Galapagos NV (GLPG.AS): 2Q21 First Take: OpEx higher, and Toledo and Tyk2 inhibitor plans expand; our initial thoughts and questions

Graig Suvannavejh, Ph.D.
+1(212)902-6393 | graig.suvannavejh@gs.com
Goldman Sachs & Co. LLC

Nick Hallatt
+44(20)7774-8215 | nick.hallatt@gs.com
Goldman Sachs International

Anna Vorobyeva, Ph.D.
+1(212)357-5693 | anna.vorobyeva@gs.com
Goldman Sachs & Co. LLC

What's new: Galapagos (GLPG) issued 2Q21 results via press release after market close yesterday (August 5) and will host a call later today (August 6) to discuss in further detail. In terms of the financials (see further details below), the company reported higher than anticipated revenue, but this was offset by higher than expected OpEx (on both R&D and SG&A), with net loss per share of €(0.98) comparing to GSe of €(0.73), and consensus of €(1.19). Of note, total liquidity as of the end of June 2021 stood at €5.0bn. On the product portfolio and pipeline front, key updates, from our perspective, included:

- Following the discontinuation of lead Toledo franchise compound GLPG3970 (an SIK2/3 inhibitor) last month (LINK), GLPG is now also advancing GLPG4399, a SIK3 inhibitor, into an initial trial in healthy volunteers this year. Further, GLPG plans to advance a follow-up SIK2/3 inhibitor into the clinic in 2022. (Recall that on the announcement of its 1Q21 results back in May (LINK), GLPG also introduced GLPG4876, yet another back up Toledo compound.)
- For GLPG3667 (GLPG's most advanced Tyk2 inhibitor), post-positive Phase 2a data in psoriasis, GLPG plans to initiate a dose finding Phase 2b trial in psoriasis. Newly disclosed, GLPG (1) is currently running an extended dose escalation study in healthy volunteers, and (2) plans to advance '3667 in a Phase 2 study in ulcerative colitis (UC) in 2022.
- GLPG expects completion of trial recruitment for (1) the pivotal Phase 3 DIVERSITY study of filgotinib in Crohn's disease (CD), and (2) the Phase 2a trial of GLPG2737 in polycystic kidney disease, both by YE21.
- GLPG and partner Gilead (GILD, covered by Terence Flynn) continue to execute on the commercial launch of Jyseleca across Europe, with operations established in 11 countries. As a reminder, as part of an amended agreement with GILD, Jyseleca sales will start flowing through GLPG's financial statements beginning in 2H21, as key EU countries are transitioned from GILD to GLPG. Further, Europe approval for filgotinib in UC is expected later this year.

Our take: Based on the 2Q21 print, we learned little that was meaningfully new; that said, we were most intrigued by the updates on the Toledo franchise and GLPG's Tyk2 candidate (programs we now come to view as GLPG's most high profile and of interest, for investors), and hence, we look forward to the company's conference call

tomorrow to potentially learn of any incremental details and additional color.

Our thesis: While GLPG has experienced an unfortunate spate of serial pipeline setbacks, we nonetheless continue to see risk in the name, which in our view could come in the form of (1) potential negative headlines/news flow for filgotinib in its IBD indications in the US, for which we believe a meaningful contribution may still exist in consensus models, (2) execution on the European launch of filgotinib by GLPG (and without partner GILD), (3) the company's current considerable gap in pipeline (no late stage product after filgotinib/Jyseleca), (4) GLPG's uneven track record of clinical development and also efficient capital allocation, and (5) anticipated future cash burn. As such, still seeing a degree of implied downside (though modest) from a stock perspective, we maintain our Sell rating.

Exhibit 1: Upcoming catalysts

Timing	Product	Event Type	Details
2021			
2H21	filgotinib	Regulatory	EU approval in UC
2H21	filgotinib	Clinical	Complete enrolment in Phase 3 DIVERSITY study in CD
2H21	'555	Clinical	Announce Phase 1b data in OA
2H21	4399 (Toledo)	Clinical	Initiate healthy volunteer study
2022+			
1Q22	'4716	Clinical	Initiate Phase 2b study in IPF
1Q22	'3667	Clinical	Initiate Phase 2b study in psoriasis
1H22	'3667	Clinical	Initiate Phase 2 study in UC
1H22	filgotinib	Regulatory	Regulatory filing in US for UC
1H22	filgotinib	Regulatory	Japan approval in UC
2H22	**filgotinib**	**Clinical**	**Announce Phase 3 DIVERSITY data in CD**
4Q22	**'2737**	**Clinical**	**Announce Phase 2a MANGROVE data in ADPKD**
1Q23	filgotinib	Regulatory	Regulatory filing in US/EU/Japan for CD
2024	**'4716**	**Clinical**	**Announce Phase 2b data in IPF**

Source: Company data, Goldman Sachs Global Investment Research

Key questions for the call

GLPG will host an investor conference call at 8:00am ET/2pm CET, August 6, to discuss 2Q21 results. Some of our initial questions for the call will be:

- What do you hope to see in the extended dose escalation study for GLPG3667, and does completion of this study impact the timing of the initiations of the respective Phase 2 and Phase 2b studies in UC and psoriasis?
- What's the current status of GLPG4876, the Toledo compound introduced in May, and how does that candidate differ from GLPG4399?
- Has anything incrementally new been learned about differential SIK inhibition? In other words, should a SIK3 inhibitor have a better efficacy/safety profile vs. a SIK2/3 inhibitor?
- What's the status of the MANTA and MANTA-RAy studies for filgotinib, and also, what's the latest regulatory status of filgotinib in UC?
- What's management's view of FDA's decision to stay the potential approvals of pending NDA and sNDA's for various JAK inhibitors?
- With filgotinib/Jyseleca in Europe expected to hit GLPG's P&L in 2H21, what have the sales so far been like, and what do the current launch metrics look like?

- In light of the company's current cash balance of €5bn, how is GLPG thinking about business development (BD) opportunities and priorities?
- What's the current status of the company's search for a new Chief Scientific Officer (CSO)?
- Beyond the previously announced R&D organizational restructuring and pipeline rationalization, how is management and the board further addressing current R&D productivity (and share price) underperformance?

2Q21 Financials

2Q21 revenue of €153mn came in above GSe (€131.5mn) and consensus (€97.6mn). OpEx of €199.8mn was higher than our €174.8mn estimate and consensus of €172.3mn. Total liquidity (current financial investments + cash + cash equivalents) as of June 30, 2021 stood at €5bn (vs. €5.1bn as of March 31, 2021). Importantly, the company reiterated operational cash burn guidance of €580mn-€620mn.

Exhibit 2: 2Q21 variance

€mn, except EPS data	2Q20	2Q21		Estimated 2Q21					
	Reported	Reported	% Growth	Gse	% Growth	% Var	Cons	% Growth	% Var
Revenue	**117.7**	**153.0**	***30%***	**131.5**	***12%***	***16%***	**97.6**	***-17%***	***57%***
R&D	(149.1)	(138.8)	*-7%*	(126.7)	*-15%*	*-10%*	(126.0)	*-16%*	*-10%*
SG&A	(54.8)	(61.0)	*11%*	(48.0)	*-12%*	*-27%*	(46.3)	*-15%*	*-32%*
OpEx	**(203.9)**	**(199.8)**	***-2%***	**(174.8)**	***-14%***	***-14%***	**(172.3)**	***-15%***	***-16%***
EBIT	(86.2)	(46.8)	*-46%*	(43.2)	*-50%*	*-8%*	(74.2)	*-14%*	*37%*
Net profit	(115.0)	(64.4)	*-44%*	(48.0)	*-58%*	*-34%*	(87.4)	*-24%*	*26%*
EPS	**(1.77)**	**(0.98)**	***-45%***	**(0.73)**	***-59%***	***-34%***	**(1.19)**	***-33%***	***18%***

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

Valuation/Risks

We are Sell-rated on GLPG, with a 12-month price target of €49 ($58 for the US ADR) that is based on a DCF valuation that assumes a 13% WACC/discount rate and 0% terminal growth rate. Risks include: positive or better-than-expected pipeline clinical data; better market uptake and commercial launch for Jyseleca (in the EU and Japan, where it is approved); and faster-than-expected clinical development and/or regulatory timelines for key pipeline products.

GLPG.AS	12m Price Target: **€49.00**	Price: **€51.05**	Downside: **4.0%**
GLPG	12m Price Target: **$58.00**	Price: **$60.06**	Downside: **3.4%**

Sell

Market cap: €3.4bn / $4.0bn
Enterprise value: €(1.4)bn / $(1.6)bn
3m ADTV: €28.1mn / $33.8mn
Belgium
Europe Biotech
M&A Rank: 3
Leases incl. in net debt & EV?: Yes

GS Forecast

	12/20	12/21E	12/22E	12/23E
Revenue (€ mn)	530.3	538.5	641.7	744.0
EBIT (€ mn)	(178.6)	(139.5)	(13.0)	64.5
EPS (€)	(4.78)	(1.77)	(0.50)	0.82
P/E (X)	NM	NM	NM	62.3
EV/EBITDA (ex lease,X)	NM	12.8	NM	NM
Dividend yield (%)	0.0	0.0	0.0	0.0
FCF yield (%)	(5.1)	(14.2)	(11.2)	(11.5)
CROCI (%)	(4.4)	(18.7)	(11.9)	(12.5)
N debt/EBITDA (ex lease,X)	–	–	(492.6)	(45.1)

	3/21	6/21E	9/21E	12/21E
EPS (€)	(0.20)	(0.73)	(0.45)	(0.39)

Source: Company data, Goldman Sachs Research estimates, FactSet. Price as of 5 Aug 2021 close.

Disclosure Appendix

Reg AC

We, Graig Suvannavejh, Ph.D., Nick Hallatt and Anna Vorobyeva, Ph.D., 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.

GS Factor Profile

The Goldman Sachs Factor Profile provides investment context for a stock by comparing key attributes to the market (i.e. our coverage universe) 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

The rating(s) for Galapagos NV is/are relative to the other companies in its/their coverage universe: Argenx SE, Autolus Therapeutics, Bicycle Therapeutics, DBV Technologies SA, Galapagos NV, Genmab, Idorsia Pharmaceuticals, Immatics NV, Immunocore, Innate Pharma SA, MorphoSys AG, Orchard Therapeutics, Philogen S.p.A., Valneva SE, Zealand Pharma A/S

Company-specific regulatory disclosures

The following disclosures relate to relationships between The Goldman Sachs Group, Inc. (with its affiliates, "Goldman Sachs") and companies covered by the Global Investment Research Division of Goldman Sachs and referred to in this research.

Goldman Sachs expects to receive or intends to seek compensation for investment banking services in the next 3 months: Galapagos NV ($60.06)

Goldman Sachs makes a market in the securities or derivatives thereof: Galapagos NV ($60.06)

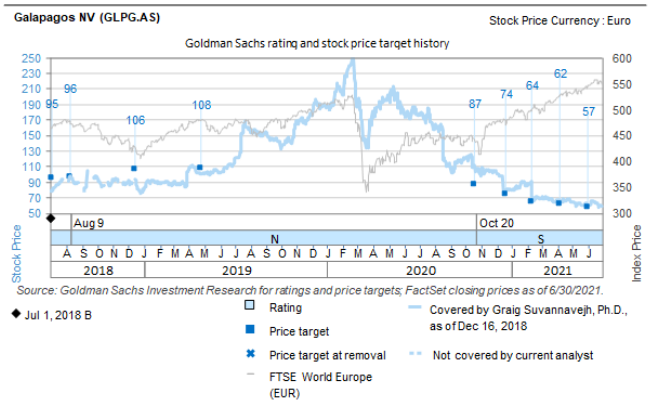
Distribution of ratings/investment banking relationships

Goldman Sachs Investment Research global Equity coverage universe

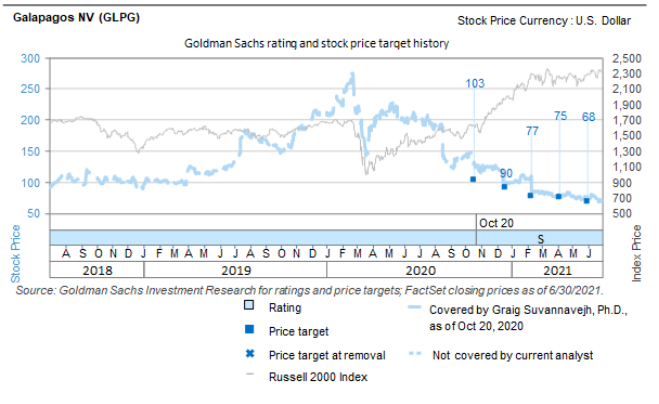
	Rating Distribution			Investment Banking Relationships		
	Buy	Hold	Sell	Buy	Hold	Sell
Global	52%	34%	14%	64%	56%	47%

As of July 1, 2021, Goldman Sachs Global Investment Research had investment ratings on 3,011 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)



The price targets shown should be considered in the context of all prior published Goldman Sachs research, which may or may not have included price targets, as well as developments relating to the company, its industry and financial markets.



The price targets shown should be considered in the context of all prior published Goldman Sachs research, which may or may not have included price targets, as well as developments relating to the company, its industry and financial markets.

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 subject company, public appearances and trading securities held 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 the Global Investment Research Division 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:** Goldman Sachs Canada Inc. is an affiliate of The Goldman Sachs Group Inc. and therefore is included in the company specific disclosures relating to Goldman Sachs (as defined above). Goldman Sachs Canada Inc. has approved of, and agreed to take responsibility for, this research report in Canada if and to the extent that Goldman Sachs Canada Inc. disseminates this research report to its clients. **Hong Kong:** Further information on the securities of covered companies referred to in this research may be obtained on request from Goldman Sachs (Asia) L.L.C. **India:** Further information on the subject company or companies referred to in this research may be obtained from Goldman Sachs (India) Securities Private Limited, Research Analyst - SEBI Registration Number INH000001493, 951-A, Rational House, Appasaheb Marathe Marg, Prabhadevi, Mumbai 400 025, India, Corporate Identity Number U74140MH2006FTC160634, Phone +91 22 6616 9000, Fax +91 22 6616 9001. Goldman Sachs may beneficially own 1% or more of the securities (as such term is defined in clause 2 (h) the Indian Securities Contracts (Regulation) Act, 1956) of the subject company or companies referred to in this research report. **Japan:** See below. **Korea:** This research, and any access to it, is intended only for "professional investors" within the meaning of the Financial Services and Capital Markets Act, unless otherwise agreed by Goldman Sachs. Further information on the subject company or companies referred to in this research may be obtained from Goldman Sachs (Asia) L.L.C., Seoul Branch. **New Zealand:** Goldman Sachs New Zealand Limited and its affiliates are neither "registered banks" nor "deposit takers" (as defined in the Reserve Bank of New Zealand Act 1989) in New Zealand. This research, and any access to it, is intended for "wholesale clients" (as defined in the Financial Advisers Act 2008) unless otherwise agreed by Goldman Sachs. A copy of certain Goldman Sachs Australia and New Zealand disclosure of interests is available at: https://www.goldmansachs.com/disclosures/australia-new-zealand/index.html. **Russia:** Research reports distributed in the Russian Federation are not advertising as defined in the Russian legislation, but are information and analysis not having product promotion as their main purpose and do not provide appraisal within the meaning of the Russian legislation on appraisal activity. Research reports do not constitute a personalized investment recommendation as defined in Russian laws and regulations, are not addressed to a specific client, and are prepared without analyzing the financial circumstances, investment profiles or risk profiles of clients. Goldman Sachs assumes no responsibility for any investment decisions that may be taken by a client or any other person based on this research report. **Singapore:** Goldman Sachs (Singapore) Pte. (Company Number: 198602165W), which is regulated by the Monetary Authority of Singapore, accepts legal responsibility for

this research, and should be contacted with respect to any matters arising from, or in connection with, this research. **Taiwan:** This material is for reference only and must not be reprinted without permission. Investors should carefully consider their own investment risk. Investment results are the responsibility of the individual investor. **United Kingdom:** Persons who would be categorized as retail clients in the United Kingdom, as such term is defined in the rules of the Financial Conduct Authority, should read this research in conjunction with prior Goldman Sachs research on the covered companies referred to herein and should refer to the risk warnings that have been sent to them by Goldman Sachs International. A copy of these risks warnings, and a glossary of certain financial terms used in this report, are available from Goldman Sachs International on request.

European Union and United Kingdom: Disclosure information in relation to Article 6 (2) of the European Commission Delegated Regulation (EU) (2016/958) supplementing Regulation (EU) No 596/2014 of the European Parliament and of the Council (including as that Delegated Regulation is implemented into United Kingdom domestic law and regulation following the United Kingdom's departure from the European Union and the European Economic Area) with regard to regulatory technical standards for the technical arrangements for objective presentation of investment recommendations or other information recommending or suggesting an investment strategy and for disclosure of particular interests or indications of conflicts of interest is available at https://www.gs.com/disclosures/europeanpolicy.html which states the European Policy for Managing Conflicts of Interest in Connection with Investment Research.

Japan: Goldman Sachs Japan Co., Ltd. is a Financial Instrument Dealer registered with the Kanto Financial Bureau under registration number Kinsho 69, and a member of Japan Securities Dealers Association, Financial Futures Association of Japan and Type II Financial Instruments Firms Association. Sales and purchase of equities are subject to commission pre-determined with clients plus consumption tax. See company-specific disclosures as to any applicable disclosures required by Japanese stock exchanges, the Japanese Securities Dealers Association or the Japanese Securities Finance Company.

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, Coverage Suspended or Not Covered), is deemed Neutral. Each region's Investment Review Committee manages Regional Conviction lists, which 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 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 and target price have been removed pursuant to Goldman Sachs policy when Goldman Sachs is acting in an advisory capacity in a merger or strategic transaction involving this company and in certain other circumstances. **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, or there are legal, regulatory or policy constraints around publishing, an investment rating or target. The previous investment rating and price target, 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. **Not Available or Not Applicable (NA).** The information is not available for display or is not applicable. **Not Meaningful (NM).** The information is not meaningful and is therefore excluded.

Global product; distributing entities

The Global Investment Research Division of Goldman Sachs 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 either Goldman Sachs Canada Inc. or 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.

Effective from the date of the United Kingdom's departure from the European Union and the European Economic Area ("Brexit Day") the following information with respect to distributing entities will apply:

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: GSI, authorised by the PRA and regulated by the FCA and the PRA, disseminates research in the following jurisdictions within the European Economic Area: the Grand Duchy of Luxembourg, Italy, the Kingdom of Belgium, the Kingdom of Denmark, the Kingdom of Norway, the Republic of Finland, Portugal, the Republic of Cyprus and the Republic of Ireland; GS -Succursale de Paris (Paris branch) which, from Brexit Day, will be authorised by the French Autorité de contrôle prudentiel et de resolution ("ACPR") and regulated by the Autorité de contrôle prudentiel et de resolution and the Autorité des marches financiers ("AMF") disseminates research in France; GSI - Sucursal en España (Madrid branch) authorized in Spain by the Comisión Nacional del Mercado de Valores disseminates research in the Kingdom of Spain; GSI - Sweden Bankfilial (Stockholm branch) is authorized by the SFSA as a "third country branch" in accordance with Chapter 4, Section 4 of the Swedish Securities and Market Act (Sw. lag (2007:528) om värdepappersmarknaden) disseminates research in the Kingdom of Sweden; 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 in the Federal Republic of Germany and those jurisdictions within the European Economic Area where GSI is not authorised to disseminate research and additionally, GSBE, Copenhagen Branch filial af GSBE, Tyskland, supervised by the Danish Financial Authority disseminates research in the Kingdom of Denmark; GSBE - Sucursal en España (Madrid branch) subject (to a limited extent) to local supervision by the Bank of Spain disseminates research in the Kingdom of Spain; GSBE - Succursale Italia (Milan branch) to the relevant applicable extent, subject to local supervision by the Bank of Italy (Banca d'Italia) and the Italian Companies and Exchange Commission (Commissione Nazionale per le Società e la Borsa "Consob") disseminates research in Italy; GSBE - Succursale de Paris (Paris branch), supervised by the AMF and by the ACPR disseminates research in France; and GSBE - Sweden Bankfilial (Stockholm branch), to a limited extent, subject to local supervision by the Swedish Financial Supervisory Authority (Finansinpektionen) disseminates research in the Kingdom of Sweden.

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 our Global Investment Research Division. 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, excluding equity and credit analysts, 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.

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.fiadocumentation.org/fia/regulatory-disclosures_1/fia-uniform-futures-and-options-on-futures-risk-disclosures-booklet-pdf-version-2018. 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 the Global Investment Research division of GS 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.