Goldman Sachs Research

Equity Research
5 June 2026 | 10:25PM JST

JAPAN CHEMICALS: SPECIALTY

Price target and earnings revisions for 9 electronic materials companies: Higher 300mm wafer outlook to boost SUMCO and Shin-Etsu earnings ; AI to drive higher Resonac earnings

Atsushi Ikeda
+81(3)4587-9940 |
atsushi.ikeda@gs.com
Goldman Sachs Japan Co., Ltd.

Yuri Izumikawa
+81(3)4587-3643 |
yuri.x.izumikawa@gs.com
Goldman Sachs Japan Co., Ltd.

We revised forecasts for nine electronic materials companies following the most recent earnings and subsequent changes in the market environment. While we have revised forecasts for many of our companies on further strengthening in underlying fundamentals for advanced semiconductor and AI related materials. The largest upward revision is for **SUMCO**, driven by higher assumed supply-demand and pricing for 300mm wafers. We now expect FY2028 operating profit to reach JPY 167.8bn, a new record high for the company. For **Shin-Etsu Chemical**, steady growth in semiconductor lithography materials and quartz products remains intact, and higher volume/price assumptions for 300mm wafers lead to upward revisions to our earnings forecast. For **Resonac**, we significantly raise estimates, as AI-related back-end materials (CCL, NCF, TIM) are tracking better than we expected, supported by strong HDD media and faster-than-expected margin expansion. **Mitsui Kinzoku** remains broadly in line with our prior assumptions, with copper foil increasingly the key driver—supported by higher MicroThin™ volumes and price revisions for semiconductor package substrates, as well as a mix shift to higher-end VSP for PCBs. At **Mitsubishi Gas Chemical**, we expect ICT materials—including BT substrates for memory and GPUs in AI servers, along with OPE for PCBs and semiconductor cleaning agents—to be clear growth drivers. At **Asahi Kasei**, ongoing portfolio reforms should support steady earnings growth, led by electronics and critical care.

Silicon Wafer Industry

1. Market environment improving significantly
The market environment for the 300mm wafer market is showing clear signs of improvement:

Shift in customer inventory strategy: Since the onset of Middle East disruptions, wafer customers have shifted from inventory reduction to inventory rebuilding.

Surging AI server demand: Over 20% of 300mm wafer demand is now AI-related, with a highly positive market impact.

Previously, slow recovery in consumer and industrial applications constrained normalization, but AI demand is now more than offsetting that weakness and has become a major growth driver. In the near term, we expect global shipments to rebound sharply, with +12% QoQ growth in 2026 Apr–Jun after bottoming in 2026

Jan-Mar. For full-year 2026, we forecast +11% YoY growth, with entry into a sustained high-growth phase over the medium to long term.

2. Key growth drivers
(a) GPU/ASIC demand and silicon interposers

Strong growth in GPU/ASIC demand for AI servers, alongside rising demand for silicon interposers (e.g., CoWoS), should drive greater wafer usage. As advanced logic performance increases, larger interposer and substrate sizes become necessary, directly increasing 300mm wafer consumption.

(b) HBM growth and increasing die size

HBM die sizes are expanding significantly, with HBM3 die size close to 3× that of conventional DRAM and HBM4E approaching 4× conventional DRAM. Alongside higher density, increased stacking, and tighter integration with advanced packaging, silicon consumption per unit rises materially. We forecast strong HBM demand growth in AI servers, with GPU-related growing at +50% / +38% / +36% between 2026-2028 and ASIC-related growing at +172% / +59% / +53% over the same period.

(c) Expansion of inference and agentic AI

As the focus shifts toward inference and agentic AI, demand for host CPUs and LPDDR memory should also grow rapidly. This phase drives expansion in total semiconductor content at the system level (CPU, memory, interconnect), not just compute chips.

(d) Growth in peripheral semiconductors and silicon photonics

We expect demand for various semiconductors accompanying AI servers (e.g., power semiconductors, retimers, PMICs, and PCIe switches) to expand steadily. We also anticipate significant demand in silicon photonics, which should act as a strong driver for wafer demand, particularly SOI (especially 300mm SOI). The essence of AI server-driven demand growth lies not only in advanced logic and HBM, but in its broad-based uplift to 300mm wafer demand across analog, power, connectivity, and optical semiconductors.

(e) NAND architecture changes (more wafers per unit)

For NAND, while we do not expect overall wafer capacity to expand significantly, the adoption of technologies such as Kioxia's CBA (CMOS directly bonded to array), which effectively uses two wafers per unit, is likely to lift wafer demand. This implies that even in a phase where bit growth does not directly translate into new capacity additions, changes in manufacturing architecture themselves can increase wafer input.

SK hynix is also expected to begin production of next-generation ~400-layer NAND using similar dual-wafer technology from around end-2026, supporting steady growth in NAND-related wafer demand into 2027. According to Shin-Etsu Chemical and others, a "three-wafer" approach is also on the roadmap for memory over the longer term. We also anticipate potential commercialization of 3D DRAM and the emergence of ultra-high-layer NAND exceeding 500 layers.

These trends indicate a structural shift away from the traditional paradigm of "area shrink through miniaturization." Instead, stacking and bonding technologies are increasing wafer consumption per unit, marking the arrival of a new technological phase.

These drivers suggest that 300mm wafers have entered a medium- to long-term high-growth phase.

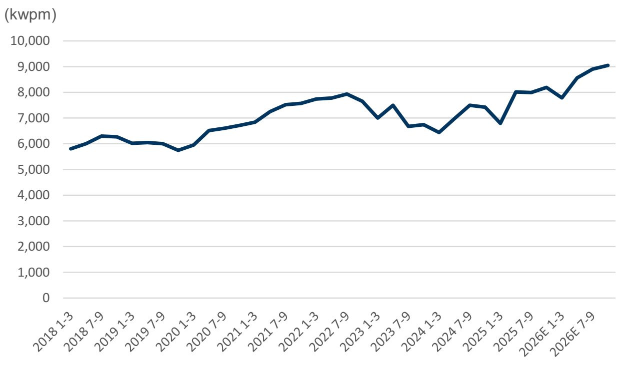
3. Supply constraints and pricing outlook

On the supply side, earnings for wafer manufacturers in our coverage excluding Shin-Etsu Chemical have been under severe pressure. This can largely be attributed to rising fixed costs from greenfield investments in recent years and lower utilization rates amid a worsened supply-demand balance. As a result, we expect the pace of 300mm wafer supply growth to slow considerably from 2026 onward. While the market expectations for demand recovery are strengthening, suppliers have been forced to remain cautious about new capacity additions at current low price levels, leading to a growing mismatch in the speed of demand recovery versus supply response.

Conversely, this implies a high likelihood that the supply-demand balance (ex-mainland China) will tighten sharply in 2027, significantly enhancing manufacturers' pricing power. At current price levels, companies lack both the financial capacity and incentive to invest, making meaningful price hikes essential to support the supply growth needed to meet post-2028 demand.

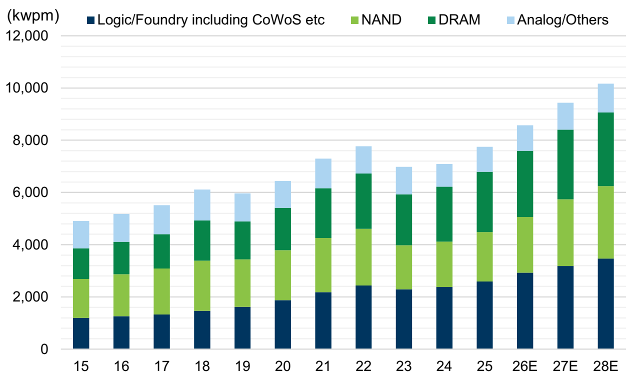
For example, SUMCO has recently scaled back and postponed its investment plan in Saga prefecture, which was originally scheduled to begin operations from 2029. Specifically, planned capex has been reduced significantly from JPY 225bn to JPY 58bn, and the company has delayed the start of operations for the new facility indefinitely. This highlights an industry-wide trend—at current prices, it is difficult to build sufficient capacity to meet future demand. Accordingly, we expect meaningful price increases under the next round of long-term agreements (LTAs) from 2028 onward, which should directly support margin expansion for manufacturers.

Exhibit 1: 300mm wafer shipment (kwpm)



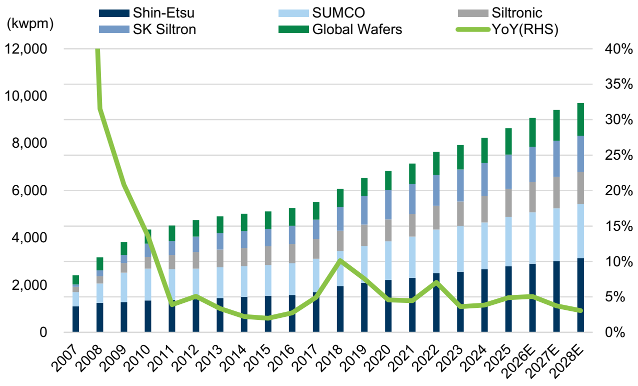
Source: Goldman Sachs Global Investment Research

Exhibit 2: Global supply/demand balance outlook for 300mm wafers



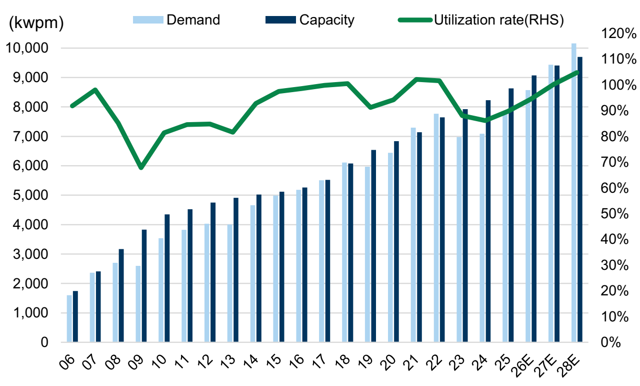
Source: SEMI, Company data, Goldman Sachs Global Investment Research

Exhibit 3: 300mm wafer supply outlook



Source: Goldman Sachs Global Investment Research

Exhibit 4: 300mm supply demand outlook



Source: Goldman Sachs Global Investment Research

SUMCO

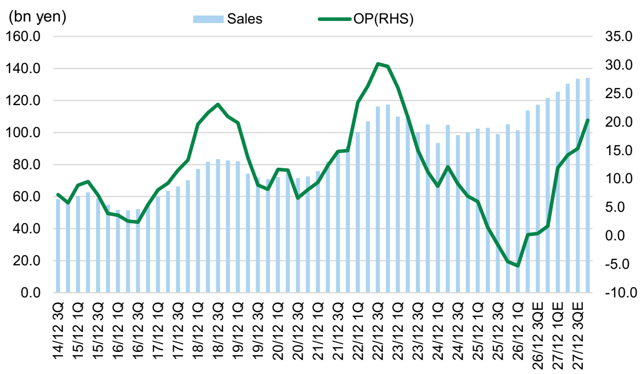
Reflecting the improved market environment for 300mm wafers described above, we have revised our forecasts for SUMCO. Primarily driven by higher volume assumptions and an increase in spot prices, we raise our FY12/2026 operating loss forecast from -JPY 9.0bn to -JPY 3.0bn, and our FY12/2027 operating profit forecast from JPY 38.6bn to JPY 61.7bn.

For FY12/2028, we incorporate contract price revisions and increase our 300mm wafer price assumption to +10% YoY (vs. flat previously), along with higher volume assumptions, resulting in a substantial upward revision to our operating profit estimate from JPY 65.9bn to JPY 167.8bn.

We raise our target price from JPY 1,910 to JPY 5,130. While we had previously based our target price on FY12/2027, we now use the average of FY12/2027 and FY12/2028, reflecting tightening supply-demand for 300mm wafers and expected LTA price increases in FY12/2028.

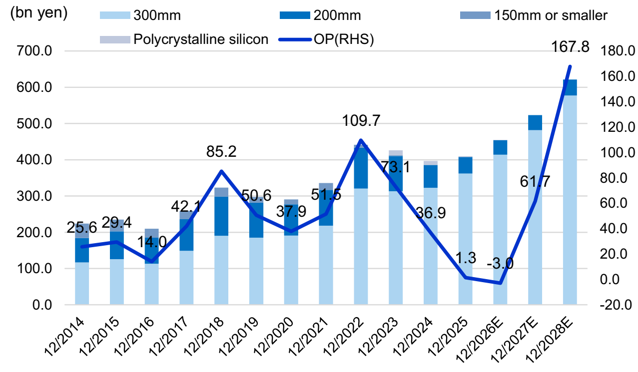
We also narrow the sector-relative discount from –40% to –10%, supported by earnings expansion in semiconductor materials. Along with the upward revisions to both volume and pricing assumptions for 300mm wafers, this drives a significant increase in our target price. The implied PER based on FY12/2028 is approximately 15x.

Exhibit 5: SUMCO: Quarterly sales and operating profit



Source: Goldman Sachs Global Investment Research, Company data

Exhibit 6: SUMCO: Long-term sales and operating profit trends by wafer diameter



Source: Company data, Goldman Sachs Global Investment Research

3436.T	12m Price Target: ¥5130	Price: ¥4459	Upside: 15%

Buy	GS Forecast				
		12/25	12/26E	12/27E	12/28E
Market cap: ¥1.6tr / $9.8bn	Revenue (¥ bn)	409.7	454.0	523.6	621.9
Enterprise value: ¥1.8tr / $11.5bn	**Op. profit (¥ bn) New**	**1.3**	**(3.0)**	**61.7**	**167.8**
3m ADTV :¥32.8bn/ $206.6mn	Op. profit (¥ bn) Old	1.3	(9.0)	38.6	65.9
Japan	Op. profit CoE (¥ bn)	--	--	--	--
Japan Chemicals & Advanced Materials	**EPS (¥) New**	**(33.6)**	**(17.4)**	**122.1**	**337.7**
	EPS (¥) Old	(33.6)	(25.7)	74.6	126.4
M&A Rank: 3	P/E (X)	NM	NM	36.5	13.2
	P/B (X)	0.7	2.7	2.6	2.3
	CROCI (%)	5.3	5.7	6.6	8.5
		3/26	6/26E	9/26E	12/26E
	EPS (¥)	(24.2)	(4.0)	(1.7)	12.6

Source: Company data, Goldman Sachs Research estimates, FactSet. Price as of 03 Jun 2026 close.

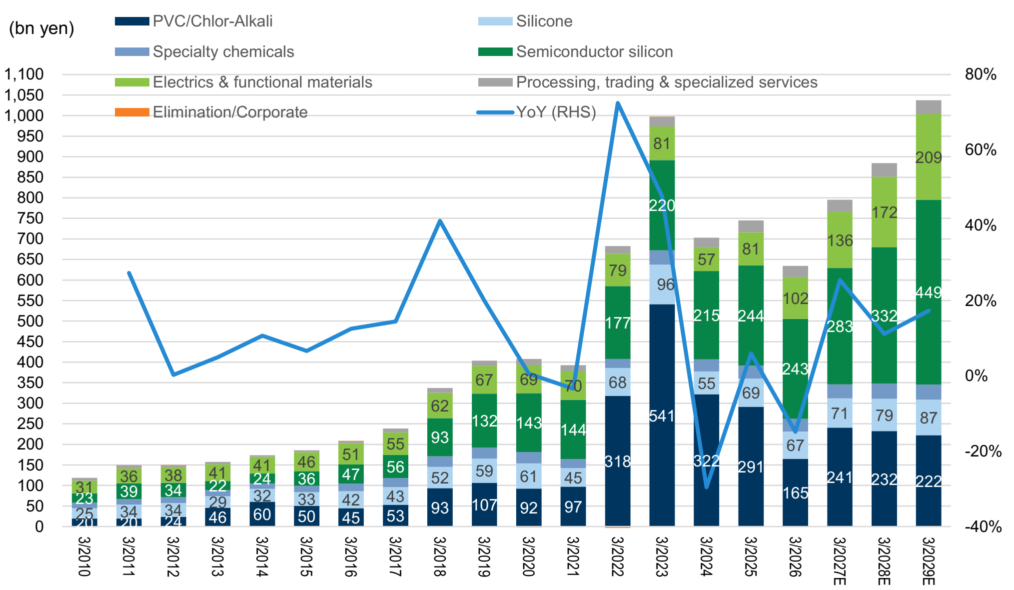
Shin-Etsu Chemical

Following the previous revision, we also raise our forecasts for Shin-Etsu Chemical to reflect higher volume and pricing assumptions for 300mm wafers, and increase our operating profit estimates by +2% / +3% / +9% for FY3/27-3/29, respectively. For our FY3/29 upgrade, in particular, we incorporate a ~10% wafer price increase assumption driven by LTA revisions.

In addition to 300mm wafers, we also expect growth to be increasingly driven by Shin-Etsu Chemical's high-growth AI server-related product portfolio, including EUV resists, multilayer materials, mask blanks, quartz products, and optical fiber preforms, where the company holds clear competitive advantages. With geopolitical risks likely to persist and raw material costs remaining elevated, we believe the market will begin to reassess the competitiveness of the company's North American operations, which benefit from relatively low-cost natural gas and stable production.

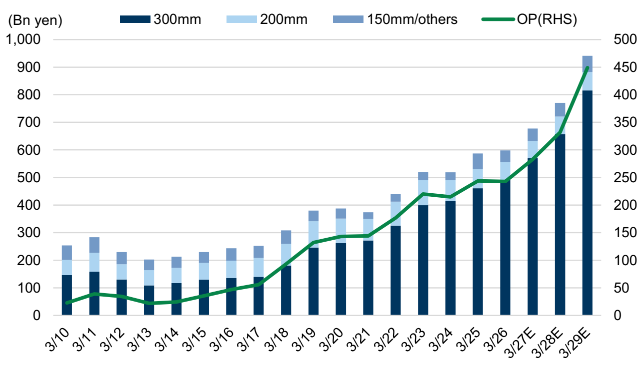
We raise our target price from JPY 8,300 to JPY 9,520. While we previously based our valuation on FY3/2027, we now use the average of FY3/2028 and FY3/2029, reflecting expected tightening in 300mm wafer supply-demand and contract price revisions. We also raise the sector-relative premium from 15% to 20%, supported by our outlook for earnings expansion in semiconductor materials. The implied PER based on FY3/2028 is just under 26x.

Exhibit 7: Shin-Etsu Chemical: Estimated operating profit trends by segment



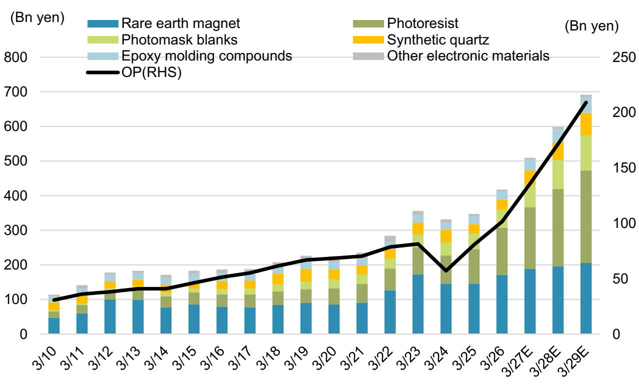
Source: Company data, Goldman Sachs Global Investment Research

Exhibit 8: Shin-Etsu Chemical: Semiconductor silicon business sales and operating profit



Source: Company data, Goldman Sachs Global Investment Research

Exhibit 9: Shin-Etsu Chemical: Electronics & Functional material business sales and operating profit



Source: Company data, Goldman Sachs Global Investment Research

4063.T	12m Price Target: ¥9520	Price: ¥7806	Upside: 22%

Buy	GS Forecast				
		3/26	3/27E	3/28E	3/29E
Market cap: ¥14.5tr / $90.7bn	Revenue (¥ bn)	2,574.0	2,933.2	3,162.2	3,463.0
Enterprise value: ¥13.5tr / $84.4bn	**Op. profit (¥ bn) New**	**635.2**	**795.5**	**884.2**	**1,037.4**
3m ADTV :¥61.8bn/ $389.6mn	Op. profit (¥ bn) Old	635.2	783.4	862.3	950.7
Japan	Op. profit CoE (¥ bn)	--	--	--	--
Japan Chemicals & Advanced Materials	**EPS (¥) New**	**255.5**	**328.4**	**373.1**	**433.2**
	EPS (¥) Old	255.5	323.9	364.6	399.4
M&A Rank: 3	P/E (X)	19.0	23.8	20.9	18.0
	P/B (X)	2.0	3.2	3.1	3.1
	CROCI (%)	10.3	11.6	12.2	13.1
		3/26	6/26E	9/26E	12/26E
	EPS (¥)	48.5	--	--	--

Source: Company data, Goldman Sachs Research estimates, FactSet. Price as of 03 Jun 2026 close.

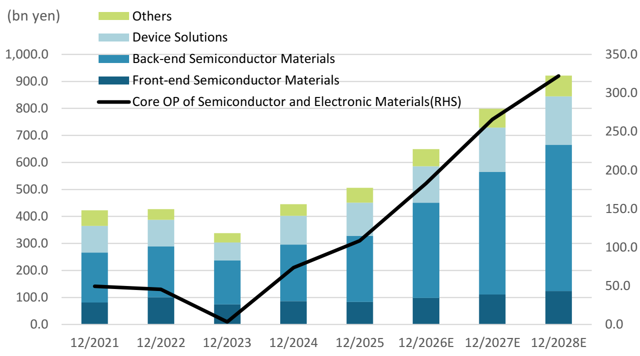
Resonac

We expect core operating profit in the semiconductor and electronic materials segment to reach JPY 182.9bn in FY12/2026, up 69% YoY and well above company guidance of JPY 128.0bn. We expect FY12/2026 core operating margin for semiconductor and electronic materials segment to improve from 21.4% to 28.2%. Growth is driven primarily by AI-related back-end materials, including CCL, NCF, and TIM. In addition, we expect device solutions for HDD media to remain solid and contribute to steady revenue and profit growth.

We expect CCL to remain particularly strong, supported by a sharp increase in volumes for AI server ABF substrates, alongside solid CPU-related demand and pricing improvements. We forecast over 65% YoY revenue growth in FY12/2026. NCF is expected to grow +120% YoY, driven by HBM demand, while TIM materials are projected at +90% YoY, highlighting the strength of AI-related materials.

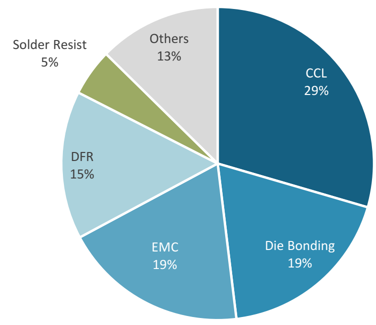
We raise our target price from JPY 15,770 to JPY 23,920, maintaining FY12/2027 as the base year. We also increase the sector-relative premium from 25% to 30%, reflecting strong earnings upgrades driven by multiple high-growth back-end material businesses, including CCL, NCF, DFR, and TIM. The implied PER based on FY12/2027 is approximately 25x.

Exhibit 10: Resonac: Semiconductor and electronic materials business earnings outlook



Source: Company data, Goldman Sachs Global Investment Research

Exhibit 11: Sales breakdown of major back-end semiconductor materials (FY12/25)



Source: Company data, Goldman Sachs Global Investment Research

4004.T	12m Price Target: ¥23920	Price: ¥18700	Upside: 27.9%

Buy	GS Forecast				
		12/25	**12/26E**	**12/27E**	**12/28E**
Market cap: ¥3.4tr / $21.2bn	Revenue (¥ bn)	1,347.1	1,443.6	1,582.8	1,716.1
Enterprise value: ¥4.1tr / $25.7bn	**Op. profit (¥ bn) New**	**46.7**	**149.9**	**259.1**	**317.7**
3m ADTV :¥50.6bn/ $318.4mn	Op. profit (¥ bn) Old	46.7	121.7	164.4	190.2
Japan	Op. profit CoE (¥ bn)	--	105.0	--	--
Japan Chemicals & Advanced Materials	**EPS (¥) New**	**160.5**	**545.4**	**954.2**	**1,185.2**
	EPS (¥) Old	160.5	440.9	602.3	709.5
M&A Rank: 3	P/E (X)	25.7	34.3	19.6	15.8
	P/B (X)	1.0	3.9	3.2	2.6
	CROCI (%)	5.7	8.0	10.0	11.2
		3/26	**6/26E**	**9/26E**	**12/26E**
	EPS (¥)	84.4	--	--	--

Source: Company data, Goldman Sachs Research estimates, FactSet. Price as of 03 Jun 2026 close.

Mitsubishi Gas Chemical

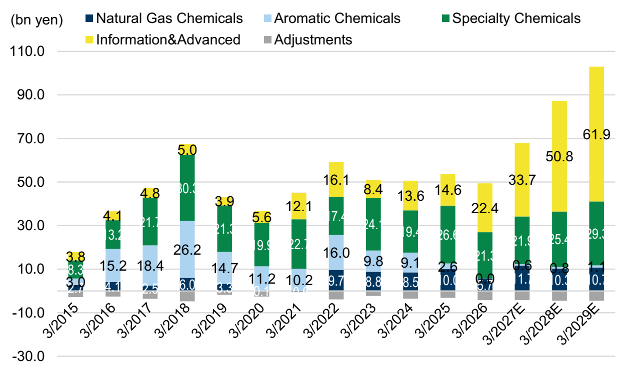
We forecast +32% YoY sales growth for BT materials in FY3/2027, versus company guidance of ~+15%, which we find conservative, particularly on pricing assumptions. We expect growth to be driven by a significant expansion in ABF substrates for AI servers utilizing the company's proprietary RS resin, as well as strong uptake in memory applications such as LPDDR for non-smartphone uses (including AI servers). We also expect the company to implement price increases. Additionally, we project sales of low-dielectric OPE® resin for AI servers to grow substantially at +45% YoY. As a result, we expect operating profit in the advanced materials segment to reach JPY 33.7bn (+50% YoY), significantly above company guidance of JPY 26.2bn.

We expect semiconductor-related etching and cleaning chemicals within functional chemicals to see profit growth, driven by expanding HBM demand in Korea, improving utilization among US logic customers (e.g., CPUs), and reduced depreciation following impairments recorded in the prior year. Natural gas-based chemicals should also deliver solid performance, supported by a tighter methanol market amidst Middle East disruptions.

We raise our target price from JPY 5,930 to JPY 6,890. While we previously based valuation on FY3/2027, we now roll forward to FY3/2028, reflecting anticipated pricing increases in BT materials and full-scale growth in ABF substrate applications.

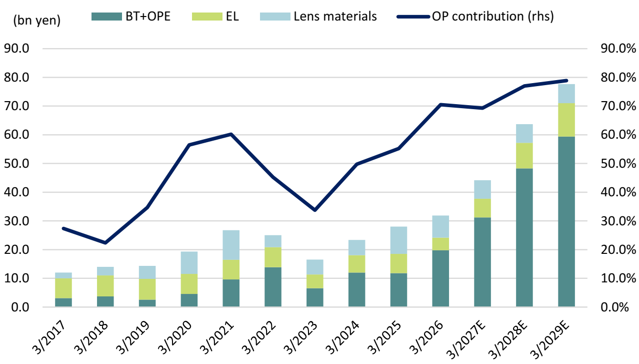
We slightly lower the sector-relative premium from 10% to 5% (mark-to market). Although our revisions to near-term earnings are modest, the shift to FY3/2028, where we see significant profit expansion, drives a meaningful increase in our target price. The implied PER based on FY3/2028 is approximately 21x.

Exhibit 12: Mitsubishi Gas Chemical: Operating profit trends by segment



Source: Company data, Goldman Sachs Global Investment Research

Exhibit 13: Mitsubishi Gas Chemical: GSe profit trends for electronic materials businesses



Source: Company data, Goldman Sachs Global Investment Research

4182.T	12m Price Target: ¥6890	Price: ¥5382	Upside: 28%	
Buy	**GS Forecast**			
		3/26	**3/27E**	**3/28E**	**3/29E**
Market cap: ¥1.0tr / $6.6bn	Revenue (¥ bn)	738.2	831.2	862.3	915.0
Enterprise value: ¥1.3tr / $7.9bn	**Op. profit (¥ bn) New**	**45.3**	**63.7**	**82.8**	**98.5**
3m ADTV :¥7.1bn/ $44.8mn	Op. profit (¥ bn) Old	47.2	64.4	83.2	--
Japan	Op. profit CoE (¥ bn)	--	59.0	--	--
Japan Chemicals & Advanced Materials	**EPS (¥) New**	**(207.0)**	**252.3**	**325.6**	**413.0**
	EPS (¥) Old	(173.1)	257.1	355.7	--
M&A Rank: 3	P/E (X)	NM	21.3	16.5	13.0
	P/B (X)	0.8	1.5	1.5	1.4
	CROCI (%)	4.8	5.8	6.3	7.0
		3/26	**6/26E**	**9/26E**	**12/26E**
	EPS (¥)	(72.7)	--	--	--

Source: Company data, Goldman Sachs Research estimates, FactSet. Price as of 03 Jun 2026 close.

Mitsui Kinzoku

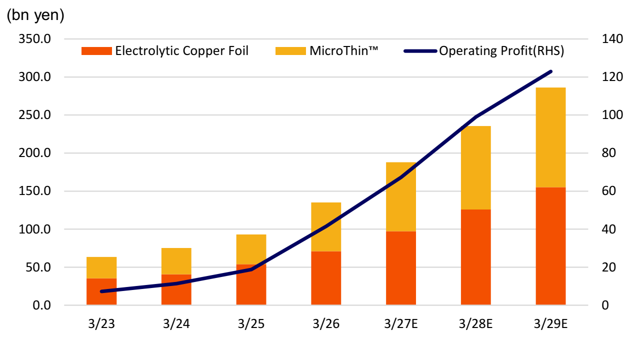
For Mitsui Kinzoku's MicroThin™ used in semiconductor package substrates, we forecast FY3/2027 volume growth of +23% YoY and price increases of ~+15% YoY. We expect demand to be driven not only by memory applications such as DRAM (including LPDDR used around AI server CPUs) and eSSDs, but also by expanding advanced applications, including optical transceivers. Despite concerns over higher copper prices, we believe steady price increases (report) should continue to support margin improvement.

For the company's VSP™ electrolytic copper foil used in AI server PCB/CCL applications, we assume +45% YoY volume growth in FY3/2027 and +18% YoY ASP growth, primarily driven by a product mix shift toward higher-end grades (HVLP4 and above). Supply tightness for VSP™ is likely to intensify from 2H 2026, and market attention should increasingly focus on Mitsui Kinzoku's ongoing capacity expansions to meet strong demand growth, particularly from 2027 onward.

Taking into account MicroThin™ price hikes and VSP™ mix improvement, company guidance for the copper foil business appears conservative, and we expect significant earnings upside.

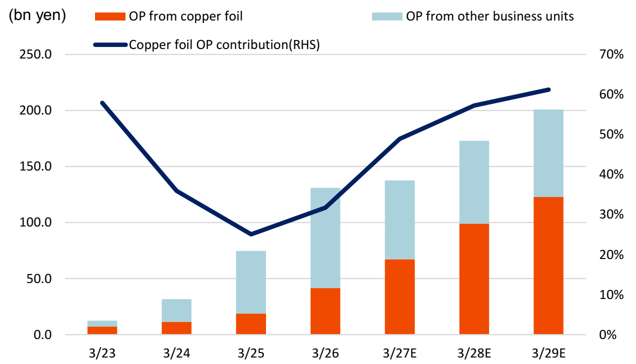
We raise our target price from JPY 44,100 to JPY 62,600. While we previously based valuation on FY3/2027, with FY3/2026 results already out, we now roll forward to FY3/2028, reflecting expected earnings expansion from MicroThin™ and full-scale volume and mix growth in AI server-related VSP™. We also raise the sector-relative premium from 45% to 60%, in line with the past three-month average reflecting strong earnings and AI server growth prospects. The implied PER based on FY3/2028 is approximately 29x.

Exhibit 14: Mitsui Kinzoku: Sales and operating profit outlook by major product in the copper foil business



Source: Company data, Goldman Sachs Global Investment Research

Exhibit 15: Mitsui Kinzoku: Trend in copper foil business's share of company-wide profit (our estimate)



Source: Company data, Goldman Sachs Global Investment Research

5706.T	12m Price Target: ¥62600	Price: ¥47600	Upside: 31.5%

Buy	GS Forecast				
		3/26	3/27E	3/28E	3/29E
Market cap: ¥2.7tr / $17.0bn	Revenue (¥ bn)	758.5	800.8	869.3	942.3
Enterprise value: ¥2.7tr / $17.1bn	**Op. profit (¥ bn) New**	**130.9**	**137.6**	**172.9**	**200.8**
3m ADTV :¥90.5bn/ $570.3mn	Op. profit (¥ bn) Old	118.8	139.1	169.4	--
Japan	Op. profit CoE (¥ bn)	--	91.0	--	--
Japan Chemicals & Advanced Materials	**EPS (¥) New**	**1,595.5**	**1,715.3**	**2,182.1**	**2,539.9**
	EPS (¥) Old	1,263.5	1,732.5	2,125.5	--
M&A Rank: 3	P/E (X)	8.6	27.8	21.8	18.7
	P/B (X)	1.9	5.4	4.4	3.6
	CROCI (%)	7.8	18.4	11.4	14.6
		3/26	6/26E	9/26E	12/26E
	EPS (¥)	737.9	--	--	--

Source: Company data, Goldman Sachs Research estimates, FactSet. Price as of 03 Jun 2026 close.

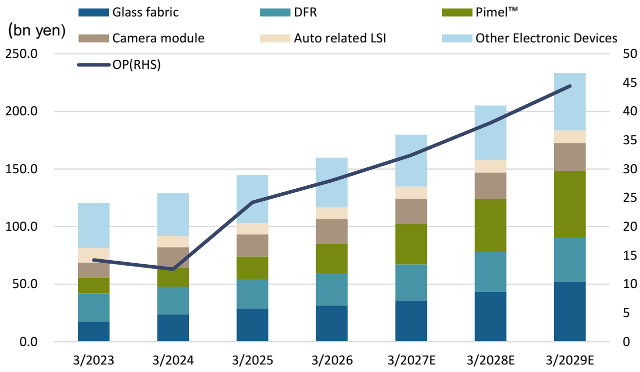
Asahi Kasei

We expect company-wide operating profit for FY3/2027 to grow +7% YoY, broadly in line with company guidance. We expect the main upside drivers to be electronics and critical care. In electronics, we forecast +32% YoY operating profit growth. We estimate that photosensitive insulating material “Pimel” will deliver +40% YoY sales growth, supported by capacity expansion. Glass cloth should also grow around +15% YoY, driven by product mix improvement (shift from L1 to L2), while DFR is expected to remain solid. In energy & infrastructure, a JPY 2.0bn negative impact from the divestment of lead-acid battery separators is expected, although positive momentum is emerging, including strong growth in ESS, which should support future earnings recovery.

For critical care, we forecast +29% YoY profit growth, driven by +15% YoY (local currency) in ACT, led by the new defibrillator “Zenix” launched last year as well as +8% YoY revenue growth in CMS, supported by new patient additions for LifeVest. Pharma & life science should also remain strong. While there are headwinds such as the Aicuris acquisition impact (–JPY 10.0bn) and in-licensing costs (–JPY 8.0bn), per management, continued top-line growth in Tarpeyo (IgA nephropathy treatment) and Envarsus XR should offset these pressures.

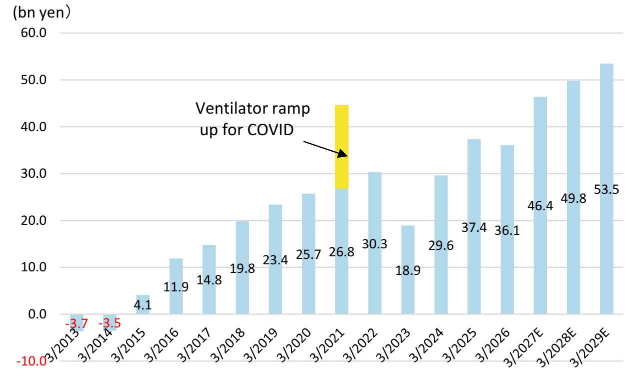
We raise our target price from JPY 2,180 to JPY 2,230. While we previously based valuation on FY3/2027, with FY3/2026 results already out, we now roll forward to FY3/2028, assuming that the and the market will increasingly price in growth in electronics, critical care, and pharma. The sector-relative discount remains unchanged at -25%. The shift of our valuation base to FY3/2028, where we see significant profit expansion, drives the increase in our target price. The implied PER based on FY3/2028 is approximately 17x.

Exhibit 16: Asahi Kasei: GSe earnings trends for digital solutions business



Source: Company data, Goldman Sachs Global Investment Research

Exhibit 17: Asahi Kasei: Operating profit trends for critical care business



Source: Company data, Goldman Sachs Global Investment Research

3407.T	12m Price Target: ¥2230	Price: ¥1757.5	Upside: 26.9%

Buy	GS Forecast				
		3/26	3/27E	3/28E	3/29E
Market cap: ¥2.4tr / $14.9bn	Revenue (¥ bn)	3,074.5	3,275.5	3,349.0	3,495.0
Enterprise value: ¥3.2tr / $20.1bn	**Op. profit (¥ bn) New**	**231.2**	**246.8**	**274.2**	**312.0**
3m ADTV :¥9.2bn/ $57.8mn	Op. profit (¥ bn) Old	230.5	258.7	272.2	--
Japan	Op. profit CoE (¥ bn)	--	248.0	--	--
Japan Chemicals & Advanced Materials	**EPS (¥) New**	**117.1**	**115.5**	**129.8**	**156.9**
	EPS (¥) Old	108.3	124.2	134.4	--
M&A Rank: 3	P/E (X)	10.6	15.2	13.5	11.2
	P/B (X)	0.8	1.1	1.0	1.0
	CROCI (%)	8.5	7.7	8.0	8.7
		3/26	6/26E	9/26E	12/26E
	EPS (¥)	28.1	--	--	--

Source: Company data, Goldman Sachs Research estimates, FactSet. Price as of 03 Jun 2026 close.

Nitto Boseki

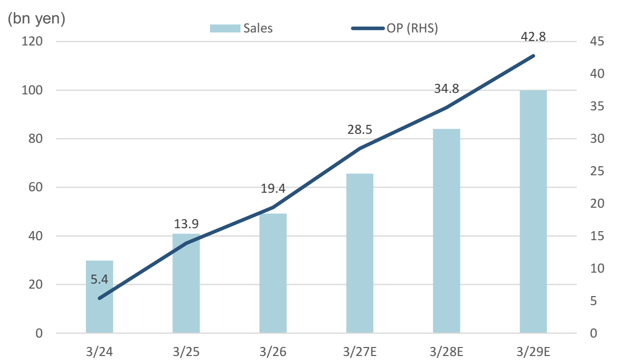
We forecast FY3/2027 T-glass volume growth of +30% YoY and price increases of +30% YoY. From FY3/2028 onward, when capacity expansions should begin to fully contribute, we expect substantial volume growth; however, we do not anticipate additional material price increases as expected by investors, based on our conversations.

For NE/NER glass (mainly for motherboards application), NE glass is likely to see limited growth due to intensifying competition across the industry. In contrast, we expect second-generation NER glass to expand significantly, driven by increasing adoption in switch substrates, with FY3/2027 sales projected to grow +75% YoY.

On the other hand, for PTFE resins, which are expected to be adopted in applications such as the “Rubin Ultra” backplane, there is a possibility that high-end low-dielectric glass may not be strictly required. In addition, substitution toward alternative materials and intensified competition—particularly from quartz cloth in the high-end segment as well as large capacity expansions by competitors—remain key risks that need close monitoring.

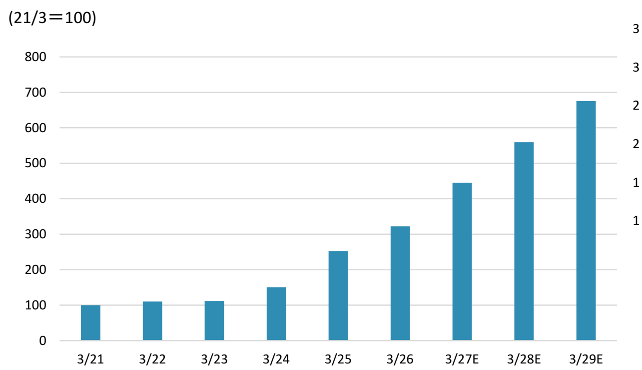
We lower our target price from JPY 27,700 to JPY 23,800. While we previously based valuation on FY3/2027, we now shift to FY3/2028, as the market focus moves toward pricing in growth not only in low-CTE glass but also in low-DK glass. We also reduce the sector-relative premium significantly from 120% to 70%, based on the recent three-month average. This reflects a softening of overly optimistic expectations in the equity market regarding further price increases for T-glass. The implied PER based on FY3/2028 is just under 37x.

Exhibit 18: Nitto Boseki: GSe earnings trends for electronic materials business



Source: Company data, Goldman Sachs Global Investment Research

Exhibit 19: Nitto Boseki: Low-CTE glass sales (indexed)



Source: Company data, Goldman Sachs Global Investment Research

3110.T	12m Price Target: ¥23800	Price: ¥21770	Upside: 9.3%

Neutral	GS Forecast				
		3/26	3/27E	3/28E	3/29E
Market cap: ¥792.4bn / $5.0bn	Revenue (¥ bn)	118.2	137.3	157.6	175.0
Enterprise value: ¥821.6bn / $5.1bn	**Op. profit (¥ bn) New**	**20.8**	**28.0**	**34.3**	**42.5**
3m ADTV :¥55.8bn/ $351.7mn	Op. profit (¥ bn) Old	20.5	29.1	34.8	--
Japan	Op. profit CoE (¥ bn)	--	26.0	--	--
Japan Chemicals & Advanced Materials	**EPS (¥) New**	**1,147.3**	**529.0**	**649.3**	**824.9**
	EPS (¥) Old	1,065.4	567.6	694.5	--
M&A Rank: 3	P/E (X)	8.5	41.2	33.5	26.4
	P/B (X)	2.0	4.1	3.8	3.5
	CROCI (%)	7.7	13.8	14.2	17.4
		3/26	**6/26E**	**9/26E**	**12/26E**
	EPS (¥)	182.9	--	--	--

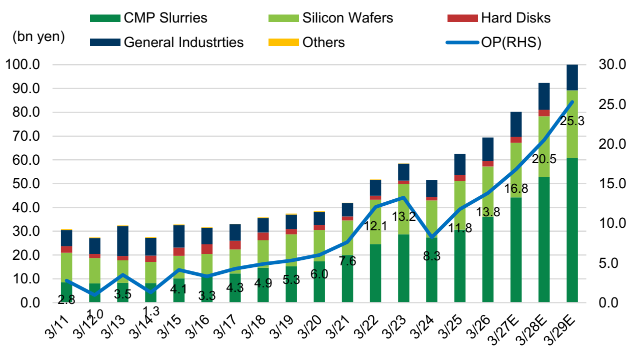
Source: Company data, Goldman Sachs Research estimates, FactSet. Price as of 03 Jun 2026 close.

Fujimi

We forecast +9% YoY growth in silicon wafer product sales for FY3/2027, well above company's conservative guidance of roughly flat. For CMP products, we expect +22% YoY sales growth (vs. the company estimate of +14%YoY), driven by strong demand from logic customers in Taiwan and memory customers in Korea and the US. While not fully reflected in our forecasts, a successful ramp-up of the company's new products for advanced packaging could provide additional upside.

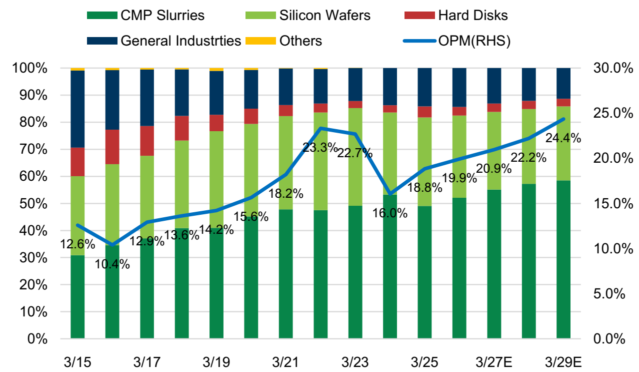
We raise our target price from JPY 3,590 to JPY 4,460. While we previously based our valuation on FY3/2027, with FY3/2026 results already out, we now roll forward to FY3/2028, as the market begins to price in full-scale growth in CMP and silicon wafer applications. We slightly lower the sector-relative premium from 30% to 25% (mark-to-market). The target price increase is driven primarily by the rollover to FY3/2028, where stronger earnings growth is expected. The implied PER based on FY3/2028 is just under 23x.

Exhibit 20: Fujimi: Sales and operating profit trends by segment



Source: Company data, Goldman Sachs Global Investment Research

Exhibit 21: Fujimi: Proportion of sales by segments and OPM trend



Source: Company data, Goldman Sachs Global Investment Research

5384.T	12m Price Target: ¥4460	Price: ¥4220	Upside: 5.7%

Neutral	GS Forecast				
		3/26	3/27E	3/28E	3/29E
Market cap: ¥313.1bn / $2.0bn	Revenue (¥ bn)	69.4	80.2	92.3	103.9
Enterprise value: ¥312.9bn / $2.0bn	**Op. profit (¥ bn) New**	**13.8**	**16.8**	**20.5**	**25.3**
3m ADTV :¥1.3bn/ $8.2mn	Op. profit (¥ bn) Old	14.1	16.4	18.5	--
Japan	Op. profit CoE (¥ bn)	--	14.5	--	--
Japan Chemicals & Advanced Materials	**EPS (¥) New**	**123.0**	**162.3**	**198.3**	**249.4**
	EPS (¥) Old	139.5	160.8	181.6	--
M&A Rank: 3	P/E (X)	18.6	26.0	21.3	16.9
	P/B (X)	2.0	3.6	3.4	3.1
	CROCI (%)	11.7	9.3	13.6	16.1
		3/26	6/26E	9/26E	12/26E
	EPS (¥)	18.3	--	--	--

Source: Company data, Goldman Sachs Research estimates, FactSet. Price as of 03 Jun 2026 close.

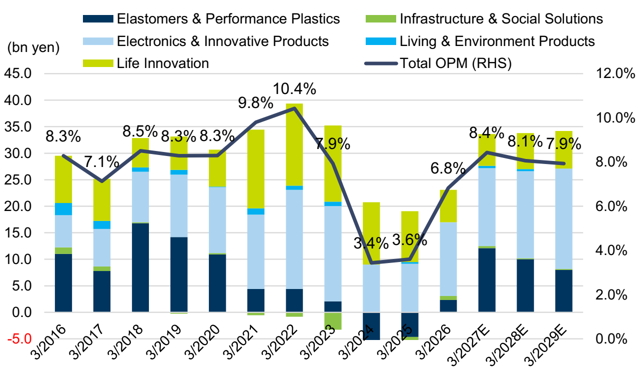
Denka

We forecast +6% YoY operating profit growth in the electronics & advanced products segment for FY3/2027 with growth to be driven by: (a) spherical silica, where adoption is expanding for semiconductor package substrates and motherboard applications, (b) snecton (low-dielectric organic insulating material), which is expected to see full-scale adoption in AI server motherboards, and (c) spherical alumina, supported by demand for high-end memory applications.

While acetylene black is seeing strong demand (e.g., for high-voltage cables), we expect reduced acetylene gas supply in Singapore to weigh on earnings in the near term. For chloroprene rubber, the full-year impact of the temporary suspension of the DPE plant should materialize in FY3/2027. In addition, Denka's product mix—less dependent on naphtha-based feedstocks—should benefit under the current market environment. However, rather than pursuing significant price hikes, the company said that it is likely to focus on optimizing its sales mix toward higher-margin and global customers, given production constraints under a single-plant (Omi) operation. Management said that losses related to DPE may persist for some time and we will continue to monitor developments in the company's progress with the joint venture.

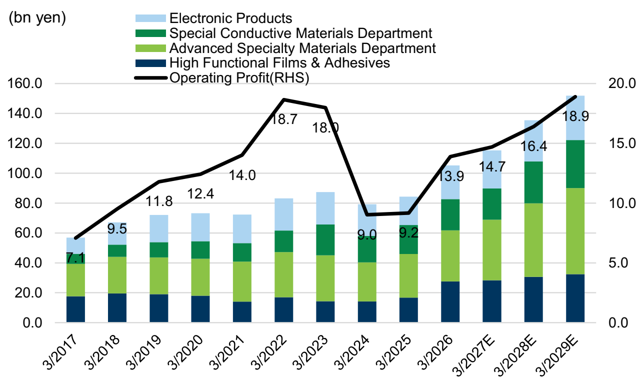
We raise our target price from JPY 3,400 to JPY 4,390. While we previously based valuation on FY3/2027, with FY3/2026 results already out, we now roll forward to FY3/2028, as the market is expected to increasingly price in full-scale growth in semiconductor and AI-related materials. We also narrow the sector-relative discount from -25% to -20% (mark-to market). The combined effects of the rollover in valuation year and balance sheet adjustments support a higher target price. The implied PER based on FY3/2028 is just under 19x.

Exhibit 22: Denka: Operating profit trends by segment



Source: Company data, Goldman Sachs Global Investment Research

Exhibit 23: Denka: Earnings trend of electronics and innovative products



Source: Company data, Goldman Sachs Global Investment Research

4061.T	12m Price Target: ¥4390	Price: ¥4233	Upside: 3.7%

Neutral	GS Forecast				
		3/26	3/27E	3/28E	3/29E
Market cap: ¥364.8bn / $2.3bn	Revenue (¥ bn)	384.2	416.4	437.9	455.4
Enterprise value: ¥600.5bn / $3.8bn	**Op. profit (¥ bn) New**	**26.2**	**35.1**	**35.3**	**36.1**
3m ADTV :¥3.8bn/ $24.2mn	Op. profit (¥ bn) Old	25.1	35.1	35.7	--
Japan	Op. profit CoE (¥ bn)	--	30.0	--	--
Japan Chemicals & Advanced Materials	**EPS (¥) New**	**182.1**	**210.0**	**233.2**	**241.3**
	EPS (¥) Old	177.5	203.1	207.7	--
M&A Rank: 3	P/E (X)	13.4	20.2	18.2	17.5
	P/B (X)	0.7	1.1	1.1	1.1
	CROCI (%)	3.2	4.5	5.2	5.3
		3/26	**6/26E**	**9/26E**	**12/26E**
	EPS (¥)	117.9	--	--	--

Source: Company data, Goldman Sachs Research estimates, FactSet. Price as of 03 Jun 2026 close.

Price Target Risks and Methodology - SUMCO
We are Buy-rated on SUMCO with a 12-month target price of ¥5,130. Our target price is based on the FY12/27-FY12/28 average correlation between the materials sector EV/GCI and CROCI/WACC estimate (using a cash return multiple of 0.7X and a 10% discount to the sector average).

Key risks: A slowdown in semiconductor demand, yen appreciation, and a greater-than-expected increase in depreciation and other fixed costs.

Price Target Risks and Methodology - Shin-Etsu Chemical
We are Buy-rated on Shin-Etsu Chemical with a 12-month target price of ¥9,520. Our target price is based on the FY3/28-FY3/29 average correlation between the materials sector EV/GCI and CROCI/WACC estimates (using a cash return multiple of 0.7X and a 20% premium to the sector average).

Key risks: Deterioration in semiconductor supply/demand, and a negative earnings impact from swings in market prices for PVC and caustic soda, and in forex.

Price Target Risks and Methodology - Resonac
We are Buy rated on Resonac with a 12-month target price of ¥23,920. Our target price is based on the correlation between the materials sector's EV/GCI and the FY12/27E CROCI/WACC (cash-return multiple of 0.7X plus a 30% premium to the sector average). Key risks include a slowdown in semiconductor demand, yen appreciation, and decline in graphite electrode earnings.

Price Target Risks and Methodology - Mitsubishi Gas Chemical
We are Buy rated on Mitsubishi Gas Chemical with a 12-month target price of ¥6,890. Our target price is based on the materials sector EV/GCI and FY3/28E CROCI/WACC

correlation (sector cash-return multiple of 0.75X plus a 5% premium to the sector average).

Key risks: Stiffer competition in smartphone lens specialty resins and semiconductor package substrate materials, yen appreciation, and price declines for methanol and other market-sensitive products.

Price Target Risks and Methodology - Mitsui Kinzoku
We are Buy rated on Mitsui Kinzoku with a 12-month target price of ¥62,600. Our target price is based on the correlation between the materials sector's EV/GCI and our FY3/28E CROCI/WACC forecast (cash return multiple of 0.7X plus a 60% premium to the sector average). Key risks include slowdown in AI server demand, yen appreciation, and decline in prices for zinc and other metals.

Price Target Risks and Methodology - Asahi Kasei
We are Buy-rated on Asahi Kasei, with a 12-month target price of ¥2,230. Our target price is derived from the correlation between materials sector EV/GCI and FY3/28E CROCI/WACC (cash return multiple 0.7X, applying a discount of 25% to the sector average). Key risks include 1) Softer-than expected performance of the electronics business, 2) Earnings downside related to Tarpeyo, 3) Yen appreciation relative to our assumed exchange rate.

Price Target Risks and Methodology - Nitto Boseki
We are Neutral rated on Nitto Boseki with a 12-month target price of ¥23,800. Our target price is based on the correlation between the materials sector's EV/GCI and the FY3/28E CROCI/WACC forecast (cash-return multiple of 0.7x plus a 70% premium to the sector average). Key risks include fluctuations in semiconductor demand, currency volatility, and changes in the competitive landscape for specialty glass.

Price Target Risks and Methodology - Fujimi Inc.
We are Neutral rated. Our 12-month target price of ¥4,460 is based on a theoretical value per share derived from the correlation between basic materials sector EV/GCI and FY3/28E CROCI (cash return multiple of 0.7X), to which we apply a 25% valuation premium (to account for potential benefits from the company's position in silicon carbide (SiC) and from booming generative AI-related demand), which we then discount back at a WACC of 5%. The main risks include stronger/weaker-than-expected semiconductor demand, lower/higher-than-expected fixed costs, and yen depreciation/appreciation.

Price Target Risks and Methodology - Denka
We are Neutral-rated on Denka with a 12-month target price of ¥4,390. Our target price is based on the theoretical value per share derived from the correlation between materials sector EV/GCI and FY3/28E CROCI/WACC (cash return multiple of 0.7X, discount of 20% to the sector average). Key risks are: (1) the impact on overall company earnings from fluctuations in the earnings of the CR business, the largest segment by sales; (2) the size of DPE-related extraordinary losses; and (3) the prevalence of influenza, which affects sales in the life innovation business.

Disclosure Appendix

Reg AC

We, Atsushi Ikeda and Yuri Izumikawa, hereby certify that all of the views expressed in this report accurately reflect our personal views about the subject company or companies and its or their securities. We also certify that no part of our compensation was, is or will be, directly or indirectly, related to the specific recommendations or views expressed in this report.

Unless otherwise stated, the individuals listed on the cover page of this report are analysts in Goldman Sachs' Global Investment Research division.

Contributing Authors: Atsushi Ikeda Goldman Sachs Japan Co., Ltd., Yuri Izumikawa Goldman Sachs Japan Co., Ltd..

Unless otherwise stated, the individuals listed in the Contributing Authors disclosure of this report are analysts in Goldman Sachs' Global Investment Research division.

GS Factor Profile

The Goldman Sachs Factor Profile provides investment context for a stock by comparing key attributes to the market (i.e. our universe of rated stocks) and its sector peers. The four key attributes depicted are: Growth, Financial Returns, Multiple (e.g. valuation) and Integrated (a composite of Growth, Financial Returns and Multiple). Growth, Financial Returns and Multiple are calculated by using normalized ranks for specific metrics for each stock. The normalized ranks for the metrics are then averaged and converted into percentiles for the relevant attribute. The precise calculation of each metric may vary depending on the fiscal year, industry and region, but the standard approach is as follows:

Growth is based on a stock's forward-looking sales growth, EBITDA growth and EPS growth (for financial stocks, only EPS and sales growth), with a higher percentile indicating a higher growth company. **Financial Returns** is based on a stock's forward-looking ROE, ROCE and CROCI (for financial stocks, only ROE), with a higher percentile indicating a company with higher financial returns. **Multiple** is based on a stock's forward-looking P/E, P/B, price/dividend (P/D), EV/EBITDA, EV/FCF and EV/Debt Adjusted Cash Flow (DACF) (for financial stocks, only P/E, P/B and P/D), with a higher percentile indicating a stock trading at a higher multiple. The **Integrated** percentile is calculated as the average of the Growth percentile, Financial Returns percentile and (100% - Multiple percentile).

Financial Returns and Multiple use the Goldman Sachs analyst forecasts at the fiscal year-end at least three quarters in the future. Growth uses inputs for the fiscal year at least seven quarters in the future compared with the year at least three quarters in the future (on a per-share basis for all metrics).

For a more detailed description of how we calculate the GS Factor Profile, please contact your GS representative.

M&A Rank

Across our global coverage, we examine stocks using an M&A framework, considering both qualitative factors and quantitative factors (which may vary across sectors and regions) to incorporate the potential that certain companies could be acquired. We then assign a M&A rank as a means of scoring companies under our rated coverage from 1 to 3, with 1 representing high (30%-50%) probability of the company becoming an acquisition target, 2 representing medium (15%-30%) probability and 3 representing low (0%-15%) probability. For companies ranked 1 or 2, in line with our standard departmental guidelines we incorporate an M&A component into our target price. M&A rank of 3 is considered immaterial and therefore does not factor into our price target, and may or may not be discussed in research.

Quantum

Quantum is Goldman Sachs' proprietary database providing access to detailed financial statement histories, forecasts and ratios. It can be used for in-depth analysis of a single company, or to make comparisons between companies in different sectors and markets.

Disclosures

Financial Advisory Disclosures

Goldman Sachs and/or one of its affiliates is acting as a financial advisor in connection with an announced strategic matter involving the following company or one of its affiliates: Resonac Holdings Corporation

The rating(s) for Asahi Kasei, Denka, Fujimi Inc., Mitsubishi Gas Chemical, Mitsui Kinzoku Co., Nitto Boseki Co, Resonac Holdings, SUMCO and Shin-Etsu Chemical is/are relative to the other companies in its/their coverage universe: Asahi Kasei, Daicel, Denka, Fujimi Inc., Kuraray, Mitsubishi Gas Chemical, Mitsui Chemicals Inc., Mitsui Kinzoku Co., Nippon Paint Holdings, Nitto Boseki Co, Resonac Holdings, SUMCO, Shin-Etsu Chemical, Tokyo Ohka Kogyo, Toray Industries, Tri Chemical Laboratories Inc., Zeon

Company-specific regulatory disclosures

Compendium report: please see disclosures at https://www.gs.com/research/hedge.html. Disclosures applicable to the companies included in this compendium can be found in the latest relevant published research

Distribution of ratings/investment banking relationships

Goldman Sachs Investment Research global Equity coverage universe

	Rating Distribution			Investment Banking Relationships		
	Buy	Hold	Sell	Buy	Hold	Sell
Global	50%	34%	16%	65%	60%	45%

As of April 1, 2026, Goldman Sachs Global Investment Research had investment ratings on 3,074 equity securities. Goldman Sachs assigns stocks as Buys and Sells on various regional Investment Lists; stocks not so assigned are deemed Neutral. Such assignments equate to Buy, Hold and Sell for the purposes of the above disclosure required by the FINRA Rules. See 'Ratings, Coverage universe and related definitions' below. The Investment Banking Relationships chart reflects the percentage of subject companies within each rating category for whom Goldman Sachs has provided investment banking services within the previous twelve months.

Price target and rating history chart(s)

Compendium report: please see disclosures at https://www.gs.com/research/hedge.html. Disclosures applicable to the companies included in this compendium can be found in the latest relevant published research

Target price history table(s)

Fujimi Inc. (5384.T)

Date of report	Target price (¥)	Closing price (¥)
01-Mar-26	3,590	3,300
03-Feb-26	2,910	2,859
12-Nov-25	2,600	2,345
05-Nov-25	2,490	2,429
10-Oct-25	2,420	2,361
25-Jun-25	2,290	1,895
20-May-25	2,230	1,876
28-Jan-25	2,460	2,227
05-Nov-24	2,600	2,318
02-Aug-24	3,030	2,921
13-May-24	3,140	3,625
25-Mar-24	3,640	3,605
10-Jan-24	3,200	3,020
02-Nov-23	3,400	3,095
13-Oct-23	3,600	3,140
28-Sep-23	3,700	3,005
06-Sep-23	3,900	3,375

SUMCO (3436.T)

Date of report	Target price (¥)	Closing price (¥)
01-Mar-26	1,910	1,828
21-Nov-25	1,600	1,175
10-Oct-25	2,060	1,658
17-Aug-25	1,370	1,201
08-May-25	1,270	994
30-Apr-25	1,440	984
09-Apr-25	1,630	779
17-Feb-25	1,740	1,114
10-Jan-25	1,890	1,155
18-Nov-24	2,140	1,270
23-Aug-24	2,500	1,807
30-Jul-24	2,900	2,465
25-Mar-24	3,000	2,425
26-Feb-24	2,700	2,374
31-Jan-24	2,440	2,256
19-Dec-23	2,490	2,186
28-Sep-23	2,210	1,945
06-Sep-23	2,230	1,998

Mitsubishi Gas Chemical (4182.T)

Date of report	Target price (¥)	Closing price (¥)
01-Mar-26	5,930	4,364
21-Nov-25	3,040	2,537
10-Oct-25	3,460	2,706
06-Jun-25	3,040	2,181
13-Feb-25	3,490	2,724
13-Nov-24	3,640	2,795
28-Aug-24	3,570	2,687
17-May-24	3,540	3,020
10-Apr-24	3,160	2,752
09-Feb-24	2,890	2,316
23-Nov-23	2,760	2,264
19-Oct-23	2,460	2,018

Resonac Holdings (4004.T)

Date of report	Target price (¥)	Closing price (¥)
01-Mar-26	15,770	11,930
12-Jan-26	8,050	6,810

Shin-Etsu Chemical (4063.T)

Date of report	Target price (¥)	Closing price (¥)
01-May-26	8,300	7,104
01-Mar-26	7,240	6,168
28-Oct-25	6,000	4,672
10-Oct-25	6,380	5,020
28-Jul-25	5,900	4,480
30-Apr-25	6,200	4,330
17-Apr-25	5,960	3,861
30-Jan-25	6,390	4,900
30-Oct-24	6,830	5,680
02-Sep-24	6,900	6,400
04-Aug-24	7,100	5,921
01-May-24	7,000	6,074
25-Mar-24	7,600	6,750
30-Jan-24	6,700	5,822
22-Dec-23	6,440	5,781
03-Nov-23	5,640	4,806
28-Sep-23	5,320	4,319
31-Jul-23	5,480	4,679

Mitsui Kinzoku Co. (5706.T)

Date of report	Target price (¥)	Closing price (¥)
01-Mar-26	44,100	36,910
12-Jan-26	24,000	19,900

Nitto Boseki Co (3110.T)

Date of report	Target price (¥)	Closing price (¥)
01-Mar-26	27,770	25,200
12-Jan-26	10,840	12,540

Asahi Kasei (3407.T)

Date of report	Target price (¥)	Closing price (¥)
01-Mar-26	2,180	1,845
04-Feb-26	1,490	1,594
05-Nov-25	1,310	1,215
09-May-25	1,280	1,007
25-Feb-25	1,230	1,012
06-Nov-24	1,260	1,118
01-Nov-24	1,230	1,127
31-Jul-24	1,110	1,094
09-May-24	1,070	1,133
07-Mar-24	990	1,069
07-Nov-23	1,030	995
03-Aug-23	950	936

Denka (4061.T)

Date of report	Target price (¥)	Closing price (¥)
01-Mar-26	3,400	3,679
06-Feb-26	2,810	3,114
19-Nov-25	2,540	2,378
01-Jun-25	1,830	2,057
07-Feb-25	1,810	2,080
28-Jan-25	1,870	2,230
08-Nov-24	1,780	2,028
13-Sep-24	1,940	2,148
10-May-24	1,910	2,302
11-Apr-24	1,900	2,346
07-Feb-24	2,070	2,441
10-Jan-24	2,320	2,585
07-Aug-23	2,330	2,553

Price targets shown in table(s) are unadjusted for corporate actions.

Regulatory disclosures

Disclosures required by United States laws and regulations

See company-specific regulatory disclosures above for any of the following disclosures required as to companies referred to in this report: manager or co-manager in a pending transaction; 1% or other ownership; compensation for certain services; types of client relationships; managed/co-managed public offerings in prior periods; directorships; for equity securities, market making and/or specialist role. Goldman Sachs trades or may trade as a principal in debt securities (or in related derivatives) of issuers discussed in this report.

The following are additional required disclosures: **Ownership and material conflicts of interest:** Goldman Sachs policy prohibits its analysts, professionals reporting to analysts and members of their households from owning securities of any company in the analyst's area of coverage. **Analyst compensation:** Analysts are paid in part based on the profitability of Goldman Sachs, which includes investment banking revenues. **Analyst as officer or director:** Goldman Sachs policy generally prohibits its analysts, persons reporting to analysts or members of their households from serving as an officer, director or advisor of any company in the analyst's area of coverage. **Non-U.S. Analysts:** Non-U.S. analysts may not be associated persons of Goldman Sachs & Co. LLC and therefore may not be subject to FINRA Rule 2241 or FINRA Rule 2242 restrictions on communications with a subject company, public appearances and trading in securities covered by the analysts.

Distribution of ratings: See the distribution of ratings disclosure above. **Price chart:** See the price chart, with changes of ratings and price targets in prior periods, above, or, if electronic format or if with respect to multiple companies which are the subject of this report, on the Goldman Sachs website at https://www.gs.com/research/hedge.html.

Additional disclosures required under the laws and regulations of jurisdictions other than the United States

The following disclosures are those required by the jurisdiction indicated, except to the extent already made above pursuant to United States laws and regulations. **Australia:** Goldman Sachs Australia Pty Ltd and its affiliates are not authorised deposit-taking institutions (as that term is defined in the Banking Act 1959 (Cth)) in Australia and do not provide banking services, nor carry on a banking business, in Australia. This research, and any access to it, is intended only for "wholesale clients" within the meaning of the Australian Corporations Act, unless otherwise agreed by Goldman Sachs. In producing research reports, members of Global Investment Research of Goldman Sachs Australia may attend site visits and other meetings hosted by the companies and other entities which are the subject of its research reports. In some instances the costs of such site visits or meetings may be met in part or in whole by the issuers concerned if Goldman Sachs Australia considers it is appropriate and reasonable in the specific circumstances relating to the site visit or meeting. To the extent that the contents of this document contains any financial product advice, it is general advice only and has been prepared by Goldman Sachs without taking into account a client's objectives, financial situation or needs. A client should, before acting on any such advice, consider the appropriateness of the advice having regard to the client's own objectives, financial situation and needs. A copy of certain Goldman Sachs Australia and New Zealand disclosure of interests and a copy of Goldman Sachs' Australian Sell-Side Research Independence Policy Statement are available at: https://www.goldmansachs.com/disclosures/australia-new-zealand/index.html. **Brazil:** Disclosure information in relation to CVM Resolution n. 20 is available at https://www.gs.com/worldwide/brazil/area/gir/index.html. Where applicable, the Brazil-registered analyst primarily responsible for the content of this research report, as defined in Article 20 of CVM Resolution n. 20, is the first author named at the beginning of this report, unless indicated otherwise at the end of the text. **Canada:** This information is being provided to you for information purposes only and is not, and under no circumstances should be construed as, an advertisement, offering or solicitation by Goldman Sachs & Co. LLC for purchasers of

Ratings, coverage universe and related definitions

Buy (B), Neutral (N), Sell (S) Analysts recommend stocks as Buys or Sells for inclusion on various regional Investment Lists. Being assigned a Buy or Sell on an Investment List is determined by a stock's total return potential relative to its coverage universe. Any stock not assigned as a Buy or a Sell on an Investment List with an active rating (i.e., a stock that is not Rating Suspended, Not Rated, Early-Stage Biotech, Coverage Suspended or Not Covered), is deemed Neutral. Each region manages Regional Conviction Lists, which are selected from Buy rated stocks on the respective region's Investment Lists and represent investment recommendations focused on the size of the total return potential and/or the likelihood of the realization of the return across their respective areas of coverage. The addition or removal of stocks from such Conviction Lists are managed by the Investment Review Committee or other designated committee in each respective region and do not represent a change in the analysts' investment rating for such stocks.

Total return potential represents the upside or downside differential between the current share price and the price target, including all paid or anticipated dividends, expected during the time horizon associated with the price target. Price targets are required for all covered stocks. The total return potential, price target and associated time horizon are stated in each report adding or reiterating an Investment List membership.

Coverage Universe: A list of all stocks in each coverage universe is available by primary analyst, stock and coverage universe at https://www.gs.com/research/hedge.html.

Not Rated (NR). The investment rating, target price and earnings estimates (where relevant) are removed pursuant to Goldman Sachs policy when Goldman Sachs is acting in an advisory capacity in a merger or in a strategic transaction involving this company, when there are legal, regulatory or policy constraints due to Goldman Sachs' involvement in a transaction, and in certain other circumstances. **Early-Stage Biotech (ES).** An investment rating and a target price are not assigned pursuant to Goldman Sachs policy when this company has neither a drug, treatment or medical device that has passed a Phase II clinical trial nor a license to distribute a post-Phase II drug, treatment or medical device. **Rating Suspended (RS).** Goldman Sachs Research has suspended the investment rating and price target for this stock, because there is not a sufficient fundamental basis for determining an investment rating or target price. The previous investment rating and target price, if any, are no longer in effect for this stock and should not be relied upon. **Coverage Suspended (CS).** Goldman Sachs has suspended coverage of this company. **Not Covered (NC).** Goldman Sachs does not cover this company.

Global product; distributing entities

Goldman Sachs Global Investment Research produces and distributes research products for clients of Goldman Sachs on a global basis. Analysts based in Goldman Sachs offices around the world produce research on industries and companies, and research on macroeconomics, currencies, commodities and portfolio strategy. This research is disseminated in Australia by Goldman Sachs Australia Pty Ltd (ABN 21 006 797 897); in Brazil by Goldman Sachs do Brasil Corretora de Títulos e Valores Mobiliários S.A.; Public Communication Channel Goldman Sachs Brazil: 0800 727 5764 and / or contatogoldmanbrasil@gs.com. Available Weekdays (except holidays), from 9am to 6pm. Canal de Comunicação com o Público Goldman Sachs Brasil: 0800 727 5764 e/ou contatogoldmanbrasil@gs.com. Horário de funcionamento: segunda-feira à sexta-feira (exceto feriados), das 9h às 18h; in Canada by Goldman Sachs & Co. LLC; in Hong Kong by Goldman Sachs (Asia) L.L.C.; in India by Goldman Sachs (India) Securities Private Ltd.; in Japan by

Goldman Sachs Japan Co., Ltd.; in the Republic of Korea by Goldman Sachs (Asia) L.L.C., Seoul Branch; in New Zealand by Goldman Sachs New Zealand Limited; in Russia by OOO Goldman Sachs; in Singapore by Goldman Sachs (Singapore) Pte. (Company Number: 198602165W); and in the United States of America by Goldman Sachs & Co. LLC. Goldman Sachs International has approved this research in connection with its distribution in the United Kingdom.

Goldman Sachs International ("GSI"), authorised by the Prudential Regulation Authority ("PRA") and regulated by the Financial Conduct Authority ("FCA") and the PRA, has approved this research in connection with its distribution in the United Kingdom.

European Economic Area: Goldman Sachs Bank Europe SE ("GSBE") is a credit institution incorporated in Germany and, within the Single Supervisory Mechanism, subject to direct prudential supervision by the European Central Bank and in other respects supervised by German Federal Financial Supervisory Authority (Bundesanstalt für Finanzdienstleistungsaufsicht, BaFin) and Deutsche Bundesbank and disseminates research within the European Economic Area.

General disclosures

This research is for our clients only. Other than disclosures relating to Goldman Sachs, this research is based on current public information that we consider reliable, but we do not represent it is accurate or complete, and it should not be relied on as such. The information, opinions, estimates and forecasts contained herein are as of the date hereof and are subject to change without prior notification. We seek to update our research as appropriate, but various regulations may prevent us from doing so. Other than certain industry reports published on a periodic basis, the large majority of reports are published at irregular intervals as appropriate in the analyst's judgment.

Goldman Sachs conducts a global full-service, integrated investment banking, investment management, and brokerage business. We have investment banking and other business relationships with a substantial percentage of the companies covered by Global Investment Research. Goldman Sachs & Co. LLC, the United States broker dealer, is a member of SIPC (https://www.sipc.org).

Our salespeople, traders, and other professionals may provide oral or written market commentary or trading strategies to our clients and principal trading desks that reflect opinions that are contrary to the opinions expressed in this research. Our asset management area, principal trading desks and investing businesses may make investment decisions that are inconsistent with the recommendations or views expressed in this research.

The analysts named in this report may have from time to time discussed with our clients, including Goldman Sachs salespersons and traders, or may discuss in this report, trading strategies that reference catalysts or events that may have a near-term impact on the market price of the equity securities discussed in this report, which impact may be directionally counter to the analyst's published price target expectations for such stocks. Any such trading strategies are distinct from and do not affect the analyst's fundamental equity rating for such stocks, which rating reflects a stock's return potential relative to its coverage universe as described herein.

We and our affiliates, officers, directors, and employees will from time to time have long or short positions in, act as principal in, and buy or sell, the securities or derivatives, if any, referred to in this research, unless otherwise prohibited by regulation or Goldman Sachs policy.

The views attributed to third party presenters at Goldman Sachs arranged conferences, including individuals from other parts of Goldman Sachs, do not necessarily reflect those of Global Investment Research and are not an official view of Goldman Sachs.

Any third party referenced herein, including any salespeople, traders and other professionals or members of their household, may have positions in the products mentioned that are inconsistent with the views expressed by analysts named in this report.

This research is not an offer to sell or the solicitation of an offer to buy any security in any jurisdiction where such an offer or solicitation would be illegal. It does not constitute a personal recommendation or take into account the particular investment objectives, financial situations, or needs of individual clients. Clients should consider whether any advice or recommendation in this research is suitable for their particular circumstances and, if appropriate, seek professional advice, including tax advice. The price and value of investments referred to in this research and the income from them may fluctuate. Past performance is not a guide to future performance, future returns are not guaranteed, and a loss of original capital may occur. Fluctuations in exchange rates could have adverse effects on the value or price of, or income derived from, certain investments.

Certain transactions, including those involving futures, options, and other derivatives, give rise to substantial risk and are not suitable for all investors. Investors should review current options and futures disclosure documents which are available from Goldman Sachs sales representatives or at https://www.theocc.com/about/publications/character-risks.jsp and https://www.goldmansachs.com/disclosures/cftc_fcm_disclosures. Transaction costs may be significant in option strategies calling for multiple purchase and sales of options such as spreads. Supporting documentation will be supplied upon request.

Differing Levels of Service provided by Global Investment Research: The level and types of services provided to you by Goldman Sachs Global Investment Research may vary as compared to that provided to internal and other external clients of GS, depending on various factors including your individual preferences as to the frequency and manner of receiving communication, your risk profile and investment focus and perspective (e.g., marketwide, sector specific, long term, short term), the size and scope of your overall client relationship with GS, and legal and regulatory constraints. As an example, certain clients may request to receive notifications when research on specific securities is published, and certain clients may request that specific data underlying analysts' fundamental analysis available on our internal client websites be delivered to them electronically through data feeds or otherwise. No change to an analyst's fundamental research views (e.g., ratings, price targets, or material changes to earnings estimates for equity securities), will be communicated to any client prior to inclusion of such information in a research report broadly disseminated through electronic publication to our internal client websites or through other means, as necessary, to all clients who are entitled to receive such reports.

All research reports are disseminated and available to all clients simultaneously through electronic publication to our internal client websites. Not all research content is redistributed to our clients or available to third-party aggregators, nor is Goldman Sachs responsible for the redistribution of our research by third party aggregators. For research, models or other data related to one or more securities, markets or asset classes (including related services) that may be available to you, please contact your GS representative or go to https://research.gs.com.

Disclosure information is also available at https://www.gs.com/research/hedge.html or from Research Compliance, 200 West Street, New York, NY 10282.