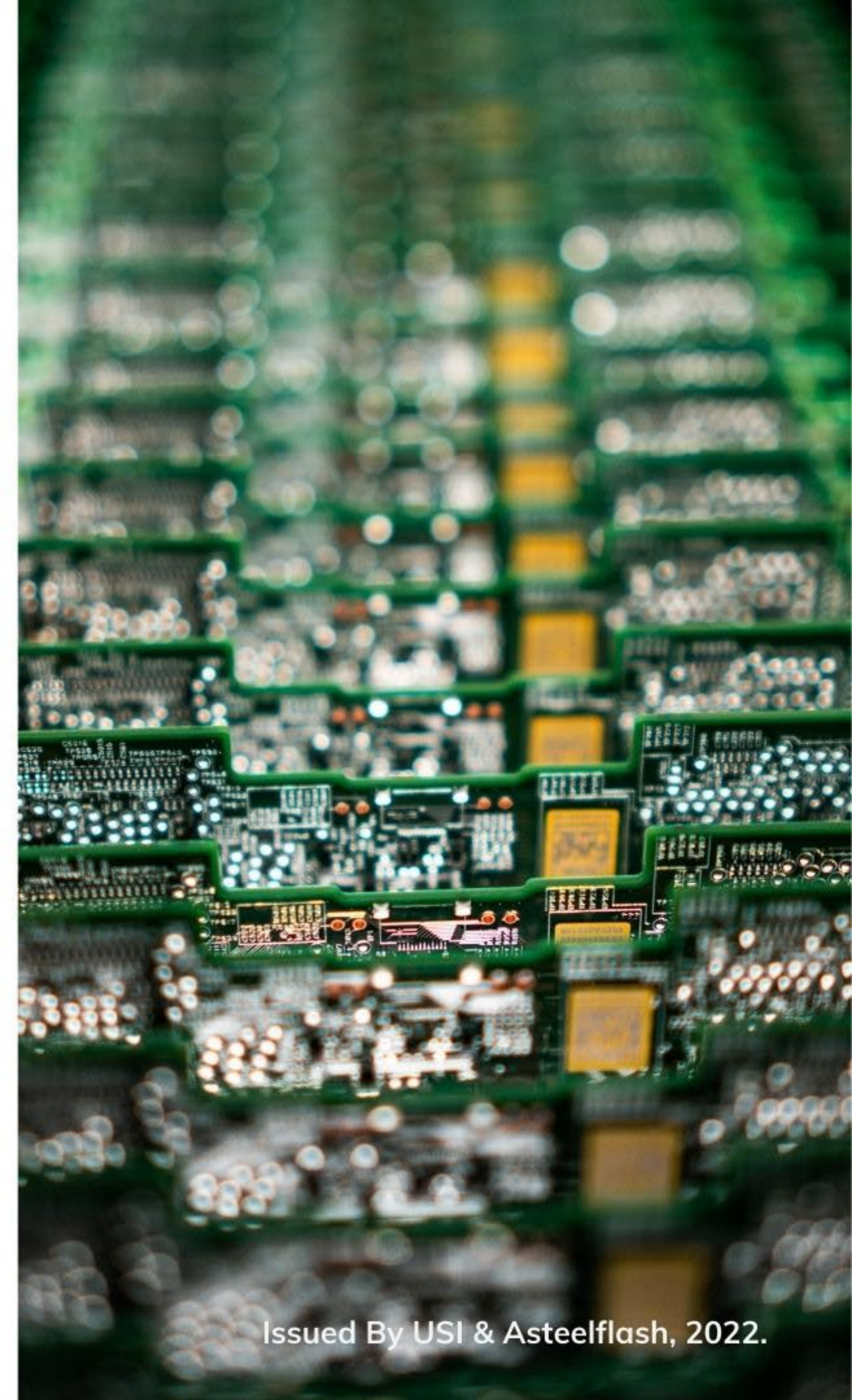
- The capacity will expand by approx. 10% in 2022, and est. BB ratio will be up to 1.7x for the automotive-grade parts.
- The key MLCC players have much more focus on automotive grade so the commercial-grade will be impacted.
- All major players highlight the supply constraints of sizes 1206 & 1210 since Q3 last year.

Connector

- JST extends a lead time of 40~52 wks and the price increase will see double-digit due to the resin and copper, and logistic cost with up trend.
- Legacy products from Foxconn like Pin Header/DDR3 socket/DVI/D-Sub/USB2.0 will be price increase around double-digit and up to 50% for some specific items.

2022 PCB/Substrate Segment Status and Trends

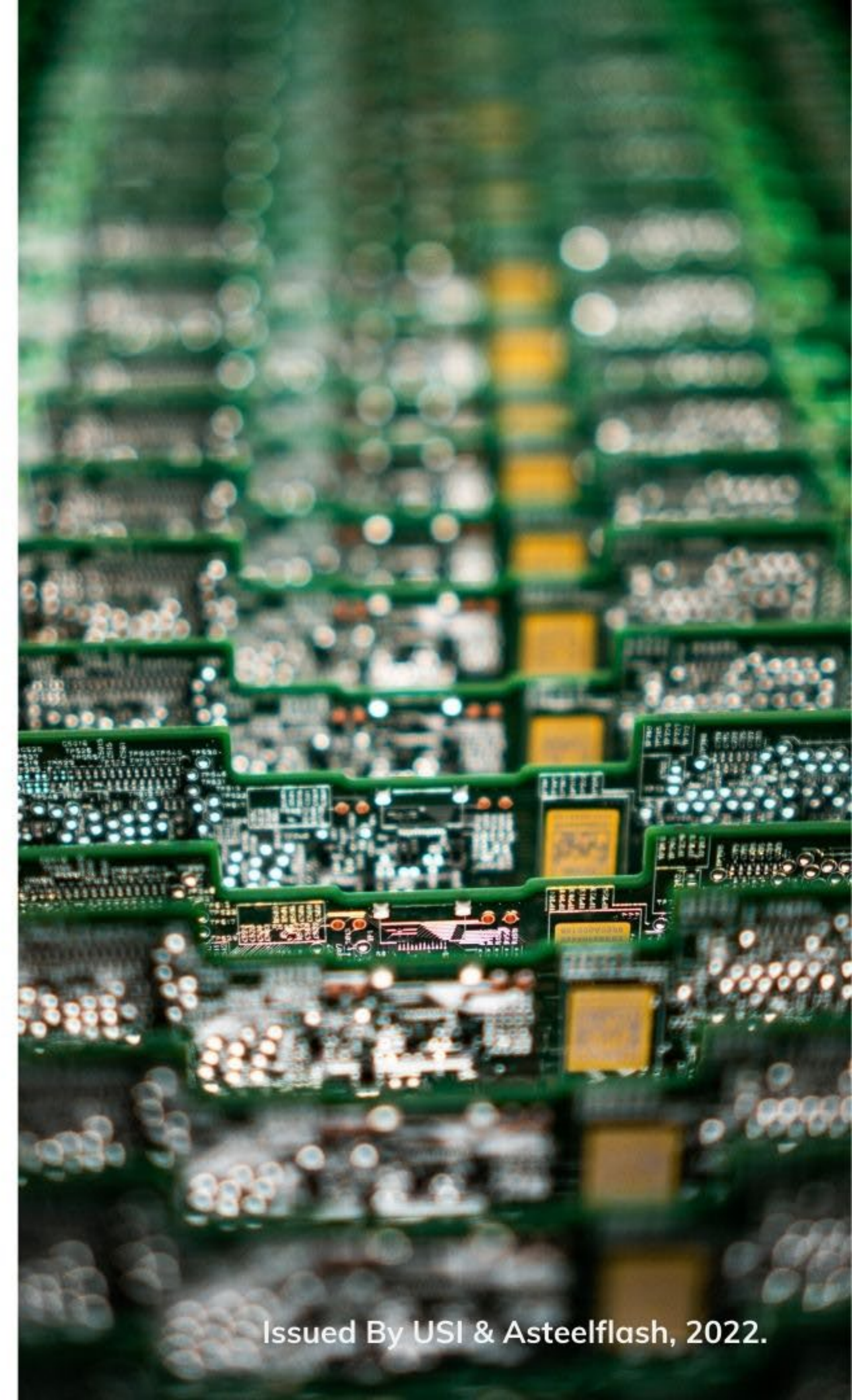
- 2021 PCB Market Result
 - Achieving record high market value, YoY growth: PCB total market 22.6%, substrate 37.9%
 - Surging PCB raw materials with the prices increase, such as Cu foil, resin, and glass fabric
 - ASP increases almost across the board due to tight supply and/or cost increases
 - Steadily increasing inventory
 - Super CAPEX investment cycle



2022 PCB/Substrate Segment Status and Trends

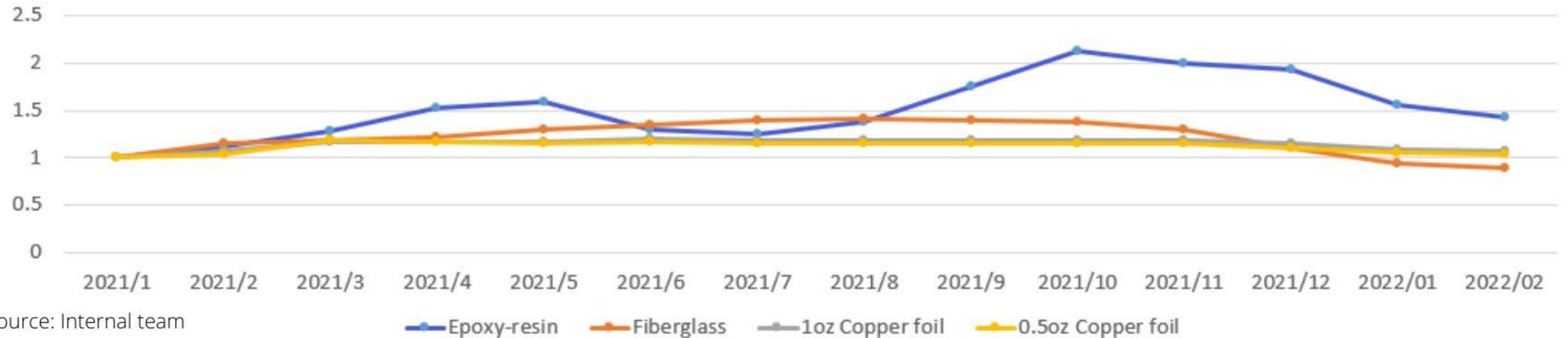
CONTINUE

- 2022 PCB Market Forecast
 - The substrate market will continue to grow at a fast rate, over 10%
 - Continued economic recovery will help PCB demand
 - Inventory level is a concern
 - Inflation and material with a high dollar is a challenge
 - PCB market expects to grow at 5% in 2022



2022 PCB/Substrate Segment Status and Trends

Price based on Jan, 2021



Source: Internal team

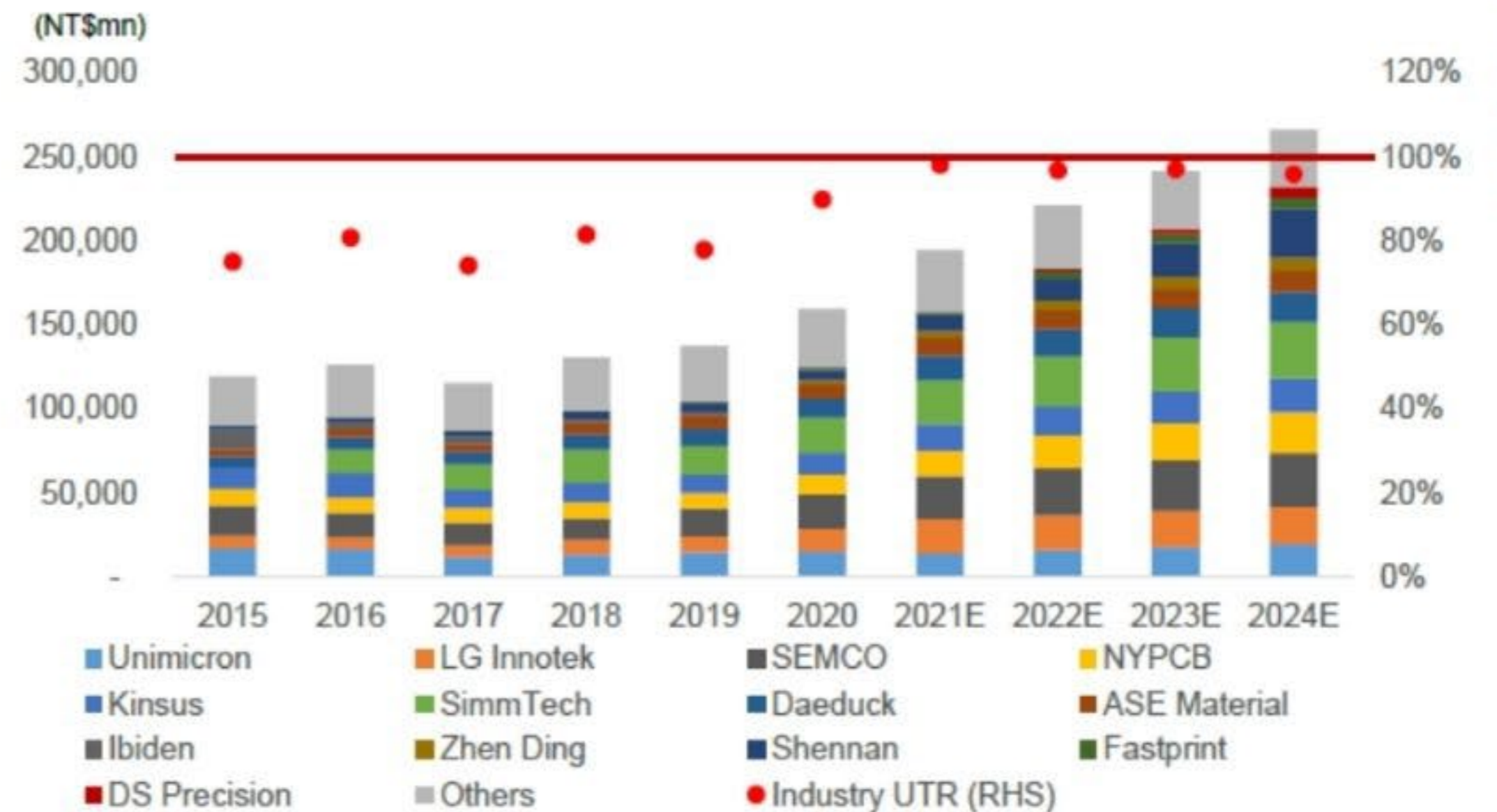
- The main material for PCB is CCL, and the main materials for CCL are copper foil, epoxy resin, and fiberglass.
- From Q4, 2021, the price of the three main materials is gradually flattening out. The Price of PCB will not fluctuate much in the short term

2022 Substrate Segment Status and Trends

BT industry price trends are likely to remain favourable as the utilization rates remain high and with solid upward demand trends.

mmWave smartphone shipment in the coming years will be a key driver (AiP, 70%+ CAGR 2021~2024). SiP, memory, and auto electronics should also remain as key demand drivers moving the BT industry forward.

Raw material lead times are longer due to solid demand (increasing from 12 to 20 weeks, with some materials are on allocation)

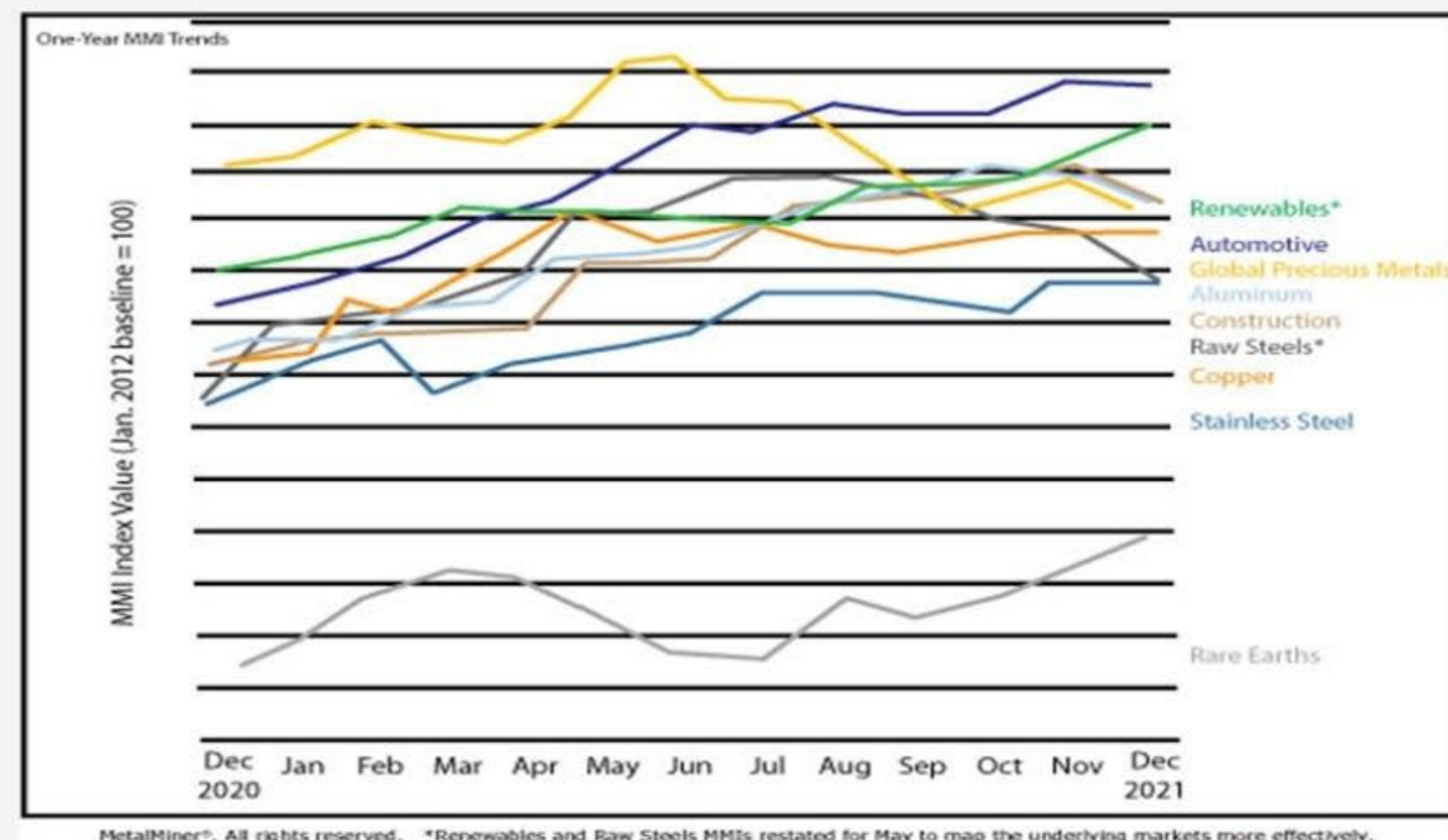


Source: Goldman Sachs, 08/24/21

• Mechanical Segment Status and Trends

Plastic/Metal – Price is still on the uptrend

The cost of plastic and metal material continues to rise. Aluminum +50%., Copper + 20% in 2021. Strong demand and tight supply. Logistic issues and energy prices rose sharply.



Source: MMI, 03/31/2022

2022 Chemical Segment Status and Trends

Process material – solder paste & solder bar/solder wire sees major price hikes

- Tin, copper, and silver price keep increase in 2022
- Covid-19 outbreak/Russia – Ukraine Conflict
- Imbalance Supply/Demand
- Prices will be updated monthly



Source: Internal team

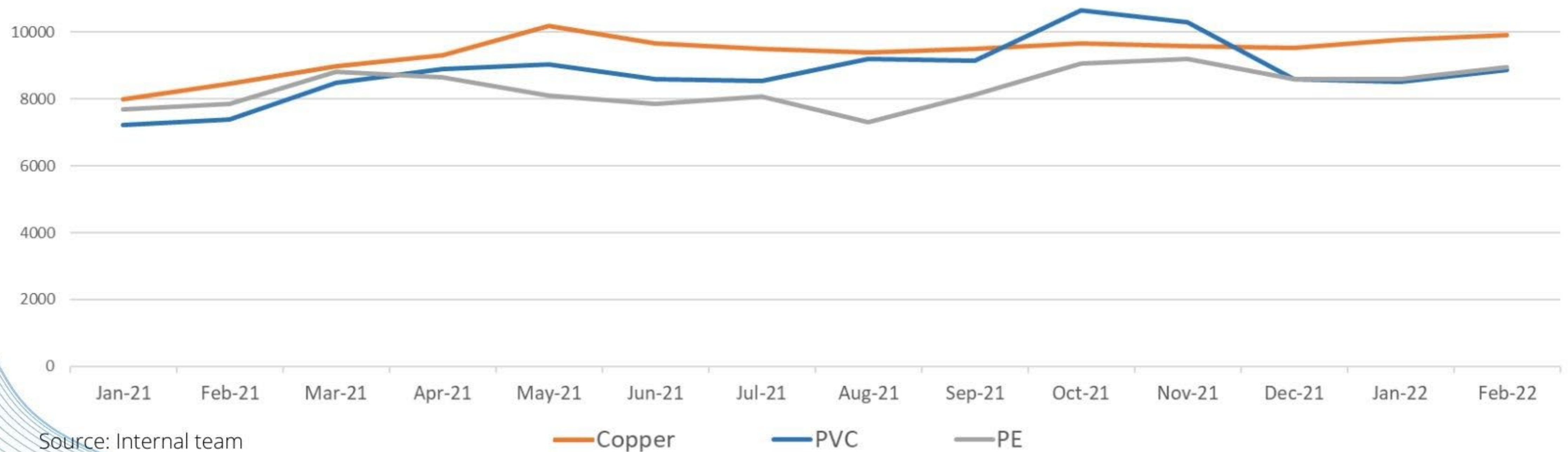
• Gold and Copper Price in Q1 22



Source: Internal team

- **Gold:** Due to the current volatility in many financial markets, gold remains fairly widely traded. The price will be around \$2000/OZ.
- **Copper:** The copper market is still expected to consume peak season, affected by the conflict between Russia and Ukraine, the current copper price is mainly affected by the surrounding metals and market news, strong support but insufficient upward power.

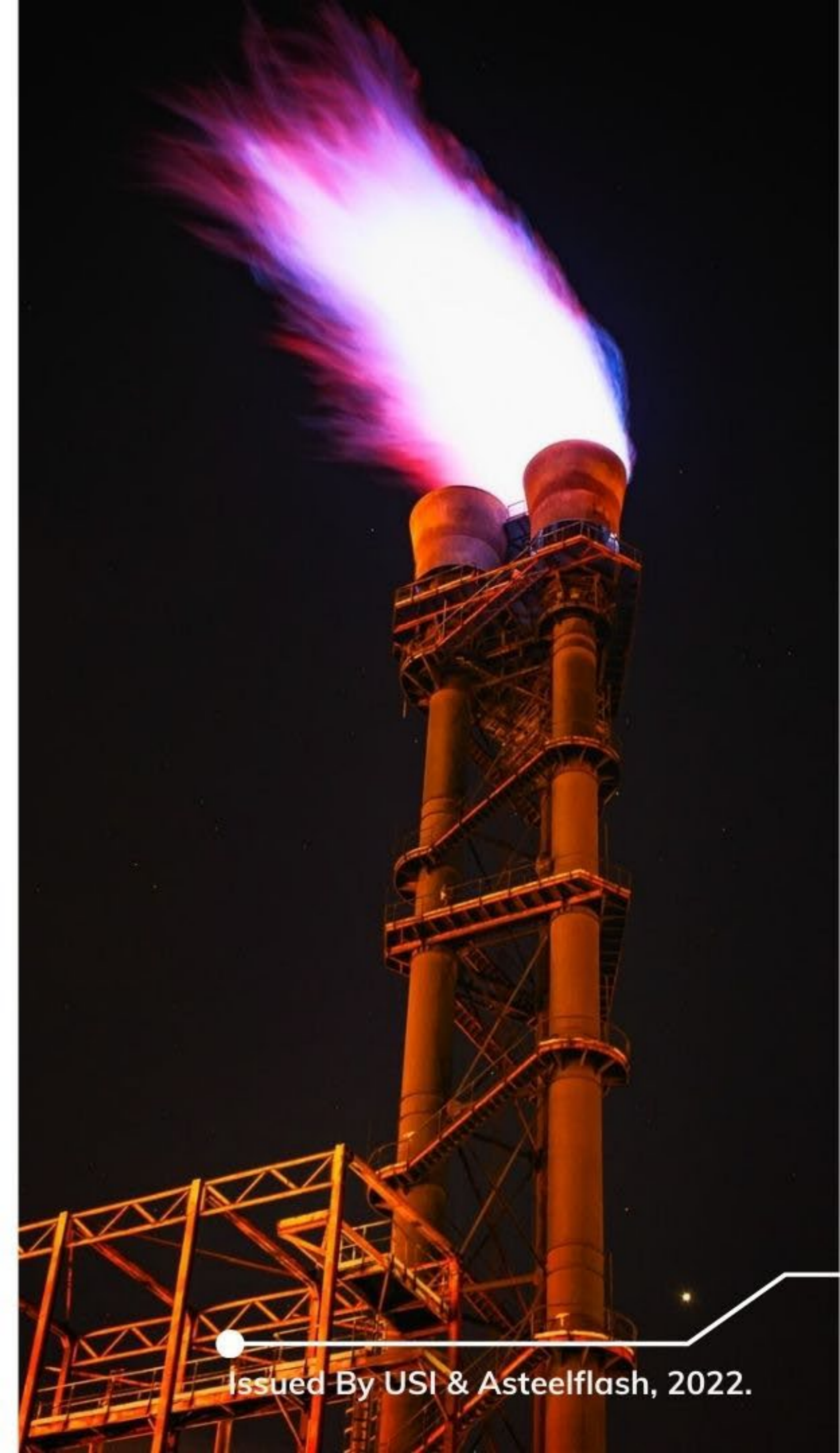
Cable Materials Price Trend



- The main materials are copper, PVE, and PE
- From Q4, 2021, the price of the three main materials is gradually flattening out.
- The Price of cable will not fluctuate much in the short term

Oil and Aluminum Price in Q1 22

- Russia's invasion of Ukraine threatens to fuel a surge in global inflation, hurting oil demand and investment.
- Iran's foreign minister says it's up to the United States to complete nuclear talks with Iran.
- Manufacturing activity in New York state weakened significantly in early March, with orders falling, delivery times lengthening and inflation measures remaining high.
- Countries like India buy Russian oil at rock-bottom prices
- Aluminum: In the short term, the market repeated, the price of aluminum fluctuated violently, the main controlled factors are still overseas energy crisis and the derivative effect of capital away from the site.



Oil and Aluminum Price in Q1 22



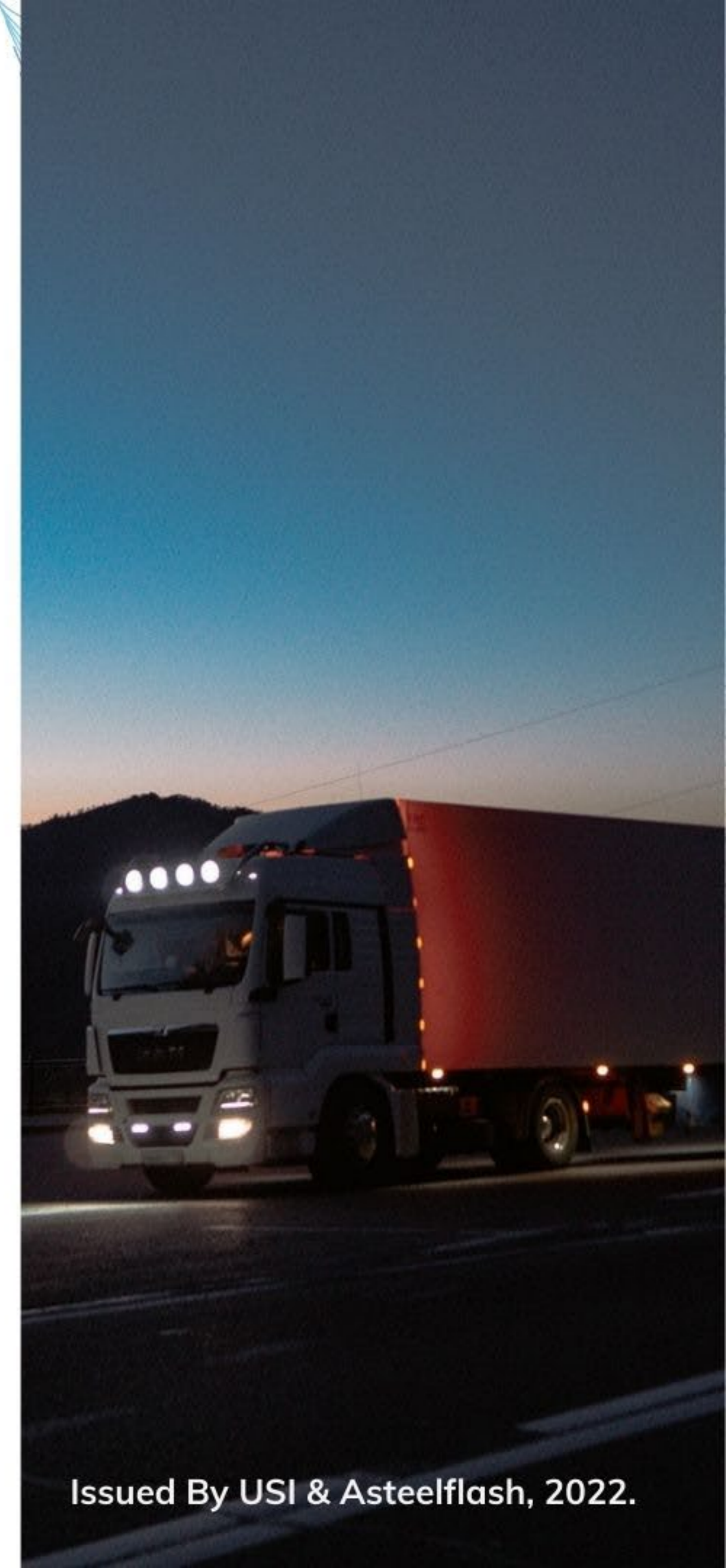
• Transportation

On top of the Covid-19 crisis, which has been disrupting the global supply chains for over two years now, international trade must face the war in Ukraine. If OPEC does not increase its production, or if the United States and China do not release emergency stocks, fuel could reach unprecedented levels next month.

This will have an immediate impact on transport costs and inflation in many markets and will reduce demand for air freight and push demand further towards sea freight.

AIR FREIGHT

At the transportation level, all our carriers and the main airlines, maritime companies as well as the railroad lines between Asia and Europe, have suspended their traffic in and out of Ukraine, Russia, and Belarus. Consequently, each flight will last for an extra 2 to 3 hours, which generates 15 tons more fuel per plane and therefore as much less freight transport capacity, and a significant additional cost in kerosene.



• Transportation

CONTINUE

Capacity constraints and air cargo high rates are expected to continue for the time being as the industry continues to battle with the impact of Covid-19.

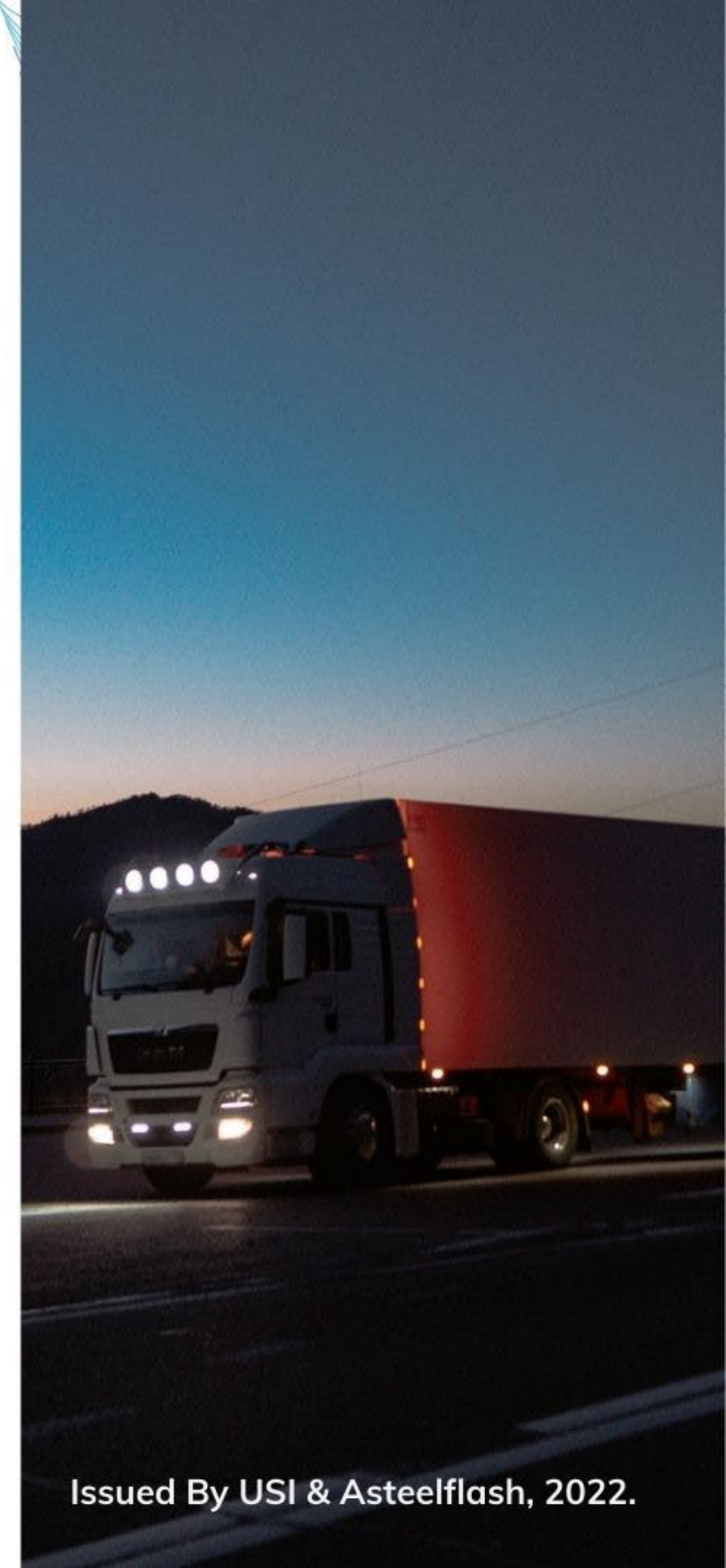
SEA FREIGHT

Industry observers say that ongoing issues in ocean freight and the emergence of the omicron variant have delayed hopes of the market returning to normal.

RAILROAD

On the rail/road trade lane from Asia to Europe, The Silk Roads are completely at a standstill. There is an average of 500,000 TEU containers (equivalent to twenty feet) per year which are transported by train from China to Europe.

The ports are still backed up and have a shortage of truck drivers, some suppliers are opting to airship their orders, such as Koa all their shipments are going by air and they are paying for the air freight. Hongkong and Shanghai have had recent shutdowns due to covid which are further delaying shipments out of Asia.





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