



China Advanced Materials

Composites – Working behind the scene of energy transitions; Initiate on ZFSY, GW Compos and Jushi

China Advanced Materials

Insights into industry transformation driven by advancements in materials science.

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We broaden our China advanced material coverage by initiating on the composite sector, with a focus on **carbon fiber (CF)/glass fiber (GF)** (in order of preference), the two most important reinforcement materials within the composites value chain. Compared to GF, a steadily growing segment where China players have a leading market share globally, we prefer CF on a faster demand growth profile (to double by 2025E) driven by **import substitution** and **expanding use cases**. We provide in-depth and differentiated analysis in this report to address **how composites players are navigating the energy transition**, where we expect **wind industry to remain the largest end-used market** (46% of total) for CF by 2025E, whilst **demand from solar industry to witness the fastest growth** (34% CAGR), a niche application in a big industry that is often overlooked by the market. We initiate on two CF producers Zhongfu Shenying (ZFSY) and Guangwei Composites (GW Compos) at Buy with 12m TPs of Rmb55.7 (58% upside) and Rmb113.6 (43% upside) respectively, and China Jushi – the global GF market leader at Neutral, 12m TP of Rmb13.4 (6% upside). **Our top pick is ZFSY** for its strong position in high-performance products with more favorable end-market exposure towards new energy (50%+), where it has significant commercialization capability and plans to grow its capacity 4X by 2024. We are 4%/12% above consensus on 2023E/24E earnings reflecting the company's solid expansion strategies and promising demand outlook in the high-grade CF segment.

We identify three key themes at the sector level:

Globalization vs. import substitution: While Chinese GF producers have been expanding capacity overseas to overcome the ongoing trade restrictions, China is addressing its low self-sufficiency in CF, which we expect to rise to 65% by 2025E (vs. 15% a decade ago) on accelerating capacity expansion as well as commercialization of high-end products by leading local players.

Yan Lin

+852-2978-7020 | yan.lin@gs.com
Goldman Sachs (Asia) L.L.C.

Cayle Song

+86(21)2401-8902 | cayle.song@gsg.hk
Beijing Gao Hua Securities Company Limited

Nick Zheng, CFA

+852-2978-1405 | nick.zheng@gs.com
Goldman Sachs (Asia) L.L.C.

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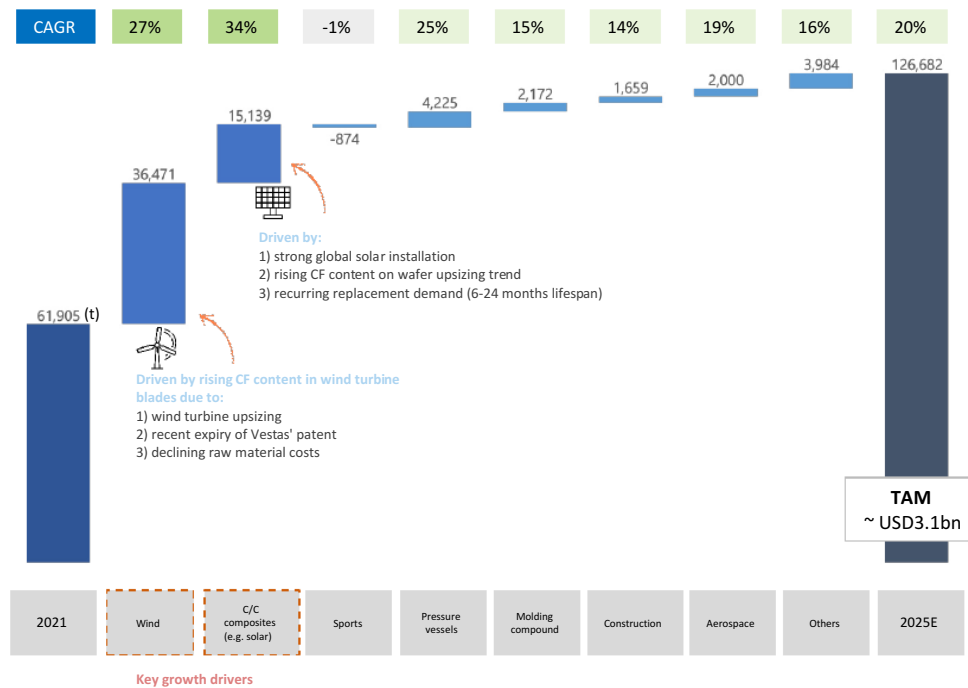
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Wind opportunity: While GF will likely remain the mainstream composite used for wind turbine blades (for better cost-to-performance), we expect the upsizing trend to drive higher use of CF, a lighter and stronger alternative. The recent expiry of a patent by Vestas for such design (in turbine blades) and declining raw material costs should accelerate the adoption by Chinese OEMs; we project 4/5X increase in CF content in onshore/offshore wind market and 27% CAGR in China's CF demand for wind industry by 2025E.

Next growth opportunities: We expect solar, where CF is increasingly used in thermal field system (to grow mono-crystalline silicon), to be the key growth driver (+34% CAGR) for China's CF demand on 1) strong global solar installation; 2) rising CF content on wafer upsizing trend; and 3) recurring replacement demand (6-24 months lifespan). Beyond 2025, auto industry could potentially see rising adoption of both CF and GF for automotive lightweighting trend as well as CF used for pressure tanks in fuel cell vehicles.

Thesis in chart: prefer CF over GF

Carbon Fiber: A 20% 2021-25E demand CAGR driven by: 1) Rise of self-sufficiency (from 47% in 2021 to 65% in 2025E); 2) 35% CAGR capacity expansion (from 2020-25E); 3) Expanding product coverage



Zhongfu Shenying (688295.SS)

BUY

TP: RMB55.7/sh
Mkt cap: US\$4.4bn
ADTV: US\$23m

GSe vs. Wind cons (EPS)

2022E: -6%
2023E: 4%
2024E: 12%

- Favorable end-market exposure towards new energy
- Commercialization capability in high-performance CF
- Plans to grow its capacity 4X by 2024E

Guangwei Composites (300699.SZ)

BUY

TP: RMB113.6/sh
Mkt cap: US\$5.7bn
ADTV: US\$75m

GSe vs. Wind cons (EPS)

2022E: -3%
2023E: -2%
2024E: 26%

- A leading player in every stage of the domestic CF development
- Successfully established a comprehensive industrial chain
- A beneficiary of wind industry development

Source: Wind, Company data, Goldman Sachs Global Investment Research, Gao Hua Securities Research

Pricing in this report is as of Oct. 10, 2022, unless specified otherwise.

PM Summary

By definition, a composite material consists of at least two distinct materials, with one acting as **reinforcement** (providing strength to the overall structure) and the other acting as **matrix** (holding the reinforcement material in place, [Exhibit 2](#)). Such a combination provides properties (e.g. strength, stiffness, conductivity, density etc.) superior to the standalone constituents therefore enabling a wide range of applications.

In this report, we focus on **glass fiber (GF)** and **carbon fiber (CF)**, the two most important reinforcement materials that are used to form fiber-reinforced composites. While GF has already become the most common reinforcement material used in over 50,000 applications across six primary end-markets (e.g. building/constructions, infrastructure, transportation, consumer electronics, industrial applications and new energy; [Exhibit 3](#)), CF has seen its use cases expanding and has emerged as a strategically critical advanced material.

We **prefer CF over GF producers**, as we expect the **CF industry will experience a faster growth with demand driven by import substitutions and expanding use cases**. We estimate China's **CF demand to double** to 127kt by 2025E (20% CAGR), with market size reaching RMB21.8bn/US\$3.1bn.

We have identified three key themes in this report that address the following questions:

1. What are the competitive landscapes and impacts from trade tensions?
2. How GF/CF producers will benefit from China's energy transition?
3. What are the future opportunities?

Three themes in focus

Tackling the ongoing trade tensions through globalization and import substitution

GF sector: Chinese GF producers have enjoyed an average of 9ppts margin premium compared to global peers over the last decade ([Exhibit 8](#)). Cost advantages arising from cheap access to raw material/labour and economies of scales have allowed Chinese manufacturers to gain market share globally. We note several countries have imposed a series of tariffs on certain GF products originating from China ([Exhibit 9](#)). The decision of building global capacity gives leading domestic producers extra flexibility to tackle the trade challenge and has proven to be a successful move. As manufacturers continue to gain overseas exposure, we believe **domestic leading GF producers will remain dominant in the global market**, with top 3 domestic producers having a combined global market share of >50% by 2025E (currently at ~42%).

CF sector: The ongoing export restriction measures imposed by Japan/US authorities have accelerated the pace of import substitutions, allowing domestic CF players to gain market share from leading overseas producers ([Exhibit 12](#)). As a result, the CF self-sufficiency rate grew from 15% in 2015 to 47% in 2021. **We expect the ratio to grow by an average of 4-5ppts per annum to reach 65% by end-2025E** ([Exhibit 13](#)). We believe this momentum will be supported by: 1) **accelerated capacity expansion**

(2015-2020: 9% CAGR vs. 2020-2025: 35%) ([Exhibit 16](#)); and 2) **expanding product coverage** with leading producers achieving **mass commercialization capability** in the high-performance CF segments (e.g. T700/800) ([Exhibit 14](#)) to cater to the broader end-market applications (e.g. solar, hydrogen pressure tank).

Capturing the wind opportunity

We believe GF composites will remain the mainstream composite material for wind turbine **blades** due to its **excellent mechanical properties** at a relatively **low cost**. However, we expect **CF composites will enjoy a faster growth to facilitate the wind turbine upsizing trend** ([Exhibit 20](#)). The adoption of CF in the **selected** structural parts (e.g. spar cap) of the wind turbine blades ([Exhibit 22](#)) using a **cost-effective fabrication (pultrusion) method** ([Exhibit 24](#)) has proven to be a commercially viable solution, with the carbon/glass **hybrid structure** taking advantage of CF's lightweight feature, meanwhile achieving a possible balance between cost and performance. This design has boosted CF consumption with wind turbine blades becoming the largest single downstream application (36% of 2021 CF demand) ([Exhibit 23](#)). Vestas (a leading wind turbine OEM), has a patent related to the adoption of pultrusion technology in the wind turbine design which expired in July 2022, opening up further opportunities for Chinese wind turbine OEMs to access this technology. With supply constraints easing, we expect the large tow T300 prices (e.g. the mainstream type of CF used in wind application) to gradually return to 2020 levels (decline by 25-35%) ([Exhibit 17](#)), that should attract further interest from domestic wind turbine OEMs. **We estimate CF demand for wind industry to grow by a CAGR of 27% for the next 3 years to reach 59kt, supported by higher CF adoption** (4%/10% for onshore/offshore wind market by end-2025E vs. 1-2% currently) ([Exhibit 28](#), [Exhibit 30](#), [Exhibit 31](#)), **with domestic consumption surpassing the export market in 2025E** ([Exhibit 29](#)). We believe wind energy industry will **remain the largest end-use industry** for CF by end-2025E in China, accounting for c.46% of the CF demand. Meanwhile, the use of CF in wind turbine blades should have limited impact on GF, given the size of substitution vs. GF's overall annual consumption.

Identifying the next growth opportunities

The potential for composite materials is vast and can be used in multiple applications by producers, this is especially true for CF composites. With GF composites being adopted in more than 50,000 applications, **the CF composites space still has a lot of undiscovered uses cases to be explored. We estimate the overall domestic CF demand to grow to 127kt in 2025 (20% CAGR), with market size reaching RMB21.8bn/US\$3.1bn**. We see early signs that C/C (carbon/carbon) composite could become the next growth driver for CF in China. C/C composite is a family of advanced composite material derived from CF reinforcement with carbon matrix. It was originally developed to be used in the aerospace industry, where **mechanical performance under high temperature matters**. In recent years, **we have seen robust growth prevailing in the civilian markets, especially in the solar energy industry** ([Exhibit 32](#)). This advanced material is being adopted in the thermal field systems of the crystal growth process (an early stage of the entire solar cell production cycle, [Exhibit 33](#)). **We estimate that solar thermal field system currently comprises c.55% of C/C**

composite content and is set to grow to 75% by 2025E to support the solar wafer size upsizing trend (Exhibit 35, Exhibit 38). Besides higher penetration, we expect demand for C/C composite will also be driven by: 1) **new solar installations at a global level** (Exhibit 37), as China has a majority market share in solar wafer production (owning 95%+ of the world's solar wafer capacity); 2) **replacement demand**, with components' lifespan ranging from 6 months to 2 years (Exhibit 34). Solar energy industry presents a significant opportunity for CF consumption. **We expect CF demand for C/C composite application to grow by 34% CAGR, reaching 22kt by end-2025E** (Exhibit 39). Beyond 2025, we believe the auto industry could take up the growth baton, supported by FCV (fuel cell vehicles) development (e.g. hydrogen storage) and automotive lightweighting trend (e.g. brake disc).

How to position - Stock ideas

We initiate coverage on three names: Zhongfu Shenying (Buy), Weihai Guangwei Composites (Buy) and China Jushi (Neutral), given their leading positions along the composite value chain. **Our top pick is ZFSY** for its strong position in high-performance products with more favorable end-market exposure towards new energy, where it has significant commercialization capability and plans to grow its capacity 4X by 2024.

Zhongfu Shenying (688295.SS): Gaining share in the growing civilian-use CF market; Buy

Zhongfu Shenying (ZFSY) is a leading CF producer (in capacity terms) in China, primarily engaged in the production of CF rovings, including both high strength and high modulus products, with downstream applications spanning across wind energy, pressure vessels and C/C composites. Its topline posted a solid 56% CAGR over 2018-2021, outstripping the capacity expansion (16% CAGR) and indicating a strong uptrend in pricing and utilization improvement. We believe T700 will be the fastest growing CF sub-segment in China for the next 3 years, driven by C/C composite demand where we are expecting a 34% CAGR by 2025E. ZFSY's current expansion plan will position it well to capture the energy transition opportunities through market share gain in the high-performance CF segment. We estimate a 46%/52% revenue/NPAT CAGR over 2021 to 2025E. **Initiate at Buy with a 12m TP of RMB55.7/sh.**

Guangwei Composites (300699.SZ): A beneficiary of wind industry development; Buy

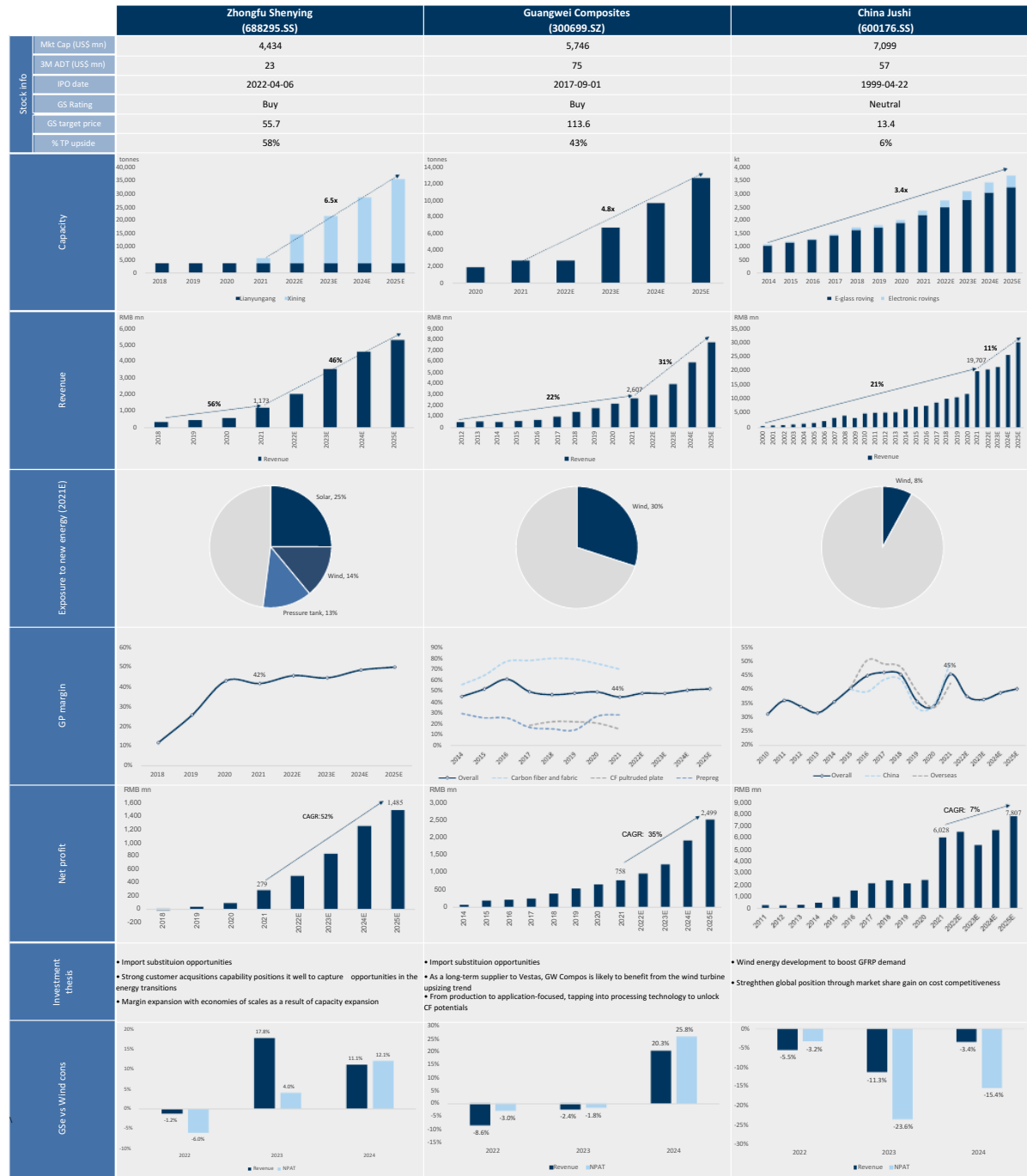
Weihai Guangwei Composites (GW Compos) is a leading player in every stage of the domestic CF development. It has emerged as a domestic leader and key contributor in setting national CF standards, **facilitating the CF commercialization and deployment in China**. The company has successfully established a **comprehensive industrial chain** among all CF producers in China, with businesses covering CF manufacturing, equipment and processing technologies. Leveraging its technical strength through the supply to the defense market, we expect GW Compos will gradually increase its exposure in the civilian market. As a long-term CF pultruded plate supplier to Vestas, **we believe GW Compos will benefit from the wind turbine upsizing trend** with more turbine OEMs adopting CF for wind turbine blade construction in the near future. We estimate NPAT to grow by 35% over 2021-2025E, outpacing topline growth (31% CAGR) on margin expansions. **Initiate coverage at Buy with a 12m TP of**

RMB113.6/sh.

**China Jushi (600176.SS): Cost competitiveness to weather a short-term slowdown;
Neutral**

China Jushi is the world's largest GF producer (c.22%/34% global/domestic market share as of 2021), with a comprehensive product offering, including GF roving, fabrics and electronic yarns. It has made significant inroads into the overseas business, with 47% of revenue generated from overseas operations in 1H22. We believe Jushi will continue to **gain market share globally on cost competitiveness**, but the recent pricing weakness arising from **supply/demand imbalance will pressurize margins** across the industry entering 2023. We estimate a revenue CAGR of 11% over 2021-2025E, mainly led by capacity expansion. At 9.3x PE (1-sd below historical avg), we believe the stock has priced in most negatives and is fairly priced. **Initiate at Neutral with a 12m TP of RMB13.4/sh.**

Three stocks in focus - our top pick is ZFSY

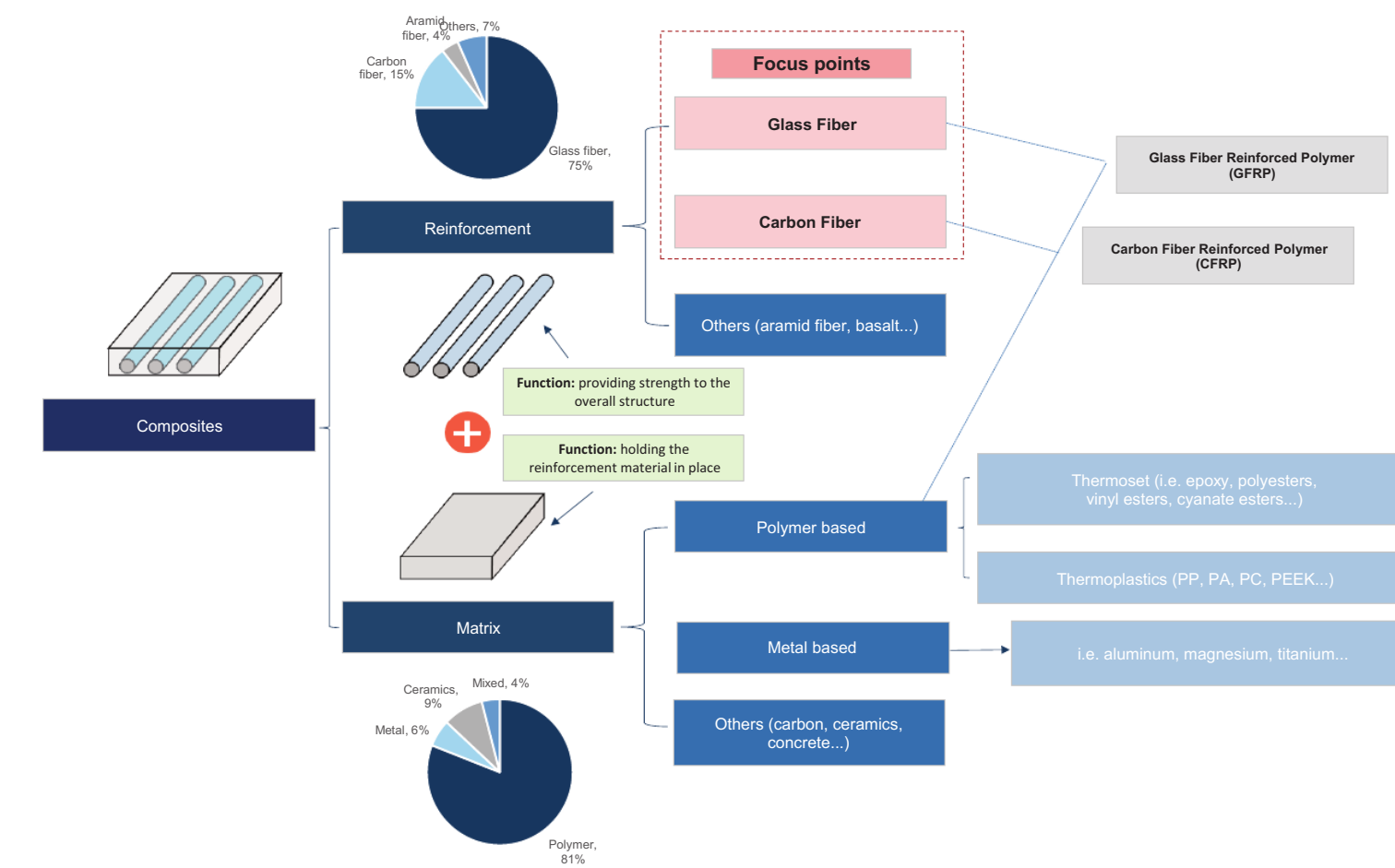
Exhibit 1: Three stocks in focus


Pricing as of Oct. 10, 2022

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

Overview of Composite Materials

Exhibit 2: Overview of composite materials






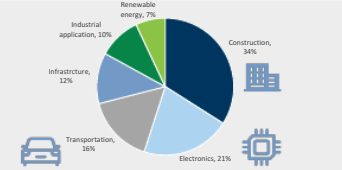
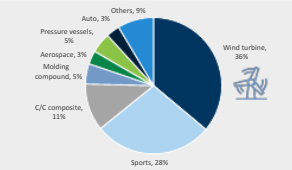
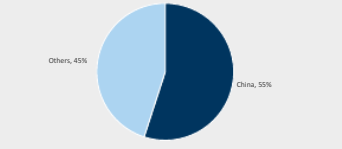
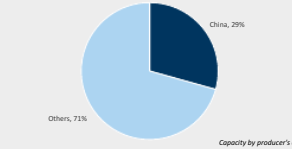
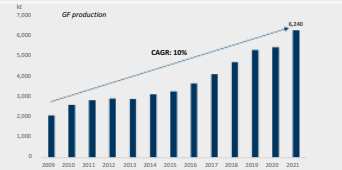
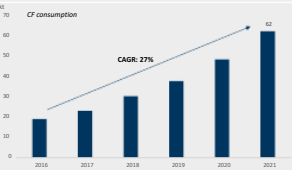
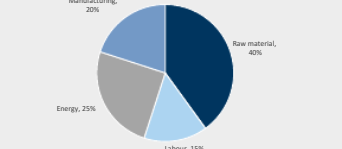
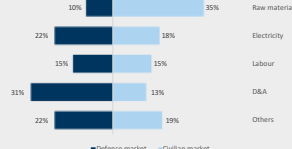
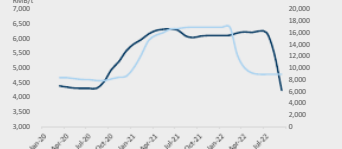
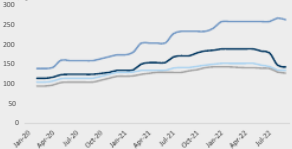






Source: Goldman Sachs Global Investment Research, CSFCM

13 October 2022

Glass Fiber (GF) vs. Carbon Fiber (CF)

Exhibit 3: GF vs CF

		Glass Fiber (GF)	Carbon Fiber (CF)
Related products		  	 
		Roving Chopped strands Fabrics/Mats	Carbon Fiber Fabrics
End market breakdown (2021)			
		Construction, 34% Electronics, 23% Transportation, 16% Infrastructure, 12% Industrial application, 10% Renewable energy, 7% Others, 45%	Wind turbine, 36% Sports, 28% C/C composite, 11% Molding compound, 5% Aerospace, 3% Pressure vessels, 5% Auto, 3% Others, 9%
Competitive landscape (2021)			
		China, 55% Others, 45%	China, 29% Others, 71% <i>Capacity by producer's country</i>
GF composite vs. CF composite	Cost	Low	High
	Density	Medium density	Low density/lightweight
	Tensile Strength	Good	Excellent
	Modulus	Good	Excellent
	Conductivity	Insulative	Highly conductive
Growth profile			
		CAGR: 10%	CAGR: 27%
Cost structure (2021)			
		Raw material, 40% Energy, 25% Labour, 15% Manufacturing, 20%	Raw materials, 35% Electricity, 18% Labour, 15% D&A, 13% Others, 19%
Price trend			
		RMB/t 7,000 6,500 6,000 5,500 5,000 4,500 4,000 3,500 3,000	RMB/kg 300 250 200 150 100 50 0
Key players	Global players		
	Domestic players		

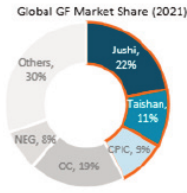
Source: Company data, Wind, Baiinfo, Goldman Sachs Global Investment Research

Three key themes in charts

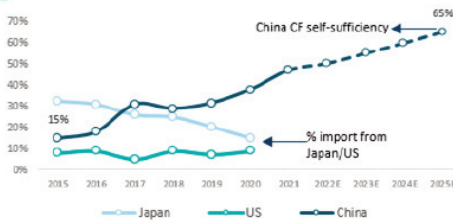
THEME 1

Tackling the ongoing trade tensions through globalization (GF) and import substitutions (CF)

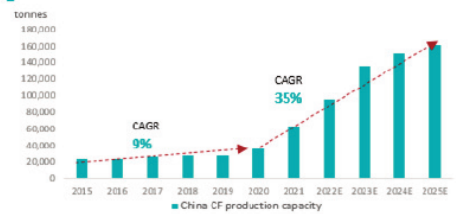
Through overseas expansion, Chinese GF producers will remain dominant



Trade tensions have accelerated CF import substitutions in China...



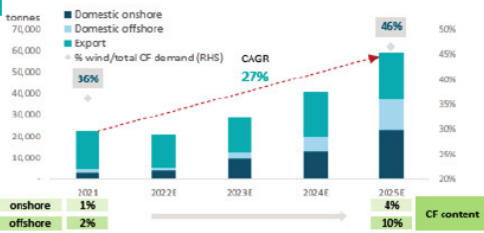
... supported by rapid capacity expansion by local players



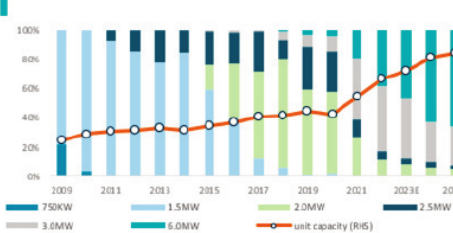
THEME 2

Capturing the wind opportunity

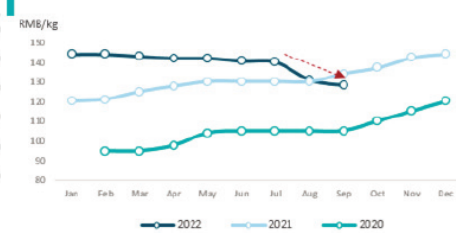
With rising CF content, China's CF demand for wind to grow 27% CAGR



... to support the wind turbine upsizing trend...



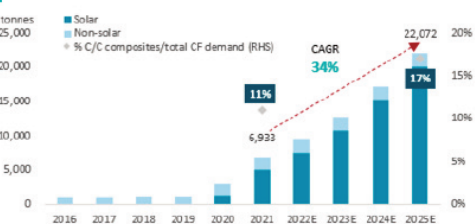
... declining raw material cost a tailwind for CF adoption



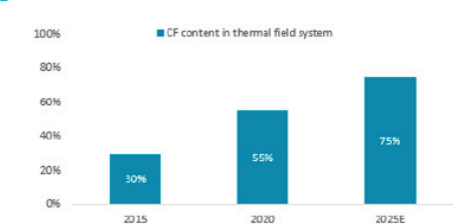
THEME 3

Identifying the next growth opportunities

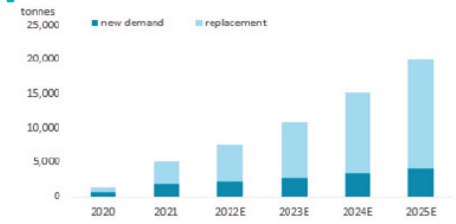
Solar industry will be the next key growth driver for China's CF demand...



...with above-solar-industry growth driven by: 1) CF content increase...



...and 2) recurring replacement demand for thermal field system



Source: Comany data, Wind, Baiinfo, Goldman Sachs Global Investment Research, Gao Hua Securities Research

13 October 2022

Global comp sheet

Exhibit 4: Global comp sheet

Company name	Ticker	Trading coy	GS Rating	TP (RMB)	upside (%)	Share price	Mkt cap (US\$ mn)	3M ADT (US\$ mn)	PE (x)			3-year EPS CAGR	PB (x)			ROE (%)			Divide
									2022E	2023E	2024E		2022E	2023E	2024E	2022E	2023E	2024E	
Glass fiber																			
Global																			
Owens Corning	OC.US	USD	Sell	74.0	-14%	86	8,236	86	6.7	7.6	6.9	6%	1.7	1.5	1.2	24.8	19.6	18.6	1.6
Nippon Electric Glass	5214.T	JPY	NC	-	-	2,587	1,767	11	9.7	9.3	9.1	-5%	0.5	0.5	0.4	6.3	5.0	5.1	4.6
Domestic																			
China Jushi	600176.SH	CNY	Neutral	13.4	6%	12.7	7,099	55	7.6	7.2	6.5	9%	1.8	1.6	1.3	24.3	21.5	20.2	4.0
Sinoma Tech	002080.SZ	CNY	NC	-	-	19.6	4,587	77	8.7	7.7	6.6	14%	1.9	1.6	1.3	21.6	20.1	19.5	3.4
Changhai Composite	300196.SZ	CNY	NC	-	-	13.6	774	10	7.6	6.4	5.3	22%	1.3	1.1	0.9	17.5	17.5	17.8	1.5
Shandong Fiberglass	605006.SH	CNY	NC	-	-	8.5	709	4	7.4	6.4	5.5	19%	1.7	1.3	1.1	22.7	21.6	20.8	3.1
Global Avg									8.2	8.4	8.0	1%	1.1	1.0	0.8	15.6	12.3	11.8	3.1
Domestic Avg									7.8	6.9	6.0	16%	1.7	1.4	1.2	21.5	20.2	19.6	3.0
Overall									8.0	7.7	7.0	8%	1.4	1.2	1.0				3.1
Carbon fiber																			
Global																			
Toray	3402.T	JPY	Buy*	1,050	41%	746.3	8,355	31	11.5	10.4	9.3	16%	0.8	0.8	0.7	7.1	7.5	7.8	2.4
Teijin	3401.T	JPY	NC	-	-	1410.0	1,915	7	9.9	8.7	8.1	14%	0.6	0.6	0.5	6.2	6.7	6.9	3.9
Hexcel	HXL	USD	Sell	46	-15%	54.1	4,547	32	42.1	27.2	19.7	115%	3.0	2.7	2.4	6.8	101.9	12.2	0.7
SGL Carbon	SGL.DE	EUR	NC	-	-	6.2	738	1	8.8	11.2	9.2	1%	1.6	1.4	1.3	17.5	12.3	13.6	0.0
GW Compos	300699.SZ	CNY	Buy	113.6	43%	79.3	5,746	75	42.0	33.2	27.2	26%	8.3	6.9	5.7	20.2	21.4	21.6	0.7
Zhongfu Shenyang	688295.SH	CNY	Buy	55.7	58%	35.3	4,434	23	60.5	39.9	28.5	59%	7.7	6.4	5.3	16.3	18.6	20.8	0.3
Sinofibers	300777.SZ	CNY	NC	-	-	45.1	2,769	45	41.7	29.8	23.8	60%	6.4	5.3	4.4	17.8	19.2	19.7	0.4
Jilin Tangu	836077.BJ	CNY	NC	-	-	46.1	2,053	3	20.4	14.3	10.9	62%	9.4	5.6	3.6	47.1	40.7	35.2	0.5
Global Avg									18.1	14.4	11.6	37%	1.5	1.4	1.3	9.4	32.1	10.1	1.8
Domestic Avg									41.1	29.3	22.6	52%	8.0	6.1	4.8	25.3	25.0	24.3	0.5
Overall									29.6	21.8	17.1	44%	4.7	3.7	3.0	17.4	28.5	17.2	1.1

NC = Not Covered; Pricing as of Oct. 10, 2022; *denotes stock on regional Conviction List

Source: Bloomberg, Wind, Company data, Goldman Sachs Global Investment Research

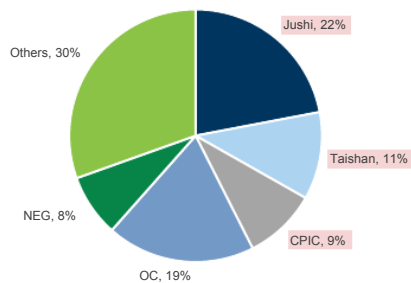
Three themes in focus

Tackling the ongoing trade tensions through globalization and import substitution

Glass Fiber industry: Going global

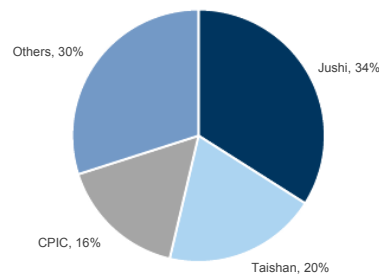
The Glass Fiber (GF) industry is a highly consolidated market both in China and globally, with the top-5 players having a combined market share of c.70% (as of 2021). This includes three Chinese manufacturers: China Jushi, Taishan Fiberglass, and Chongqing Polycomp International (CPIC). The proximity and cheap access to raw materials, coupled with low labor costs and economies of scale have allowed Chinese players to strengthen their market positions. **Historically, Chinese GF producers have enjoyed an average 9ppt margin premium compared to global peers.**

Exhibit 5: Market share of GF industry (Global) - 2021



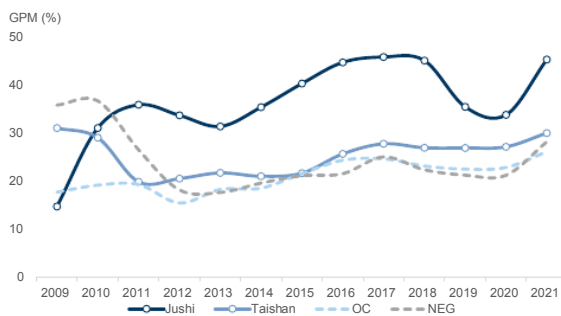
Source: Company data, Goldman Sachs Global Investment Research

Exhibit 6: Market share in GF industry (China) - 2021



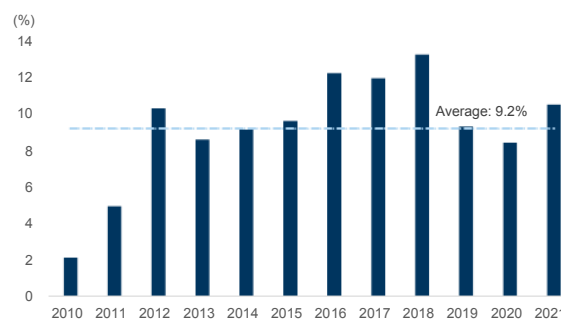
Source: Company data, Goldman Sachs Global Investment Research

Exhibit 7: GPM of leading GF producers



Source: Company data

Exhibit 8: GPM spread of leading Chinese GF producers vs global peers

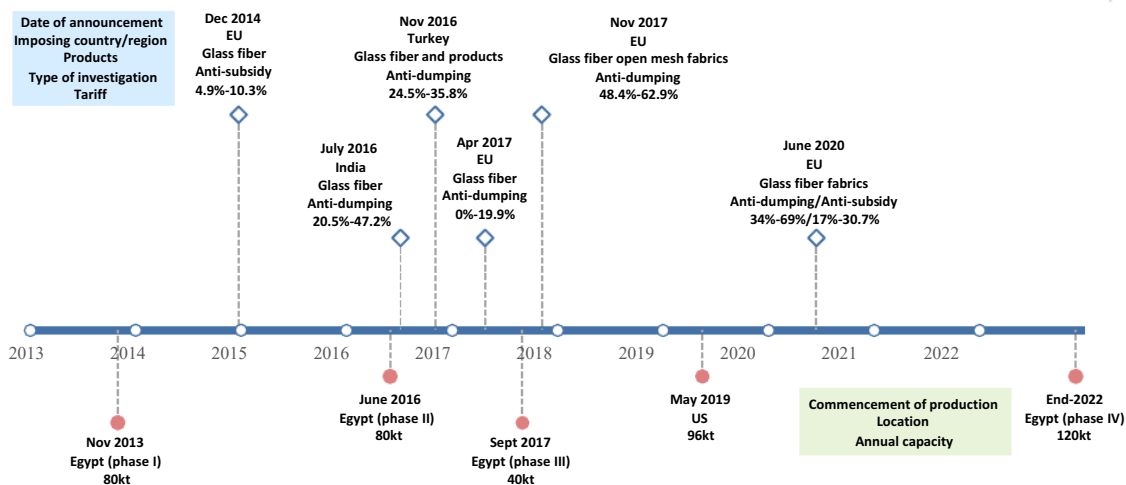


Source: Company data, Goldman Sachs Global Investment Research, Gao Hua Securities Research

Since the early 2010s, European Union countries, India, Turkey and the United States have imposed a series of anti-dumping and anti-subsidy measures on imports of certain GF products from China. To minimize this impact, Jushi has become the first manufacturer to build production plants outside of China. Jushi's first overseas plant,

located in the Suez Economic and Trade Cooperation Zone of Egypt, benefiting from easy access to Europe, Turkey, Middle East markets, commenced construction in 2011. The first phase of 80kt in capacity was put into operation in 2013. With the completion of the second/third phases of the project in 2016/2017, the annual production capacity of its Egyptian plants increased to 200kt. The ongoing trade tensions appear to have accelerated the pace of global expansion. Specifically, the construction cycle of Jushi's first three Egypt plants was shortened to 5 years compared to 8-10 years in the original plan. Following success in the Egyptian market, Jushi's second overseas base, in South Carolina in the US, began construction in 1Q2017 and commenced operation in 2019. The 4th phase of the Egypt plant, with an annual capacity of 120kt, is expected to come on stream at the end of 2022 with overseas operations accounting for 15% of its total capacity. As manufacturers continue to gain overseas exposure, **we believe Chinese leading GF producers will remain dominant in the global market.**

Exhibit 9: Timeline of anti-dumping and anti-subsidy measures vs. Jushi's overseas expansion

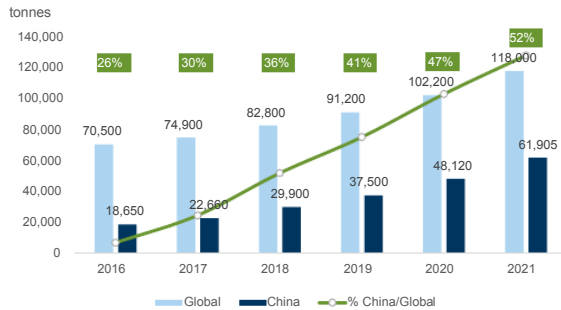


Source: Company data, data compiled by Goldman Sachs Global Investment Research, Gao Hua Securities Research

Carbon Fiber industry – import substitution

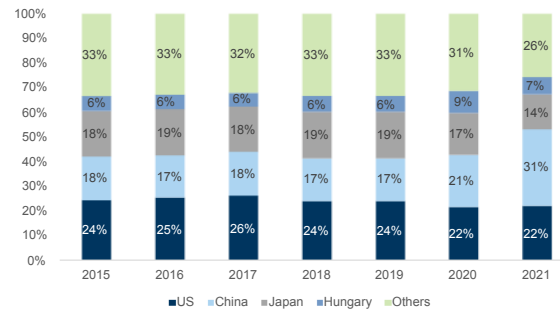
Unlike the GF sector, where Chinese producers have leading market share globally, the market landscape for Carbon Fiber (CF) sector is somewhat different. Chinese scientists began conducting research studies on CF materials in the 1960s, at around the same time as Japan, UK, and the US players, but development lagged behind global peers. Commercialization did not start until 2010s. China now consumes more than half of the world's CF composites, but only owns 1/3 of the world's capacity.

Exhibit 10: CF consumption (China vs. Global)



Source: Wind, CSFCM, Bainfo

Exhibit 11: CF capacity breakdown by country

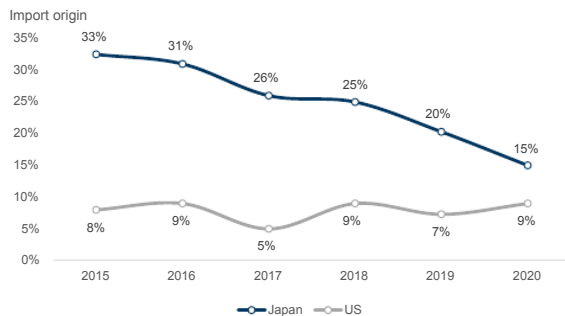


Source: Wind, CSFCM, Bainfo

In the past, the domestic CF market relied heavily on Japan. In 2015, 1/3 of the CF products consumed in China were imported from Japan. Both Japan and the US have regularly imposed export restriction measures on Chinese companies, particularly high-end products used for military purposes. As a recent example, in 2020, Toray (covered by Atsushi Ikeda), the leading Japanese CF maker received a warning from Japanese authorities, indicating that some of their CF products that had been exported to the Chinese market were sold to unauthorized parties. Following this incident, Toray suspended exports to China, causing supply disruptions in China's domestic market.

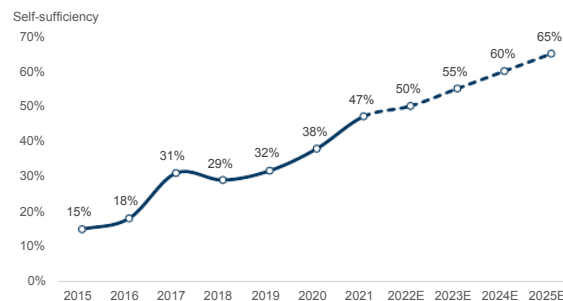
The ongoing export restrictions have accelerated the pace of import substitution with the self-sufficiency rate growing from 15% in 2015 to 47% in 2021. We expect China's CF self-sufficiency to grow by an average of 4-5ppts per annum to reach 65% by end-2025E, supported by growing product coverage and capacity expansion in the domestic market.

Exhibit 12: China's CF imports by country



Source: Wind, CFSCM

Exhibit 13: China's CF self-sufficiency rate



Source: Wind, CFSCM, Goldman Sachs Global Investment Research, Gao Hua Securities Research

With product and technology readiness, we believe visibility for import substitution is high. [Exhibit 14](#) shows the product portfolio of Toray and leading Chinese players. Toray's product classification is well recognized by industry players and is often used as a benchmark for product comparison. Toray produces high-strength CF ranging from standard modulus to intermediate and high modulus products. **Nowadays, leading**

Toray and leading Chinese CF producers



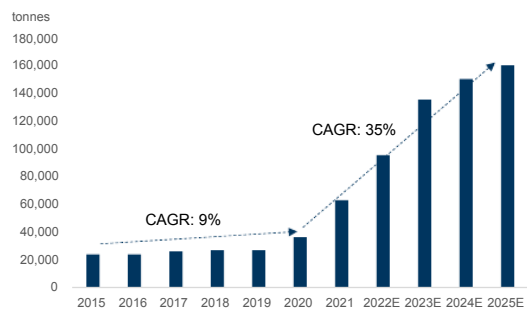
	Aircraft	Space	UAM	Automotive	Train	Marine	Pressure Vessel	Pipe	Electric Cable	Medical	Civil Engineering	Sporting Goods	Wind	Solar
T300	•		•	•	•	•				•		•	•	
T400	•												•	
T700	•	•	•	•	•	•	•	•	•	•	•	•		•
T800	•	•	•	•	•	•	•	•			•	•		
T1000		•		•										
T1100	•	•	•	•								•		
M35J												•		
M40J			•	•		•						•		
M46J		•		•		•				•	•	•		
M50J												•		
M55J		•		•						•		•		
M60J		•								•		•		

Source: Company data, Goldman Sachs Global Investment Research, Gao Hua Securities Research

- The T-series (T = "Tensile Strength") is characterized by high tensile strength and a standard to intermediate modulus. The number following the letter T denotes the approximate tensile strength in kgf/mm² or Ksi (T700 has a tensile strength of 711 Ksi).
- The M-series (M = "Modulus"), comes with high modulus features. The number following the letter M indicates the approximate tensile modulus in kgf/mm² (M55J has a tensile modulus of 55 x 10³ kgf/mm²). (Source: Toray company website)

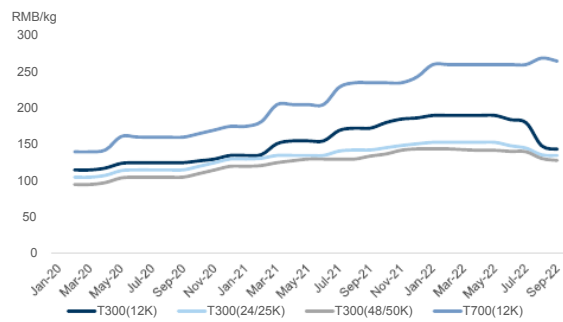
Capacity expansion in response to strong downstream demand and trade restrictions is another factor supporting import substitution momentum. China’s CF operating capacity reached 69kt in 2021, compared to 36kt a year earlier. **With existing announced capacity plans, operating capacity could reach c.161kt by 2025E.** We have started to see pricing trend divergence between low-grade (e.g. T300) and high-grade (e.g. T700 or above) CF products entering 3Q22. We expect prices to remain resilient for high-grade products entering 4Q22/1H23 given higher entry barriers, a longer product verification process, and limited suppliers with industrialization capabilities in T700 productions.

Exhibit 16: China's CF capacity projection



Source: Baiinfo, Goldman Sachs Global Investment Research, Gao Hua Securities Research

Exhibit 17: Domestic CF prices



Source: Baiinfo

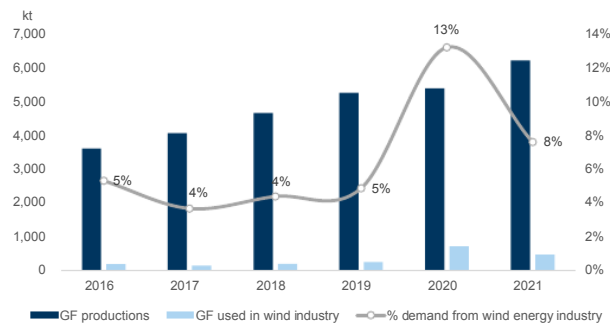
Capturing the wind opportunity

The role of composite materials in the wind industry

The selection of lightweight materials is important for wind turbine blade construction. The most widely used composite in wind turbine blades is GFRP (Glass Fiber Reinforced Polymer). Its wide-spread use in the market is attributed to its excellent mechanical properties at a relatively low cost. The GF sector has benefited from an increase in wind turbine installations over the past two years. As a rough rule of thumb, 1GW of wind capacity installations requires 10kt of GF consumption. China added 72GW/48GW of wind capacity in 2020/2021, respectively, implying 720kt/480kt of GF consumption, accounting for 13%/8% of total GF demand, up from previous levels of c.5%.

Our China Clean Energy team estimates China wind installation (by volume) to accelerate at 22% CAGR over 2022-25E, which would continue to support GF consumption. However, **we are seeing a more promising future for the CF sector, as it not only benefits from higher wind turbine installations but also rising CF content used in wind turbine blades in order to meet the recent wind industry trends.**

Exhibit 18: GF consumption and % demand from wind industry



Source: Wind

Latest trends in wind development

One clear trend in the wind industry is turbine and plant upsizing. Taking as an example, for Goldwind (covered by Chao Ji), China's largest wind turbine manufacturer, the most popular model prior to 2015 was the 1.5MW-rated turbine, accounting for c.60% of sales volume. Since 2016, the mainstream model had shifted to 2MW and more recently to 3MW. Our China clean energy team estimates that 6MW+ will become the next growth driver, making up more than 60% of Goldwind's sales volume.

Although turbine upsizing requires higher upfront costs, it brings the benefit of unit cost reduction when measured through a plant's entire lifespan, as higher rated turbines reduce the number of systems required to generate the same amount of energy across a wind farm, which sequentially leads to less component/materials cost as well as lower maintenance expenses.

Wind energy output depends on three key factors: 1) air density; 2) wind speed; and 3)

swept area of the turbine blade. The industry's race to produce a longer turbine blade is not only to meet the higher desired power output for the offshore wind market but also to compensate for slower wind speed as far as the onshore wind market is concerned.

Exhibit 19: The wind power equation

$$P = \frac{1}{2} \rho A V^3 = \frac{1}{2} \rho \pi r^2 V^3$$

where:

P is wind energy output

ρ is air density

A is the swept area

r is the blade length

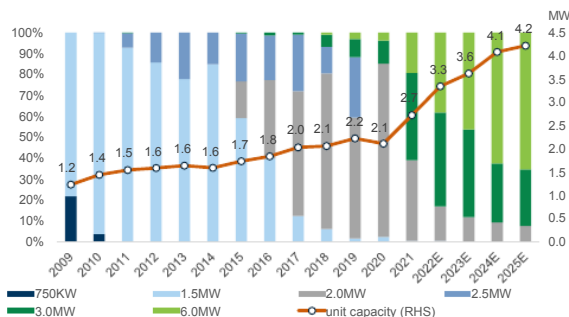
V is wind velocity

Source: Company data, Goldman Sachs Global Investment Research, Gao Hua Securities Research

Why CF is a promising alternative solution

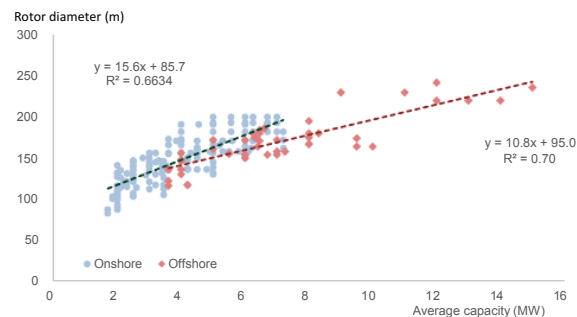
We have gathered specifications from over 200 wind turbine blade models that are offered by leading global and domestic wind turbine OEMs (in [Exhibit 21](#)). The longest wind turbine blade available in the market today is around 120m long, comparable to the length of a football pitch. A longer blade adds extra weight and is also more **susceptible to tip deflection**, hence **stiffness-to-weight ratio is a major consideration** from the material selection perspective. CF is considered to be a promising alternative solution to GF, given its low density and superior stiffness properties. However, the elevated cost compared to GF (>10 times more expensive) as well as supply chain restrictions also limit broader adoption.

Exhibit 20: Goldwind's product breakdown by rated power



Source: Company data, Goldman Sachs Global Investment Research, Gao Hua Securities Research

Exhibit 21: Specification of turbine blades produced by leading turbine OEMs

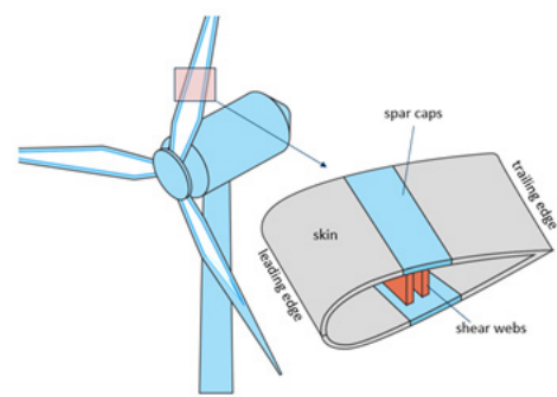


Source: Company data

The use of CF in the selected structural parts of the turbine blades has proven to be a commercially viable solution. **This carbon/glass hybrid structure takes advantage of**

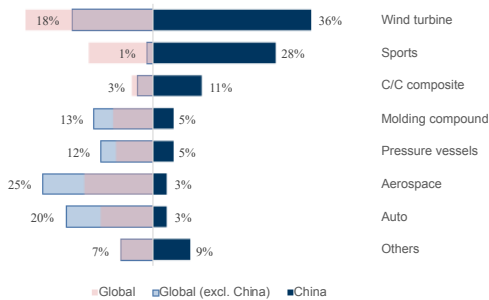
carbon fiber’s lightweight characteristics and achieves a possible balance between cost and performance. Vestas (covered by Ajay Patel), a leading global wind turbine OEM, uses CF on the spar caps (Exhibit 22) of the turbine blade. The spar cap, which serves as the backbone of the blade, is manufactured from the pultrusion method instead of the conventional resin infusion or resin transfer molding process.

Exhibit 22: Structure of wind turbine blade



Source: Goldman Sachs Global Investment Research, Gao Hua Securities Research

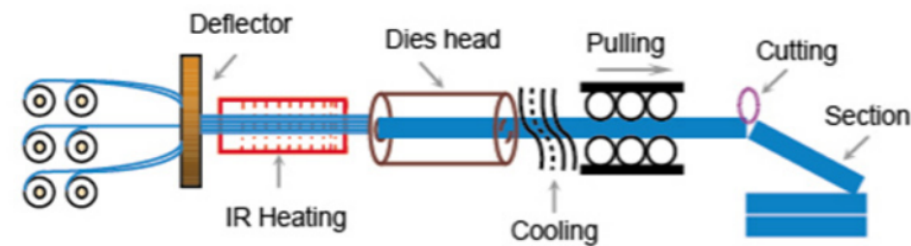
Exhibit 23: CF demand by end-market (measured by volume) - 2021



Source: Wind, CSFCM

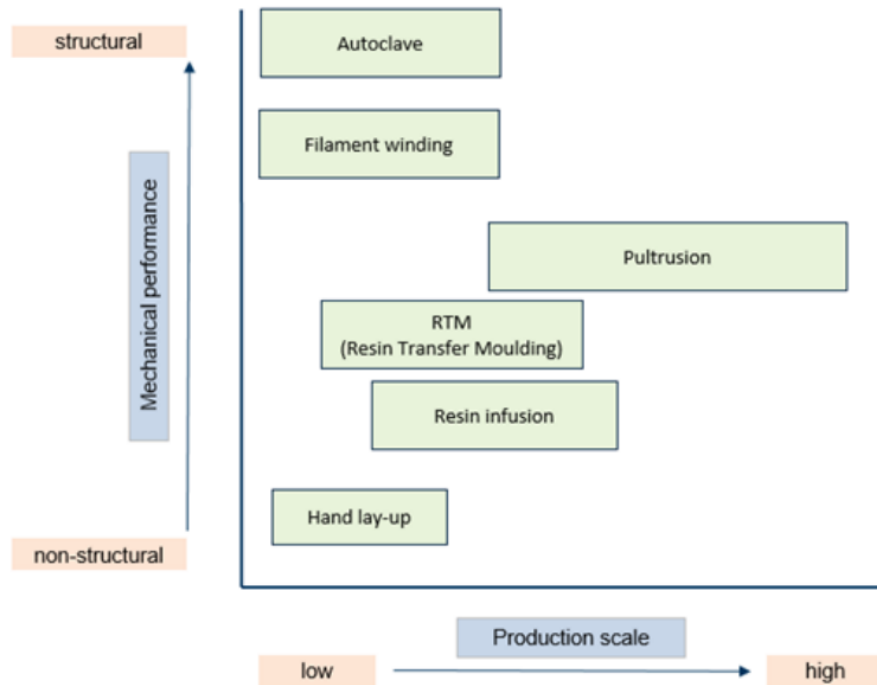
Pultrusion (pull + extrusion) is a low-cost and high-volume manufacturing process, suitable for producing long parts with **constant cross-section** and **continuous length**, which makes it an ideal fabrication process for spar caps. The successful implementation of this cost-effective method has boosted CF adoption in the wind energy industry. Wind turbine blades have become the largest (measured by production volume) single downstream application of CF both at national and global levels. Vestas has owned a patent, associated with the adoption of the technology, which expired in July 2022, **opening up further opportunities for Chinese wind turbine OEMs to access to this technology.**

Exhibit 24: Schematic illustration of pultrusion process



Source: Company data

Exhibit 25: Comparison of different composite manufacturing process

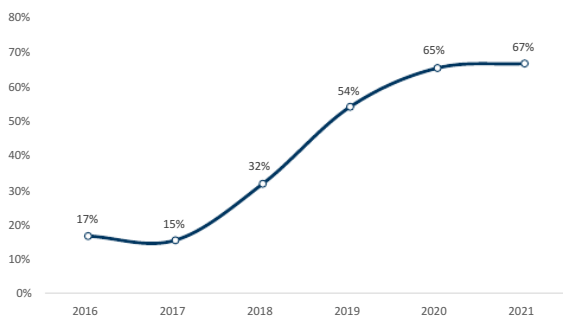


Source: Company data, compiled by Goldman Sachs Global Investment Research, Gao Hua Securities Research

We expect the wind energy will remain the largest end-use industry for CF by end-2025E in China

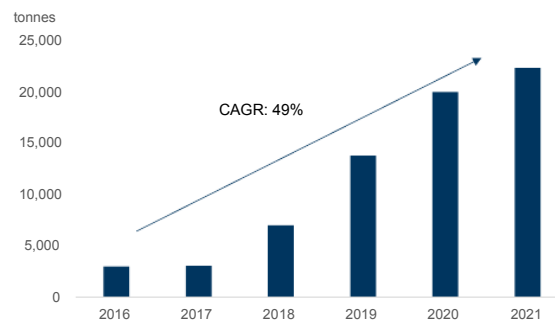
In 2021, China produced 22kt of CF for use in wind turbine blades, which accounted for roughly 2/3 of the world's demand for this end-market. However, little of this CF production was consumed by domestic turbine OEMs or blade manufacturers.

Exhibit 26: % of CF used in wind turbine blades produced in China



Source: Wind, CSFCM

Exhibit 27: CF consumption used in the wind energy industry



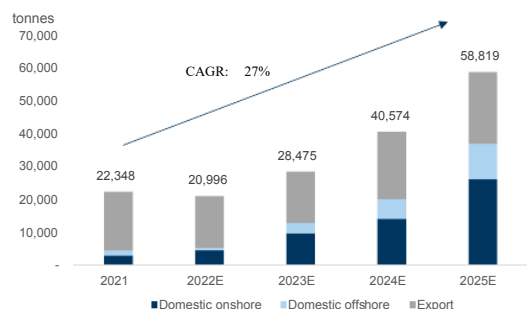
Source: Wind, CSFCM

We estimate demand for this segment to **grow by a CAGR of 27% for the next 3 years, reaching 59kt, with domestic consumption surpassing the export market in 2025**. We believe wind energy will remain the largest end-use industry segment for CF

by end-2025E in China, accounting for 46%/32% of the total demand measured by volumes/value, respectively. We have incorporated the following key assumptions into our demand analysis:

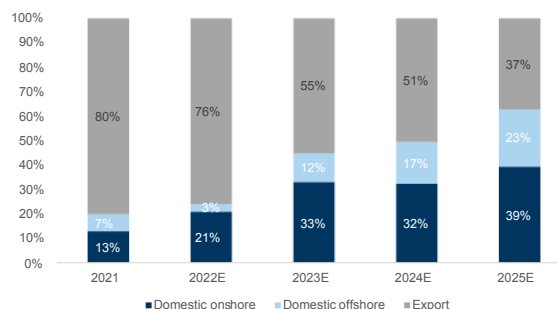
- Wind installations to maintain at a high level in China, with an average c.70GW-80GW to be added each year.
- We use Goldwind/Shanghai Electric's data as proxies for China's onshore/offshore markets respectively, given both companies are leaders in the respective fields. We derive future product mix based on the companies' historical sales mix and product pipelines.
- We extrapolate blade length assumptions from the regression model shown in [Exhibit 21](#)
- Based on the density of materials, we factor in a 30% weight reduction in switching from GF to CF
- CF content to grow to 4%/10% for onshore/offshore wind turbine blades by end-2025E
- For the export market, we assume CF demand to grow in-line with Vestas' deliveries, consistent with our Europe Utilities team's estimates.

Exhibit 28: Projection of CF consumption used in wind turbine blades



Source: Goldman Sachs Global Investment Research, Gao Hua Securities Research, Wind

Exhibit 29: CF consumption breakdown by destination



Source: Goldman Sachs Global Investment Research, Gao Hua Securities Research, Wind

We think the biggest source of uncertainty in our demand analysis could be from the CF content assumptions. Upside risks to our base case assumptions include:

- CF adoption extends from spar caps to other parts of the turbine blade
- Potential technology breakthrough that leads to improvement in fabrication efficiency and reduction in manufacturing costs

We have conducted a sensitivity analysis with different CF content assumptions for both onshore and offshore markets, and present our findings in [Exhibit 30](#) and [Exhibit 31](#).

Exhibit 30: Sensitivity analysis of different CF content assumptions

unit: tons								
% CF content (offshore)		1%	2%	3%	4%	5%	6%	7%
	2%	27,931	34,544	41,157	47,770	54,382	60,995	67,608
	4%	30,694	37,306	43,919	50,532	57,145	63,757	70,370
	6%	33,456	40,069	46,682	53,294	59,907	66,520	73,133
	8%	36,218	42,831	49,444	56,057	62,669	69,282	75,895
	10%	38,981	45,594	52,206	58,819	65,432	72,045	78,657
	12%	41,743	48,356	54,969	61,581	68,194	74,807	81,420
	14%	44,506	51,118	57,731	64,344	70,957	77,569	84,182
	16%	47,268	53,881	60,493	67,106	73,719	80,332	86,944

Source: Goldman Sachs Global Investment Research, Gao Hua Securities Research

Exhibit 31: Sensitivity analysis of different CF content assumptions

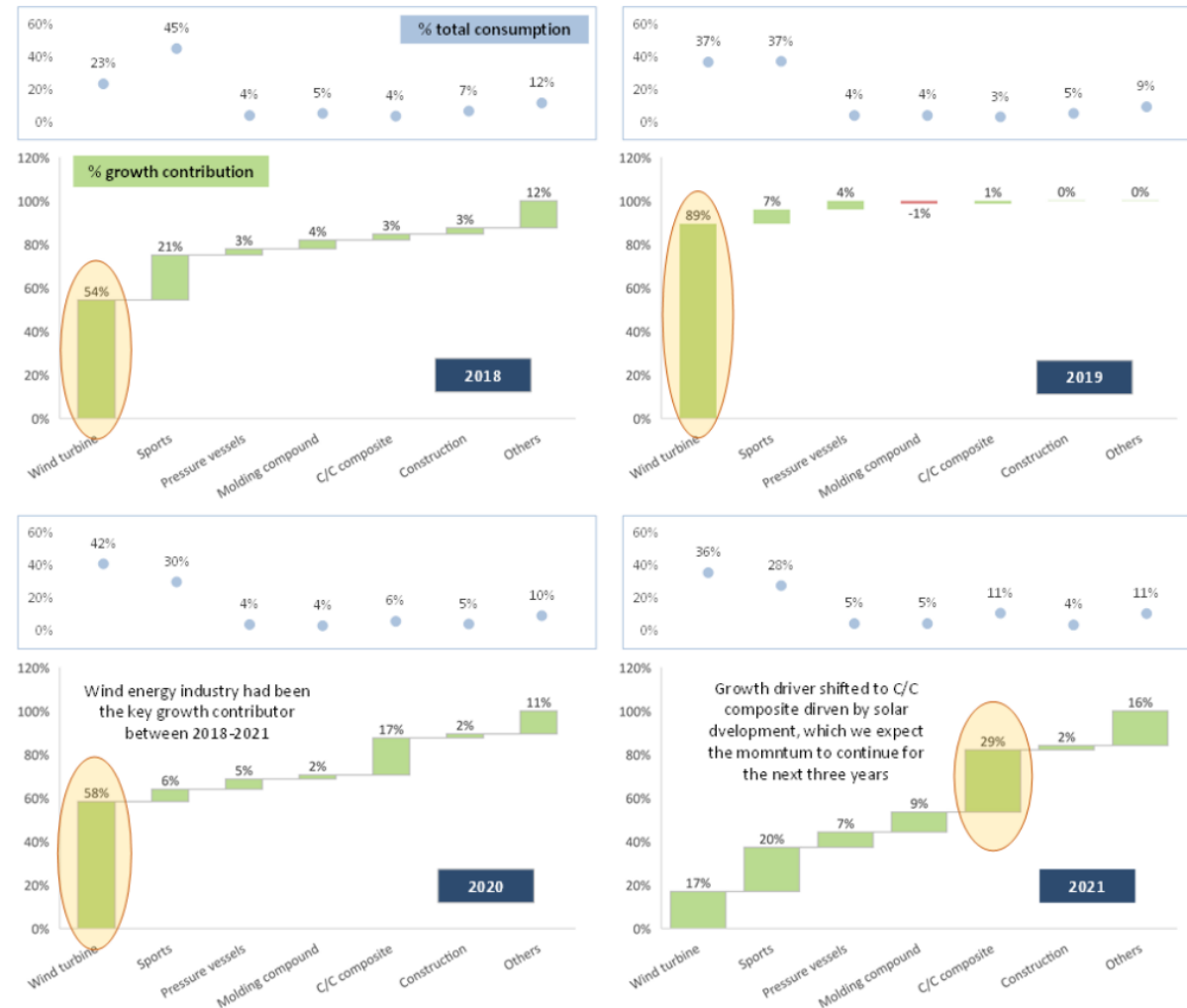
4-yr CAGR								
% CF content (offshore)		1%	2%	3%	4%	5%	6%	7%
	2%	6%	12%	16%	21%	25%	29%	32%
	4%	8%	14%	18%	23%	26%	30%	33%
	6%	11%	16%	20%	24%	28%	31%	34%
	8%	13%	18%	22%	26%	29%	33%	36%
	10%	15%	20%	24%	27%	31%	34%	37%
	12%	17%	21%	25%	29%	32%	35%	38%
	14%	19%	23%	27%	30%	33%	36%	39%
	16%	21%	25%	28%	32%	35%	38%	40%

Source: Goldman Sachs Global Investment Research, Gao Hua Securities Research

Identifying the next growth opportunities

With GF composites being adopted in more than 50,000 applications, the CF composite space still has a lot of undiscovered use cases to be explored. In the near term, we see **growing demand coming from the solar industry, driven by: 1) higher CF content used during the solar production process; 2) new solar installations at a worldwide level; and 3) replacement demand**. Beyond 2025, the auto industry could take up the growth baton, supported by FCVs (fuel cell vehicles) and the lightweight automotive trend.

Exhibit 32: CF growth contribution by end-market application



Source: Wind, Baiinfo

The role of composite materials in the solar energy industry

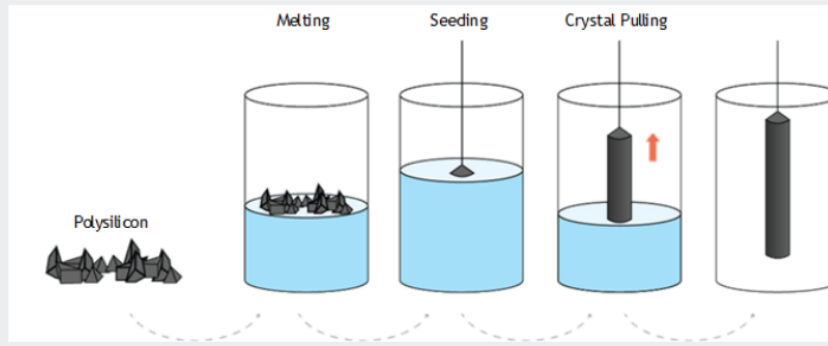
Composite materials consist of reinforcement and matrix. **C/C (carbon/carbon) composite is a family of advanced composites made from CF reinforcement with carbon matrix**. It was originally developed to be used in the aerospace industry, where **mechanical performance under high temperature matters**. The most common

applications include aircraft brake discs and rocket engine nozzles. **In recent years, we have seen robust growth prevailing in the civilian market segment, especially in the solar industry.** Specifically, this material is used in the thermal field system of the crystal growth process (an early stage of the entire solar cell production cycle).

Solar value chain: How does the monocrystalline growth process work?

In the mono-crystalline growth process ([Exhibit 33](#)), polysilicon is melted in a quartz crucible. A seed crystal silicon rod is dipped into molten silicon held by crucible to start the formation of a continuous single crystal. The seed is pulled upwards while rotating it, to **form a mono-crystalline ingot before cutting/slicing into wafer.**

Exhibit 33: Monocrystalline growth process

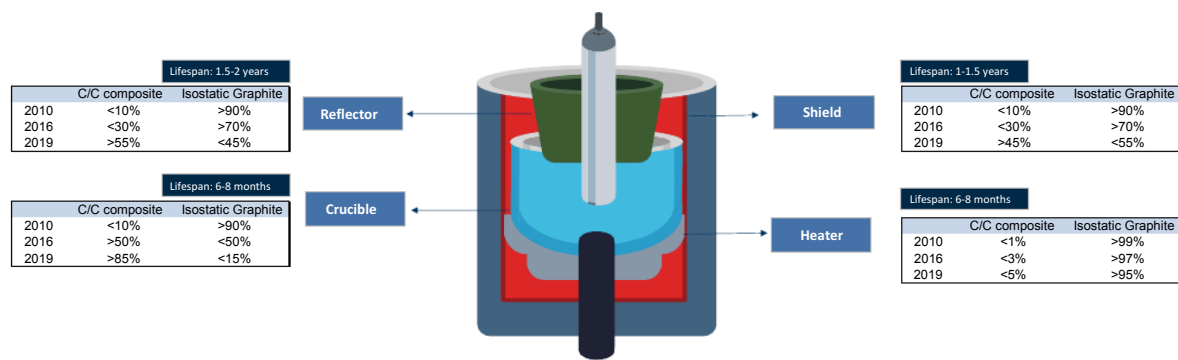


The mono-crystalline growth process is conducted in a thermal field system

([Exhibit 34](#)), consisting of two crucibles, a heater, a reflector, three thermal shields and other accessories. Key functions of these components are:

- Crucible: used to hold the molten silicon; there are two types of crucibles made from different materials within a thermal heat field system. The material used to construct the inner layer of the crucible is quartz, as this material is chemically inert in contact with most substances, hence minimizing contamination. **The outer layer is used to protect the quartz crucible, hence needs to be made from materials with high strength.**
- Heater: to melt solid silicon
- Reflector: transfer heat and establish a temperature gradient to enable crystal growth process
- Thermal shield: to provide thermal insulation

Exhibit 34: A schematic diagram of thermal heat field system used for mono-crystalline silicon growth process

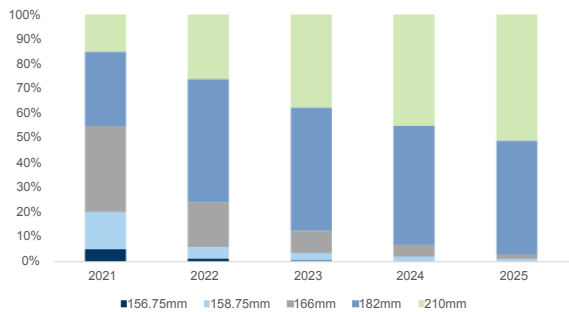


Source: Company data

Isostatic graphite was the most commonly used material for components within a thermal heat field. **The strength of graphite increases with temperature up to a certain limit, this unique feature makes it an indispensable material for high temperature applications.** However, this material has shown some limitations as solar cell manufacturers are actively **adopting larger wafer sizes** to optimize active space in the solar panel to meet the industry’s growing demand for higher power ratings and **achieve better efficiency.**

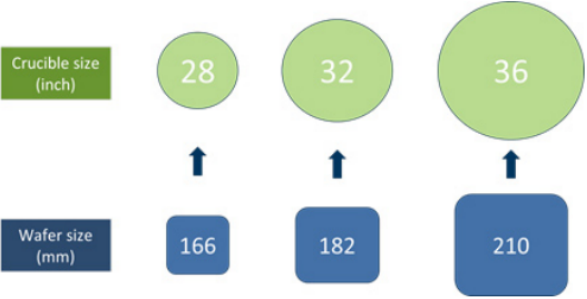
Upscaling wafer size needs to be supported by a large thermal heat field system. Our channel checks with industry experts suggest that **fabrication of graphite crucibles becomes challenging** when crucible sizes exceed 28 inches, hence there is an increasing need to **switch to C/C composites from a manufacturing perspective.** C/C composite also exhibits better resistance to cracking compared to isostatic graphite, this provides extra safety to the system as more molten silicon is held in a larger crucible. Given wafer manufacturers’ existing expansion plans, crucible sizes could increase to 28/32/36 inches to produce 166/182/210mm wafer sizes, respectively.

Exhibit 35: Projection of solar wafer size



Source: CPIA

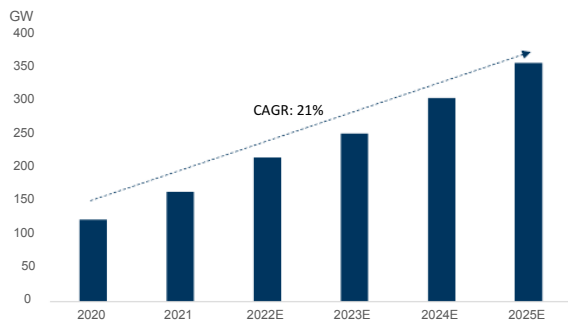
Exhibit 36: Wafer size vs. crucible size



Source: Company data

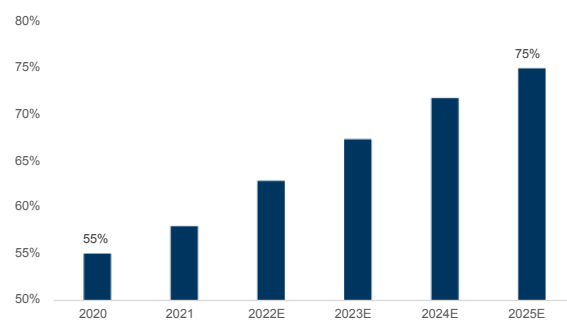
From our channel checks with thermal field components makers, **we estimate that solar thermal field system currently comprises c.55% of C/C composite content**, with crucible having the highest penetration (>90%), while heaters have the lowest penetration (c.5%). The low C/C composite adoption by heater is mainly due to the technological difficulty of achieving uniform resistance, and we believe isostatic graphite will remain as the mainstream material for this component in the near term. Other than that, we expect that by end-2025, all graphite crucibles will be replaced with C/C composite, and 80%+ of thermal shields and reflectors will also adopt this advanced material. This should **boost C/C composite content to 75%+ on the system level based on our forecast**. On top of higher penetration, demand for C/C composite will also likely be driven by new solar installations on a worldwide level, as China has a near monopoly position on solar wafer production (owning 95%+ of the world's solar wafer capacity). In addition, components within the solar thermal field system are exposed to harsh operating environments, and therefore can be considered consumables, with lifespans ranging from 6 months to 2 years.

Exhibit 37: New global solar installations



Source: Bloomberg, Goldman Sachs Global Investment Research, Gao Hua Securities Research

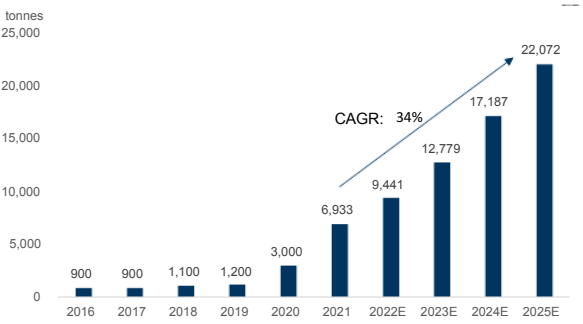
Exhibit 38: C/C composite content for solar thermal field



Source: Company data, Goldman Sachs Global Investment Research, Gao Hua Securities Research

The global solar industry presents a significant opportunity for CF consumption. **We expect CF demand for C/C composite applications to grow from 6.9kt in 2021 to 22kt by end-2025**, contributing to c.17% of the total CF demand. On the back of the energy transitions, we estimate the overall domestic CF demand to **grow from 62kt in 2021 to 127kt in 2025, with market size reaching RMB21.8bn**.

Exhibit 39: Projection of CF demand for C/C composite



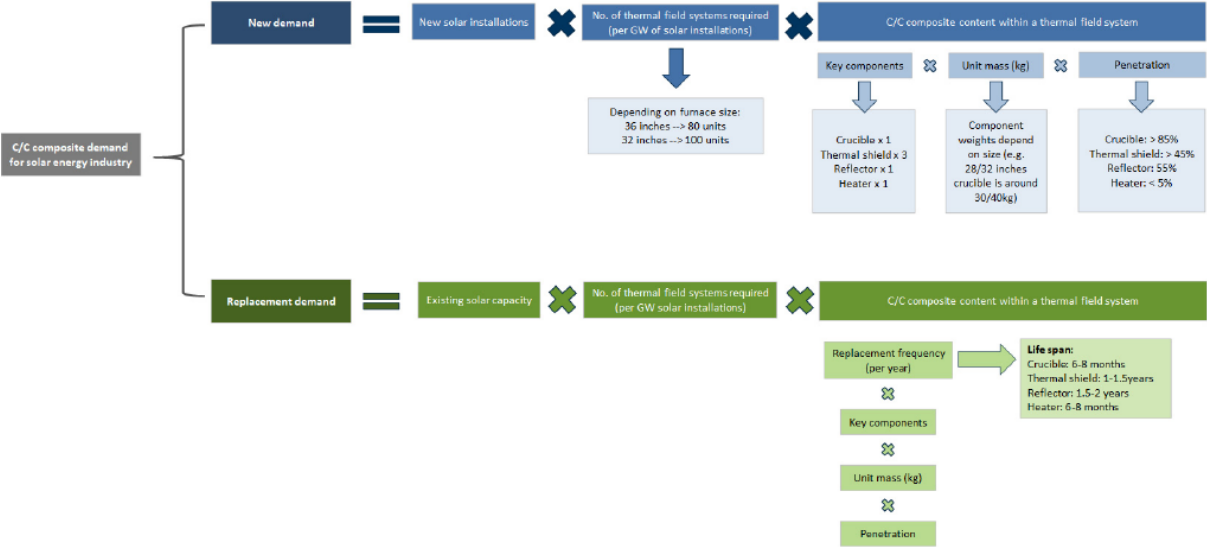
Source: Company data, Goldman Sachs Global Investment Research

Exhibit 40: Demand increment by end-market (2021-2025E)



Source: Goldman Sachs Global Investment Research

Exhibit 41: Methodology of projecting C/C composite demand used in solar energy industry



Source: Goldman Sachs Global Investment Research, Gao Hua Securities Research

Zhongfu Shenying (688295.SS): Gaining share in the growing civilian-use CF market; initiating at Buy

A leading CF supplier targeting the civilian market; initiating at Buy

Founded in 2006, Zhongfu Shenying (ZFSY) is a leading CF producer (in capacity terms) in China, primarily engaged in the production of CF rovings, including both high strength and high modulus products, with downstream applications spanning across wind energy, pressure vessels and C/C composites. Its topline posted a solid 56% CAGR over 2018-2021, outstripping the capacity expansion (16% CAGR) and indicating a strong uptrend in pricing and utilization improvement. We believe T700 will be the fastest growing CF sub-segment in China for the next 3 years, driven by C/C composite demand where we are expecting a 34% CAGR. ZFSY's current expansion plan (4x increment between 2021-2024E) will position it well to capture the energy transition opportunities through market share gain in the high-performance CF segment. We estimate a 46%/52% revenue/NPAT CAGR over 2021 to 2025E. **Initiate at Buy with a 12m TP of RMB55.7/sh.**

Realizing economies of scale with capacity expansion

The company's strong market position can be attributed to the successful adoption of the "dry jet wet spinning" process, that substantially improves manufacturing efficiency, hence boosting production capabilities. Currently, ZFSY has an annual production capacity of 14.5kt, and is set to grow to 28.5kt by 2024. We estimate a margin uptrend (1H22 GPM: 45% vs 2025E: ~49%) to be supported by economies of scale, with unit cost reduction coming from: 1) labour cost; 2) D&A expense; 3) electricity consumption.

Well positioned in the fastest growing CF sub-segment

We believe T700 will be the fastest growing CF sub-segment in China for the next 3 years, driven by C/C composite demand where we are expecting a 34% CAGR. We expect based on ZFSY's current expansion plan it will continue to gain market share (currently 50%) in the high-performance CF segment, particularly given its solid track record of customer acquisitions (e.g. ZFSY is a supplier to the largest C/C composites and hydrogen pressure tanks producers).

Valuation and risks

Our target price of RMB55.7/sh is based on 43x FY2025 PE, discounted back to 2023E at 10.2% CoE. Given the lack of long-term historical trading data for ZFSY, our target multiple is at a c.43% premium to GW Compos' target multiple. We think a premium is justified given a faster earnings growth trajectory. Specifically, we estimate ZFSY's earnings to grow by 33% CAGR over 2025-2028E (as part of our DCF cross-check) vs. GW Compos at 23%, implying a 1.3x PEG for both companies. Key downside risks include: slower-than-expected demand growth in the high-end civilian market; slower-than-expected capacity ramp up; pick up in import of high performance CF; quality issues relating to ZFSY's product; delays in product launch.

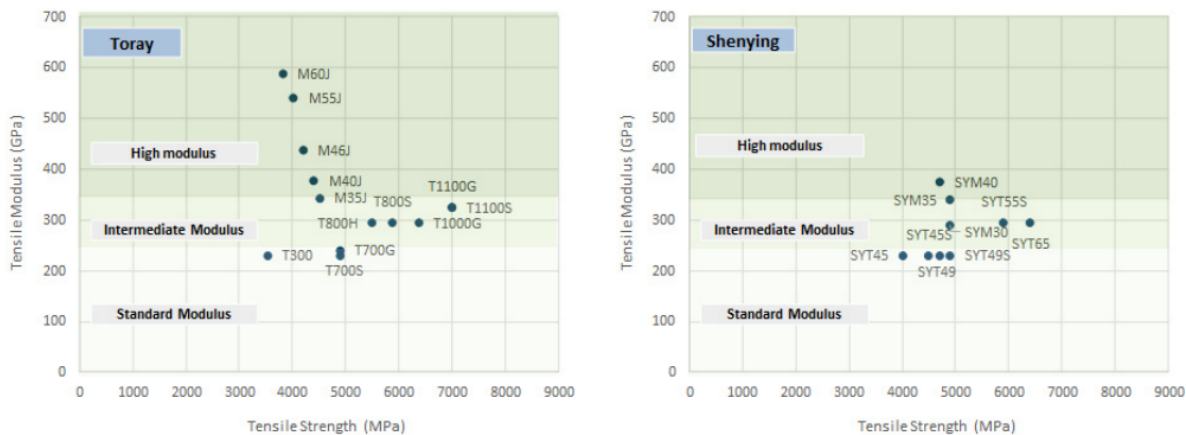
688295.SS	12m Price Target: Rmb55.7	Price: Rmb35.25	Upside: 58%		
Buy	GS Forecast				
Market cap: Rmb31.7bn / \$4.4bn	Revenue (Rmb mn)	12/21	12/22E	12/23E	12/24E
Enterprise value: Rmb31.8bn / \$4.4bn	EBITDA (Rmb mn)	1,173.4	2,007.1	3,525.3	4,567.6
3m ADTV :Rmb158.8mn/ \$23.2mn	EPS (Rmb)	0.35	0.57	0.92	1.39
China	P/E (X)	NM	61.3	38.3	25.4
China Advanced Materials & Construction	P/B (X)	NM	7.1	6.8	5.9
	Dividend yield (%)	--	0.7	1.2	1.8
M&A Rank: 3	N debt/EBITDA (ex lease,X)	3.4	0.0	0.4	0.5
Leases incl. in net debt & EV?: No	CROCI (%)	20.0	22.2	22.6	25.8
	FCF yield (%)	#VALUE!	(3.9)	(0.2)	0.3
		3/22	6/22	9/22E	12/22E
	EPS (Rmb)	0.14	0.12	0.22	0.09

Source: Company data, Goldman Sachs Research estimates, FactSet. Price as of 10 Oct 2022 close.

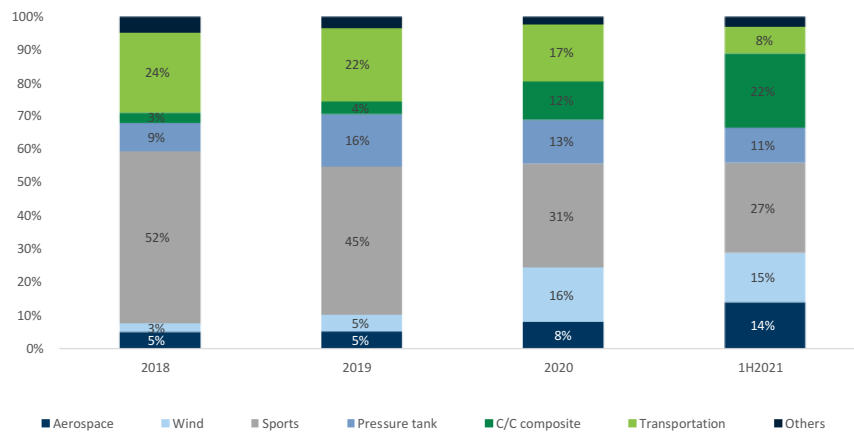
Leading CF producer targeting civilian market

Founded in 2006 and listed in 2022, ZFSY is one of the biggest CF producers in China. The company has production bases in Lianyungang (Jiangsu) and Xining (Qinghai), with a combined capacity of 14.5 kt as of 1H2022. It is primarily engaged in the production of CF rovings, including high strength (T300, T700, T800) and high modulus products, with downstream application spanning across aerospace, wind energy, sporting goods, pressure tanks, C/C composites and transportation.

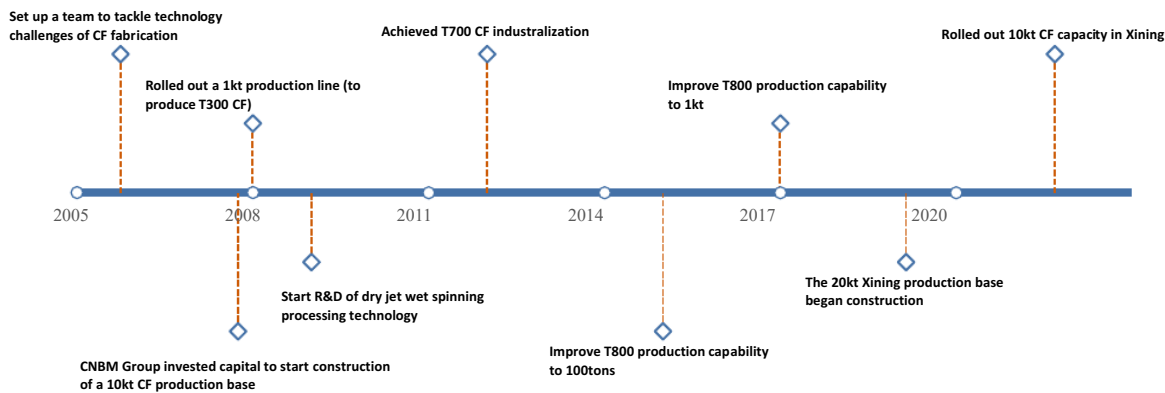
Exhibit 42: ZFSY's product portfolio and specification mapping with Toray's standards



Source: Company data, compiled by Goldman Sachs Global Investment Research, Gao Hua Securities Research

Exhibit 43: ZFSY revenue breakdown by end-market

Source: Company data

Exhibit 44: History of product development

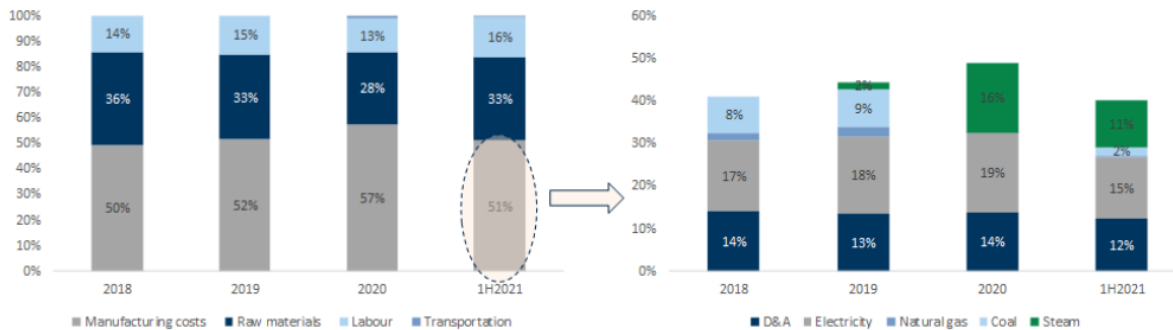
Source: Company data, compiled by Goldman Sachs Global Investment Research, Gao Hua Securities Research

Further cost savings from improving manufacturing process

ZFSY is one of the few domestic CF suppliers that has achieved industrialization capability in T700 (or above) high-performance CF productions. According to the company, it has currently more than 50% of the domestic market share in this segment. We think ZFSY's strong market position in this segment is due to the successful adoption of the "dry jet wet spinning process" (for more details, please refer to the Appendix section, [Exhibit 101](#)), which substantially improves the spinning speed (to >

400m/min) compared to the wet spinning process (~100m/min), hence leading to a higher manufacturing efficiency, and sequentially lower unit production cost. We expect further unit cost reduction with the newly deployed Xining plant gradually ramping up. The phase I of the Xining plant has a combined capacity of 11kt, with the individual lines capable of producing 3kt CF annually, which is by far the most efficient CF production facility in China. The phase II (14kt) is scheduled to roll out in 2023. We expect source of unit cost reduction will be primarily coming from: labour cost (c.15% of COGS), D&A (c.13% of COGS) and electricity expense (c.18% of COGS).

Exhibit 45: ZFSY's cost structure



Source: Company data

Well positioned in the fastest growing CF sub-segment

We believe T700 will be the fastest growing CF sub-segment in China for the next 3 years, driven by C/C composites where we are expecting a 34% CAGR. ZFSY's current expansion plan suggests that it will continue to gain market share in the high-end civilian market, particularly given its solid track record of customer acquisitions. The company has a more balanced client mix (top 5 contributed to 40% of revenue in 1H21) compared to other domestic listed CF producers due to its civilian market focused business model. Even though ZFSY's clients are not well-known household names, a lot of them are domestic leaders in their fields, such as the largest C/C composites producer and hydrogen tank manufacturer.

Valuation and risks

Initiating at Buy with a 12m target price of RMB55.7/sh

We use a discounted P/E methodology in line with our broader China Chemicals coverage. Our target price of RMB55.7/sh is based on 43x FY2025 PE, discounted back to 2023E at 10.2% CoE. Given the lack of long-term historical trading data for ZFSY, we derive our target multiple based on the target multiple for GW Compos (30X) and assigning a premium to factor in ZFSY's faster long-term growth (33% CAGR over 2025-2028E as part of our DCF vs. GW Compos at 23%, implying a 1.3x PEG for both companies). We think a premium is justified given the company's faster earnings growth trajectory.

We have cross-checked our PE valuation using a DCF methodology, which is an appropriate analysis in our view as DCF can reflect the company's long-term cash flow/earnings growth potential. We project the company's cash flow until 2030E, and discount it back based on 8.9 % WACC, assuming 1.1x beta based on industry's 2-year historical average. We assume a terminal growth of 3%, in line with our broader China Chemicals coverage. Our DCF cross-check suggests a 12-month implied theoretical valuation of RMB54.9/sh, largely consistent with the TP derived under our PE methodology.

Risks to our investment view

Industry risks

- **Slower-than-expected economic activity:** which could lead to weaker-than expected demand for CF, hence impact our estimates for the company's sales volume and pricing.
- **Slower-than-expected investment in the new energy industry:** more than half of ZFSY's revenue is derived from the new energy sectors. We see downside risk to earning from slower-than-expected energy transitions.
- **Slower-than-expected capacity expansion:** which could lead to slower import substitution
- **Trade tensions:** a relaxation in trade tension may lead to rising import and slowdown in the pace of import substitutions.
- **Rise in raw material/fuel costs:** this could impact producers' margin if they cannot fully pass through the cost hikes to downstream customers. Higher raw material costs may lead to higher composites prices, which could result in slow CF adoptions.

Company-specific risks

- **Faster capacity expansion by other competitors:** which could lead to market share loss for the company. This may also affect company's bargaining/pricing power within the CF value chain.
- **Quality issues relating to ZFSY's product:** which could lead to significant damage to its track record and therefore slower-than-expected progress in gaining market

share.

- **Delays in product launch:** this may constrain ZFSY's ability to meet the increasing demand from its customers, hence leading to a slower-than-expected revenue growth.

Exhibit 46: Upside/downside potential to DCF-derived valuation

DCF calculation	2019A	2020A	2021A	2022E	2023E	2024E	2025E	2026E	2027E	2028E	2029E	2030E
EBIT	23	83	297	609	961	1,459	1,776	2,339	3,093	4,053	4,860	5,594
yoy chg%		262%	258%	105%	58%	52%	22%	32%	32%	31%	20%	15%
- EBIT x tax rate	-	-	(17)	(91)	(144)	(219)	(266)	(351)	(464)	(608)	(729)	(839)
+ Depreciation and amortization	55	50	90	208	325	427	526	616	695	771	845	916
- Increase/(decrease) in net working capital	(50)	49	(66)	71	430	52	149	25	1	1	61	29
- Increase in capital expenditure	(68)	(917)	(1,164)	(2,001)	(1,646)	(1,654)	(1,659)	(1,397)	(1,330)	(1,303)	(1,274)	(1,216)
FCFF (Rmb mn)	(40)	(735)	(859)	(1,203)	(73)	66	526	1,232	1,996	2,914	3,763	4,483
yoy chg%		1735%	17%	40%	-94%	-190%	701%	134%	62%	46%	29%	19%
Terminal value												77,744
Present value					(70)	58	425	913	1,358	1,819	2,157	43,262
DCF Valuation												
Firm Value	49,922											
- Net debt	463											
- Minority interest	13											
Equity Value	49,445											
Number of shares	900											
Implied PV per share	54.9											
WACC Calculation												
Equity component												
Equity risk premium						6.5%						
Risk free rate						3.0%						
Beta						1.10						
Cost of equity						10.2%						
Debt component												
Cost of debt						5.0%						
Tax rate						18.0%						
After-tax cost of debt						4.1%						
Long-run debt-to-capital ratio						20.0%						
WACC						8.9%						
Terminal growth rate						3.0%						

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

Financials

Income statement

- **Revenue:** We expect ZFSY to deliver a revenue CAGR of 46% over 2021-25E, mainly led by capacity expansion. We have factored in 28% blended price hikes in 2022E to reflect strong pricing and tight supply in the high-end market. We have assumed blended ASP to decline by 2-6% over 2023E to 2025E, with price reductions coming from wind/sports industry exposure. ASPs associated with pressure tank and C/C exposures should remain relatively resilient.
- **Margin:** We expect 4ppts margin expansion in 2022E, as acrylonitrile (AN) prices have fallen by 25% yoy ytd. We expect further margin improvement when capacity gradually ramps up.
- **NPAT:** We expect NPAT to grow by a CAGR of 52% over 2021-2025E, faster than the topline growth, due to margin expansion.
- **GSe vs consensus** - We are 6% lower than Wind consensus on 2022E NPAT which we believe reflects our conservative margin assumption. For 2023/2024E NPAT, we are 4%/12% above consensus likely driven by our expectations for ZFSY to be able to ramp up capacity quickly to meet increasing downstream demand.

Exhibit 47: Income statement

Zhongfu Shenyang (688295.SS)							
Rmb in millions (PRC GAAP)							
	2019A	2020A	2021A	2022E	2023E	2024E	2025E
Revenue	415	532	1,173	2,007	3,525	4,568	5,275
Carbon fiber	411	528	1,163	1,992	3,505	4,542	5,245
Sales volume (t)	3,422	3,761	6,142	9,277	17,277	23,777	27,777
ASP (RMB/t)	120,118	140,254	189,419	214,666	202,851	191,026	188,819
Others	4	5	11	16	21	26	31
COGS	(309)	(303)	(685)	(1,091)	(1,956)	(2,352)	(2,637)
Gross profit	106	229	488	916	1,569	2,216	2,639
% GPM	25.6%	43.0%	41.6%	45.6%	44.5%	48.5%	50.0%
Business Taxes	(6)	(9)	(10)	(26)	(46)	(60)	(69)
Selling Expenses	(6)	(3)	(4)	(15)	(26)	(34)	(39)
Admin Expenses	(72)	(82)	(177)	(266)	(536)	(663)	(755)
Impairment loss of assets	-	(52)	0	0	0	0	0
Operating income	23	83	297	609	961	1,459	1,776
Net finance income	(19)	(14)	(27)	(48)	(2)	(2)	(10)
Share of Profit of Associates & JCEs	-	-	-	-	-	-	-
Other gains/losses	22	17	25	24	24	24	-
Profit before tax	26	85	295	586	984	1,482	1,765
Income tax	-	-	(16)	(88)	(148)	(222)	(265)
Net Profit	26	85	279	498	836	1,260	1,500
Minority Interest	-	-	-	(5)	(8)	(13)	(15)
Net Profit Attributable to Shareholders	26	85	279	493	828	1,247	1,485
EPS	0.06	0.14	0.35	0.57	0.92	1.39	1.65
NPM (%)	6.3%	16.0%	23.8%	24.6%	23.5%	27.3%	28.2%
% yoy	n.a	226%	227%	77%	68%	51%	19%

Source: Company data, Goldman Sachs Global Investment Research

Balance sheet

- **Net gearing:** We expect the net gearing to remain low at below 20% until 2025E.
- **ROE:** We expect ROE to gradually improve from 18% in 2022E to 26% in 2025%

with margin expansion

Exhibit 48: Balance sheet

Zhongfu Shenying (688295.SS)							
Rmb in millions (PRC GAAP)							
	2019A	2020A	2021A	2022E	2023E	2024E	2025E
PP&E	687	1,677	2,696	4,500	5,693	6,796	7,808
Intangible Assets	136	130	190	183	315	441	563
Other Non Current Assets	2	14	146	141	137	134	132
Non Current Assets	824	1,822	3,032	4,824	6,144	7,371	8,504
Cash and Cash Equivalents	235	148	320	2,524	3,090	3,454	4,259
Receivables	7	0	1	1	2	2	2
Inventories	38	31	154	145	391	254	469
Other Current Assets	65	151	218	516	512	718	650
Current Assets	345	330	693	3,187	3,994	4,428	5,380
Total Assets	1,169	2,152	3,724	8,011	10,139	11,800	13,884
Short-term Borrowings	72	56	576	900	1,200	1,320	1,500
Payables	108	304	534	800	1,343	1,492	1,687
Other Current Liabilities	98	178	129	329	508	546	712
Current Liabilities	278	538	1,239	2,030	3,051	3,357	3,900
Long-term Borrowings	97	469	1,059	1,553	2,198	2,858	3,572
Other Non Current Liabilities	123	188	191	191	191	191	191
Non Current Liabilities	220	658	1,250	1,744	2,389	3,049	3,763
Total Liabilities	497	1,195	2,489	3,774	5,440	6,406	7,663
Total Shareholders' Equity	671	957	1,235	4,237	4,699	5,393	6,221
Share Capital	1,015	800	800	900	900	900	900
Reserves and REs	(344)	157	435	3,332	3,785	4,467	5,280
Other Comprehensive Income	-	-	-	-	-	-	-
Treasury Stock	-	-	-	-	-	-	-
Minority Interests	-	-	-	5	13	26	41
Total Equity	671	957	1,235	4,237	4,699	5,393	6,221
Total Liabilities and Equity	1,169	2,152	3,724	8,011	10,139	11,800	13,884
Net Debt (Net Cash)	(34)	441	1,316	35	463	944	1,099
Net Debt / Total Equity	-5.1%	46.1%	106.5%	0.8%	9.9%	17.5%	17.7%
Book Value Per Share	0.66	1.20	1.54	4.70	5.21	5.96	6.87

Source: Company data, Goldman Sachs Global Investment Research

Cash flow statement

- **Capex:** We assume Rmb1.5bn-2.0bn annual capex over 2022E to 2025E to support company's current expansion plan.
- **FCF:** With a gradual improvement in OCF, we expect FCF to turn positive in 2024E

Exhibit 49: Cash flow statement

Zhongfu Shenying (688295.SS)							
Rmb in millions (PRC GAAP)							
	2019A	2020A	2021A	2022E	2023E	2024E	2025E
Net Profit	26	85	279	493	828	1,247	1,485
Depreciation and Amortization	55	50	90	208	325	427	526
Total Change in Working Capital	(50)	49	(66)	71	430	52	149
Inventories	11	7	(123)	8	(245)	137	(215)
Receivables	(38)	(11)	(146)	(299)	3	(206)	68
Payables	(15)	36	172	362	673	121	296
Other Change in Working Capital	(7)	16	31	-	-	-	-
Others	22	66	28	53	10	15	25
Operating Cash Flow	53	249	331	825	1,594	1,741	2,186
Capex	(68)	(917)	(1,164)	(2,001)	(1,646)	(1,654)	(1,659)
Disposals	0	0	0	-	-	-	-
Acquisitions	-	-	-	-	-	-	-
Divestitures	-	-	-	-	-	-	-
Other Investing Cash Flow	1	-	(6)	10	76	93	104
Investing Cash Flow	(66)	(916)	(1,170)	(1,991)	(1,570)	(1,562)	(1,555)
Issuance of Equity Capital	400	200	-	2,727	-	-	-
New Borrowings	223	767	1,233	1,500	2,000	2,200	2,500
Repayment of Borrowings	(448)	(389)	(176)	(577)	(1,006)	(1,355)	(1,540)
Dividend Distribution	(18)	(16)	(39)	(223)	(375)	(565)	(673)
Other Financing Cash Flow	46	20	(7)	(58)	(78)	(95)	(114)
Financing Cash Flow	203	581	1,011	3,370	541	185	173
Change in Cash and Cash Equivalents	190	(86)	172	2,204	565	365	805
Effect of Changes in FX Rate	0	0	0	-	-	-	-
Free Cash Flow	(15)	(667)	(833)	(1,175)	(52)	87	528

Source: Company data, Goldman Sachs Global Investment Research

Guangwei Composites (300699.SZ): A beneficiary of wind industry development; Initiate at Buy

Vertical integration differentiates it from domestic peers; Initiating at Buy

Founded in 1992, Weihai Guangwei Composites (GW Compos) has been a leading player in every stage of the domestic CF development. It has emerged as a domestic leader and key contributor in setting CF standards, facilitating the CF industrialization and deployment in China and gaining market share in an overseas-players dominated market earlier. Over the past 30 years, GW Compos has successfully established one of the most comprehensive industrial chain among all CF producers in China, with business covering CF manufacturing, equipment and fabrication technologies. Leveraging its technical strength through the supply to the defense market, we expect GW Compos will gradually increase its exposure in the civilian market. We estimate NPAT to grow by 35% CAGR over 2021-2025E, outpacing topline growth (31% CAGR) on margin expansion. **Initiate at Buy with a 12m TP of RMB113.6/sh.**

The current product mix to benefit from favorable pricing trend

We expect to see further divergence in pricing trend entering into 2023, with ample new supply coming on stream in the low-end (T300) market, whilst supply/demand dynamics to remain tight in the high-end market. This is favorable for GW Compos, as its pultruded plate business (c.30% of FY21 revenue), which relies on external sourcing of T300 CF (as raw materials) will likely enjoy margin expansions. Leveraging on its competitive advantage, we expect GW Compos will continue to focus on high-performance CF productions, a market with a much higher entry barrier and a more resilient pricing outlook.

Tapping into processing technology to unlock CF potentials

With import substitution accelerating, we believe broader CF adoption will rely on: 1) utilizing existing mature fabrication methods and extending to new use cases; and 2) innovation and improvement in composite processing technology. As a long-standing supplier to Vestas, we believe GW Compos has already proven its capability in composite fabrications. The company aims to gradually transition from a production-focused to application-focused CF supplier and continue to target at the high value-added market. The recent acquisition of Guangsheng (a company involved in the production of rocket/missile engine casing using filament winding process) highlights GW's intention towards tapping into the composite processing technology to unlock CF potentials, in our view.

Valuation and risks

Our target price of RMB113.6/sh is derived using a target multiple of 30x on 2025E EPS, discounted back to 2023E at 10.2% CoE. The target PE multiple is lower than GW Compos' historical average to reflect a gradual transition into the civilian market. Key risks include: 1) Slower-than-expected economic activity; 2) Slower-than-expected capacity expansion; 3) Rise in raw material/fuel costs;

300699.SZ	12m Price Target: Rmb113.6	Price: Rmb79.32	Upside: 43.2%		
Buy	GS Forecast				
Market cap: Rmb41.1bn / \$5.8bn	Revenue (Rmb mn)	12/21 2,607.3	12/22E 2,914.3	12/23E 3,902.6	12/24E 5,888.1
Enterprise value: Rmb39.1bn / \$5.5bn	EBITDA (Rmb mn)	945.5	1,183.2	1,531.7	2,383.2
3m ADTV :Rmb518.4mn/ \$75.3mn	EPS (Rmb)	1.46	1.83	2.35	3.67
China	P/E (X)	51.2	43.3	33.8	21.6
China Advanced Materials & Construction	P/B (X)	9.4	8.6	7.4	6.0
	Dividend yield (%)	0.7	0.8	1.0	1.6
M&A Rank: 3	N debt/EBITDA (ex lease,X)	(2.1)	(1.7)	(1.5)	(1.2)
Leases incl. in net debt & EV?: Yes	CROCI (%)	24.7	27.0	29.4	38.2
	FCF yield (%)	1.5	1.0	1.6	3.0
		3/22	6/22E	9/22E	12/22E
	EPS (Rmb)	0.40	0.58	0.68	0.19

Source: Company data, Goldman Sachs Research estimates, FactSet. Price as of 10 Oct 2022 close.

One of the most vertically integrated CF manufacturers in China

Founded in 1992, GW Compos is the first A-share listed CF producer and the earliest domestic private enterprise to implement the localization of CF. Over the past 30 years, the company has successfully established one of the most complete industrial chain ([Exhibit 100](#)) with a comprehensive product coverage among all CF producers in China. It is engaged in the production of CF roving, prepreg, woven fabrics, CF pultruded plate, as well as supply of CF related machinery.

GW Compos has been a leading player in every stage of the domestic CF development. It has emerged as a domestic leader and key contributor in setting CF standards, facilitating the CF industrialization and deployment in China gaining market share in an overseas-players dominated market earlier.

Exhibit 50: CF national and industry standards

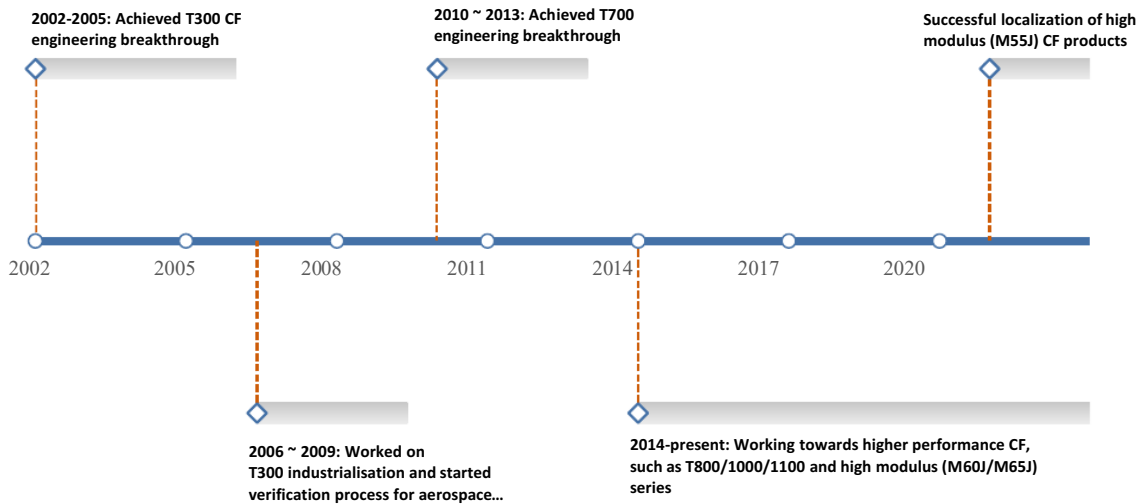
Standard name	Standard name (Chinese)	Standard type
PAN-based carbon fibre	聚丙烯腈基碳纤维	National standard
Carbon fiber prepreg	碳纤维预浸料	National standard
Technical specifications of high temperature carburetor for carbon fiber production	碳纤维生产用高温碳化炉技术条件	Industry standard
Technical specifications of graphing furnace for high modulus Carbon Fiber Production	高模量碳纤维生产用石墨化炉技术条件	Industry standard
Multiaxial fiber warp knitted fabric	多轴向纤维经编织物	Association standard
High modulus PAN-based carbon fibre	高模型聚丙烯腈基碳纤维	Association standard

Source: Company data

It started CF research and development in 2002, and achieved T300 CF engineering breakthrough following 3 years of continuous efforts. Between 2006 to 2009, GW Compos had been focusing on T300 industrialization and started verification process for aerospace applications. In 2013, it achieved the shift from T300 to T700 engineering breakthrough. Since then, the company has been intensively working towards higher performance CF, such as T800/1000/1100 and high modulus (M60J/M65J) series.

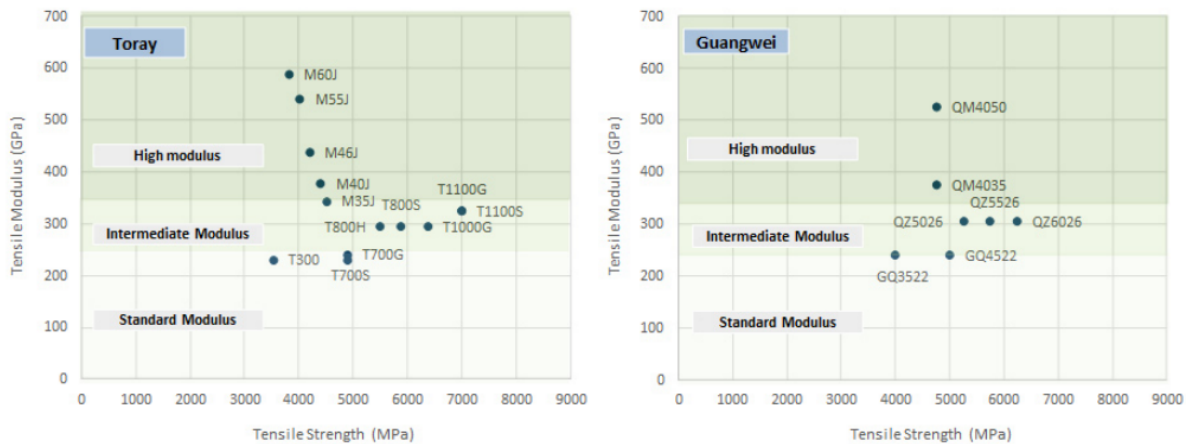
GW Compos is able to leverage its technology know how and industrialization capability, and is actively seeking opportunities to developed products for the military and civilian markets, diversifying its revenue stream.

Exhibit 51: GW Compos' product development milestone



Source: Company data

Exhibit 52: Guangwei's product portfolio and specification mapping with Toray's standards

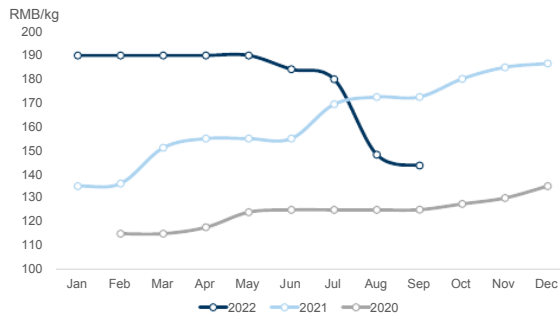


Source: Company data, data compiled by Goldman Sachs Global Investment Research, Gao Hua Securities Research

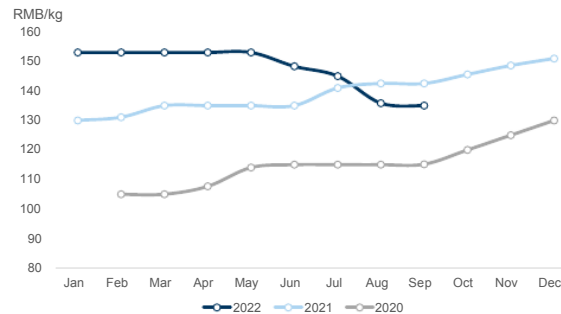
Aggressive supply additions affected low-end products, while S/D for high-end product remained tight

Robust demand and constrained foreign supply had driven CF prices in 2020/2021, with

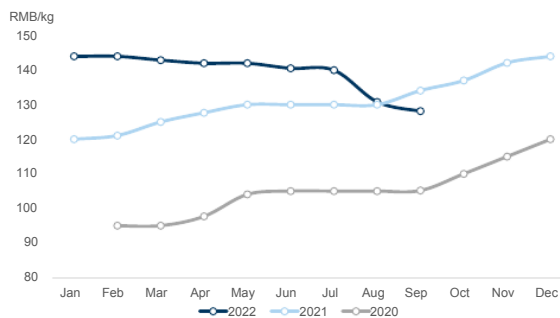
CF roving prices up by an average of c.60% over the two-year period. Despite ample new supply, prices remained resilient during most of 1H22, before T300 prices declined in June. T300 prices have already dropped by 7-20% from the peak, and lower than the same period last year. In contrast, T700 prices have seen a mild improvement. We believe this is due to the higher entry barriers compared to T300 and limited CF producers that have T700 mass/stable production capability. In addition, there is also robust demand from certain applications that use T700 CF, such as C/C composites (used in solar energy industry) and pressure vessels.

Exhibit 53: T300 (12K) CF prices

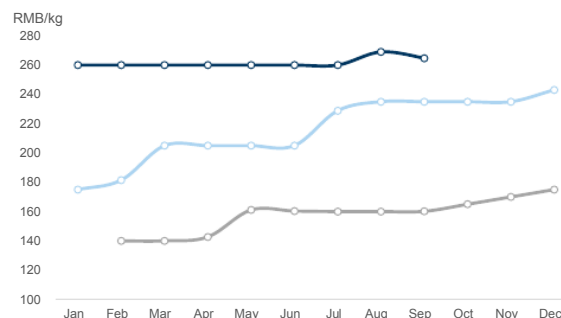
Source: Baiinfo

Exhibit 54: T300 (24/25K) CF prices

Source: Baiinfo

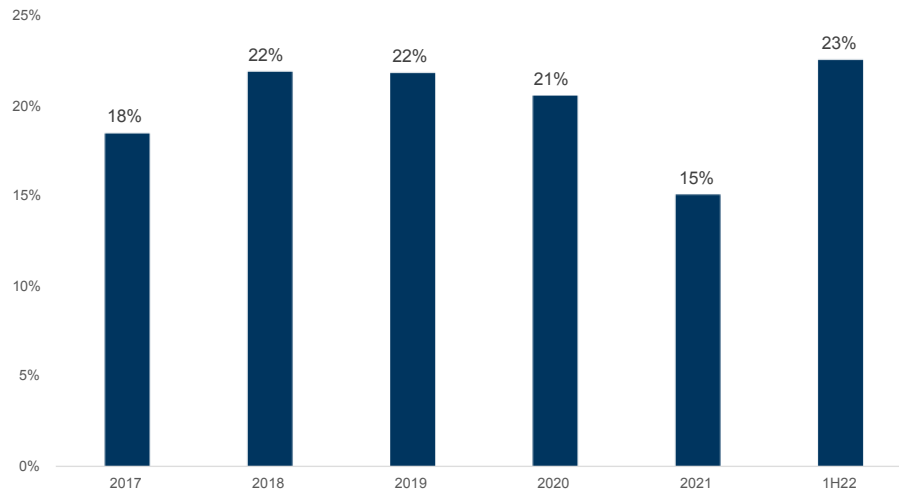
Exhibit 55: T300 (48K) CF prices

Source: Baiinfo

Exhibit 56: T700 (12K) CF prices

Source: Baiinfo

We do not think the industry's aggressive supply additions will pose risk to GW Compos at this stage, instead GW Compos could be a potential beneficiary with an increase in supply of large tow T300 grade CF. Its pultruded plate business (accounting for c.30% of company's FY21 topline) is fabricated from large tow T300 CF, which were sourced from external suppliers. The segment margin (down 6ppts yoy to 15% in 2021) was severely hit by rising raw material (T300 CF) cost due to tighter supply.

Exhibit 57: GPM of pultruded plate business

Source: Company data

To minimize supply chain disruptions, the under-construction Baotou (Inner Mongolia) plant was originally planned for large tow CF production. However, with easing supply in this segment, GW Compos has adjusted its plan to focus on T700/800/1000 production. We think GW will benefit from the softening T300 prices, meanwhile enjoying pricing premium in the more resilient high-end market.

CF Basics - product classification by tow size

- Small tow (小丝束):
 - Definition: CF rovings that contain $\leq 24,000$ (24K) filaments, such as 1K, 3K, 6K, 12K, 24K
 - Global players: Toray, Toho, Mitsubishi Chemical
- Large tow (大丝束):
 - Definition: CF rovings that contain $\geq 48K$ filaments
 - Global players: SGL, Zoltek (acquired by Toray)

(Source: Company data)

Tapping into processing technology to unlock CF potential

The potential of CF is vast and would broaden as producers deploy it in wider applications. As localization accelerates, we think broader CF adoption will rely on: 1) innovation and improvement in composite processing technology; and 2) utilization of existing mature fabrication methods and extension to new use cases. We have already seen some successful examples led by GW Compos. The adoption of pultrusion method has greatly boosted CF consumption in wind turbine blades in recent years. As a

long-standing supplier to Vestas, we believe GW Compos has a proven capability in composite fabrications.

Going forward, the company expects to gradually transition from a production-focused to application focused CF supplier and continue to target at the high value added market. GW Compos' recent acquisitions (Guangsheng and Lanke) will complement its existing business, strengthening its presence along the CF value chain, in our view.

Valuation and risk

Initiating at Buy with 12m target price of RMB113.6/sh

We use a discounted P/E methodology in line with our broader China Chemicals coverage. Our target price of RMB113.6/sh is derived using a target multiple of 30x on 2025E EPS, discounted back to 2023E at 10.2% CoE. The target PE multiple is lower than GW Compos' 5-year historical average of 45x to reflect a gradual transition into the civilian market. We benchmark our target multiple to the historical trading averages of Hexcel (a US CF producer; covered by Noah Poponak) and AVIC Jonhon (similar split between defense vs. civil; covered by Jacqueline Du).

We cross-check our PE valuation using DCF methodology, which we think can reflect the company's long-term cash flow/earning growth potential. We project the company's cash flow until 2030E, and discount it back to 2023E based on 10.2% WACC, assuming 1.1x beta based on industry's 2-year historical average. We assume a terminal growth of 3% in line with our broader China Chemicals coverage. The DCF cross check implies a per share value of RMB125.2/sh, 10% higher than our TP derived using the PE methodology.

Risks to our investment view

Industry risks

- **Slower-than-expected economic activity:** which could lead to weaker-than expected demand for CF, hence impact sales volume and pricings.
- **Slower-than-expected capacity expansion:** which could lead to market share loss for the company. We see downside risk to earnings on slower capacity expansion.
- **Trade tensions:** which could impact the pace of import substitution for CF.
- **Rise in raw material/fuel costs:** this could impact producers' margin if they cannot fully pass through the cost hikes to downstream customers. Higher raw material costs may lead to higher composites prices, which could result in slow CF adoptions.

Company-specific risks

- **Faster capacity expansion by other competitors:** which could lead to market share loss for the company. This may also affect company's bargaining/pricing powers within the CF value chain.
- **Delays in product launch:** this may constrain the company's ability to meet the increasing demand from its customers, hence leading to a slower-than-expected revenue growth.
- **Weakness in defense demand:** GW Compos has substantial amount of revenue generated from defense market, a highly restrictive area with a lack of data disclosure (e.g. pricing, volume, customer breakdown). Any decline in defense spending or loss of market share would present downside risks to our TP and estimates.

Exhibit 58: Valuation cross-check using DCF methodology

DCF calculation	2019A	2020A	2021A	2022E	2023E	2024E	2025E	2026E	2027E	2028E	2029E	2030E
EBIT	498	646	798	997	1,309	2,120	2,833	3,691	4,588	5,357	6,115	7,866
yoy chg%		30%	24%	25%	31%	62%	34%	30%	24%	17%	14%	29%
- EBIT x tax rate	(71)	(75)	(89)	(112)	(160)	(280)	(402)	(561)	(697)	(814)	(929)	(1,196)
+ Depreciation and amortization	80	94	147	187	223	263	296	329	363	398	432	468
- Increase/(decrease) in net working capital	149	244	321	(250)	(260)	(289)	95	52	(10)	99	82	71
- Increase in capital expenditure	(366)	(581)	(601)	(438)	(469)	(589)	(463)	(484)	(550)	(517)	(544)	(612)
FCFF (Rmb mn)	290	329	576	384	643	1,225	2,358	3,028	3,693	4,523	5,156	6,598
yoy chg%		13%	75%	-33%	67%	91%	93%	28%	22%	22%	14%	28%
Terminal value												95,049
Present value					612	1,059	1,852	2,159	2,390	2,658	2,750	49,228
DCF Valuation												
Firm Value	62,709											
- Net debt	(2,325)											
- Minority interest	112											
Equity Value	64,922											
Number of shares	518											
Implied PV per share	125.2											
WACC Calculation												
Equity component												
Equity risk premium						6.5%						
Risk free rate						3.0%						
Beta						1.10						
Cost of equity						10.2%						
Debt component												
Cost of debt						5.0%						
Tax rate						18.0%						
After-tax cost of debt						4.1%						
Long-run debt-to-capital ratio						0.0%						
WACC						10.2%						

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

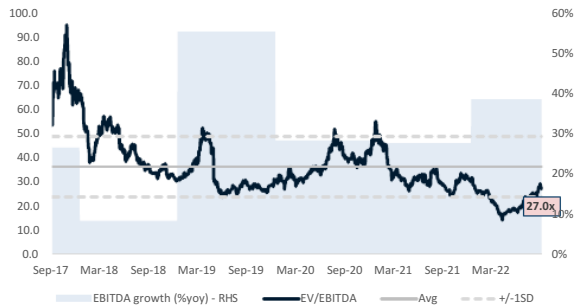
Valuation charts

Exhibit 59: 5-year forward PE



Source: Company data, Goldman Sachs Global Investment Research

Exhibit 60: 5-year forward EV/EBTIDA



Source: Company data, Goldman Sachs Global Investment Research

Exhibit 61: 5-year forward PB



Source: Company data, Goldman Sachs Global Investment Research

Exhibit 62: Dividend yield



Source: Company data, Goldman Sachs Global Investment Research

Financials

Income statement

- **Revenue:** We expect GW Compos to deliver a revenue CAGR of 31% over 2021-25E, mainly led by capacity expansion. We have factored in stagnated price movement in 2022E/2023E to reflect product mix shift to the civilian market, offset by resilient pricing and tight supply in the high-performance CF market. We have assumed a mild price decline (~2%) from 2024E following cost reductions.

Exhibit 63: Income statement

Weihai Guangwei (300699.SZ)							
Rmb in millions (PRC GAAP)							
	2019A	2020A	2021A	2022E	2023E	2024E	2025E
Revenue	1,715	2,116	2,607	2,914	3,903	5,888	7,713
% yoy	26%	23%	23%	12%	34%	51%	31%
Carbon fiber and fabrics	798	1,078	1,275	1,503	2,224	3,819	5,250
% yoy	32%	35%	18%	18%	48%	72%	37%
% revenue	47%	51%	49%	52%	57%	65%	68%
CF pultruded plate	673	718	808	802	948	1,111	1,296
% yoy	29%	7%	13%	-1%	18%	17%	17%
% revenue	39%	34%	31%	28%	24%	19%	17%
Prepreg	177	236	359	414	443	465	488
% yoy	-2%	34%	52%	15%	7%	5%	5%
% revenue	10%	11%	14%	14%	11%	8%	6%
Other products	51	70	145	171	252	433	596
Other business	16	13	20	24	35	60	83
Cost of Sales	(892)	(1,074)	(1,449)	(1,515)	(2,035)	(2,897)	(3,700)
Gross Profit	823	1,042	1,158	1,399	1,867	2,992	4,013
% GPM	48%	49%	44%	48%	48%	51%	52%
% yoy	29%	27%	11%	21%	33%	60%	34%
Carbon fiber and fabric	633	810	893	1,053	1,461	2,494	3,426
% GPM	79%	75%	70%	70%	66%	65%	65%
CF pultruded plate	147	148	122	152	179	209	243
% GPM	22%	21%	15%	19%	19%	19%	19%
Prepreg	25	64	101	144	154	162	170
% GPM	14%	27%	28%	35%	35%	35%	35%
Other products	12	10	33	39	57	98	135
% GPM	24%	15%	23%	23%	23%	23%	23%
Other business	6	10	9	11	16	27	38
% GPM	40%	74%	45%	45%	45%	45%	45%
Business Taxes	(19)	(18)	(21)	(24)	(32)	(49)	(64)
Selling Expenses	(33)	(19)	(17)	(19)	(46)	(98)	(167)
Admin Expenses	(281)	(364)	(328)	(366)	(491)	(740)	(969)
Impairment loss of assets	8	6	7	8	10	15	20
Operating income	498	646	798	997	1,309	2,120	2,833
Net Finance Expense	(7)	(17)	(10)	45	45	45	47
Share of Profit of Associates & JCEs	(7)	6	2	2	2	2	2
Other gains/losses (net)	124	90	61	24	27	18	23
Profit before tax	608	725	852	1,067	1,382	2,184	2,904
Income tax	(86)	(84)	(95)	(119)	(169)	(288)	(412)
Net profit	522	641	756	947	1,214	1,896	2,492
Minority Interest	-	1	2	3	4	6	7
Net Profit Attributable to Shareholders	522	642	758	950	1,217	1,902	2,499
EPS	1.01	1.24	1.46	1.83	2.35	3.67	4.82
NPM (%)	30%	30%	29%	33%	31%	32%	32%
% yoy	39%	23%	18%	25%	28%	56%	31%

Source: Company data, Goldman Sachs Global Investment Research

- **Margin:** We expect 3.6ppts yoy margin expansion in 2022E, thanks to the margin recovery in pultruded plate business with lower raw material (e.g. T300 large tow) cost. We expect further margin expansion of c.2ppts each year from 2024E with economies of scale and potentially lower production cost of its new Baotou plant.
- **NPAT:** We expect NPAT to grow by a CAGR of 35% over 2021-2025E, faster than the topline growth, due to margin expansion.
- **GSe vs consensus** - Our 2022E/2023E are largely inline with Wind consensus (~2-3% diff.). For 2024, we are 26% above consensus, driven by our expectation for the company to ramp up capacity quickly to meet increasing downstream demand.

Balance sheet

- **Net gearing:** We expect the company to remain in a net cash position until 2025E.
- **ROE:** We expect ROE to improve from 20% in 2021 to 30% in 2025E, driven by improved profitability.

Exhibit 64: Balance sheet

Weihai Guangwei (300699.SZ)							
Rmb in millions (PRC GAAP)							
	2019A	2020A	2021A	2022E	2023E	2024E	2025E
PP&E	1,067	1,435	1,835	2,094	2,347	2,684	2,858
Intangible Assets	146	260	234	228	222	217	211
Other Non Current Assets	136	107	197	212	227	223	224
Non Current Assets	1,349	1,802	2,266	2,533	2,796	3,124	3,293
Cash and Cash Equivalents	869	1,485	1,949	2,077	2,362	3,000	4,572
Receivables	251	243	403	319	644	647	1,255
Inventories	297	286	412	335	668	522	694
Other Current Assets	1,296	832	529	852	929	1,623	1,274
Current Assets	2,713	2,846	3,293	3,583	4,602	5,792	7,796
Total Assets	4,063	4,649	5,559	6,116	7,399	8,916	11,088
Short-term Borrowings	-	-	-	16	16	16	16
Payables	234	240	335	346	491	700	922
Other Current Liabilities	239	270	424	322	652	706	1,011
Current Liabilities	473	510	759	683	1,159	1,422	1,949
Long-term Borrowings	-	-	-	10	20	28	36
Other Non Current Liabilities	340	422	535	535	535	535	535
Non Current Liabilities	340	422	535	546	555	563	571
Total Liabilities	813	932	1,294	1,229	1,714	1,985	2,520
Total Shareholders' Equity	3,245	3,636	4,146	4,772	5,573	6,825	8,469
Share Capital	518	518	518	518	518	518	518
Reserves and REs	2,753	3,144	3,647	4,272	5,073	6,325	7,970
Other Comprehensive Income	1	(13)	(19)	(19)	(19)	(19)	(19)
Treasury Stock	(27)	(13)	-	-	-	-	-
Minority Interests	4	81	118	116	112	107	99
Total Equity	3,249	3,717	4,265	4,887	5,685	6,931	8,569
Total Liabilities and Equity	4,063	4,649	5,559	6,116	7,399	8,916	11,088
Net Debt (Net Cash)	(869)	(1,485)	(1,946)	(2,051)	(2,325)	(2,954)	(4,518)
Net Debt / Total Equity	-26.8%	-40.0%	-45.6%	-42.0%	-40.9%	-42.6%	-52.7%
Book Value Per Share	6.26	7.01	8.00	9.21	10.75	13.17	16.34

Source: Company data, Goldman Sachs Global Investment Research

Cash flow statement

- **Capex:** we expect a steady increase in capex to support company's expansion plan.
- **FCF:** we expect FCF to stay in the positive territory.

Exhibit 65: Cash flow statement

Weihai Guangwei (300699.SZ)							
Rmb in millions (PRC GAAP)							
	2019A	2020A	2021A	2022E	2023E	2024E	2025E
Net Profit	522	642	758	950	1,217	1,902	2,499
Depreciation and Amortization	80	94	147	187	223	263	296
Total Change in Working Capital	149	244	321	(250)	(260)	(289)	95
Inventories	(102)	11	(126)	77	(333)	146	(172)
Receivables	90	67	133	(239)	(402)	(698)	(259)
Payables	162	166	315	(88)	474	262	526
Other Change in Working Capital	-	-	-	-	-	-	-
Others	2	(24)	(30)	(49)	(50)	(52)	(56)
Operating Cash Flow	753	956	1,196	837	1,129	1,823	2,835
Capex	(366)	(581)	(601)	(438)	(469)	(589)	(463)
Disposals	1	1	7	-	-	-	-
Acquisitions	(3,187)	(4,580)	(4,121)	-	-	-	-
Divestitures	3,376	5,026	4,155	-	-	-	-
Other Investing Cash Flow	22	20	9	(9)	(9)	7	9
Investing Cash Flow	(154)	(114)	(550)	(447)	(478)	(583)	(455)
Issuance of Equity Capital	-	-	-	-	-	-	-
New Borrowings	-	-	26	26	26	26	26
Repayment of Borrowings	-	-	-	(3)	(16)	(17)	(18)
Dividend Distribution	(185)	(259)	(259)	(325)	(416)	(650)	(854)
Other Financing Cash Flow	4	78	37	39	39	38	38
Financing Cash Flow	(181)	(182)	(196)	(263)	(367)	(602)	(807)
Change in Cash and Cash Equivalents	419	661	451	128	285	639	1,572
Effect of Changes in FX Rate	4	(9)	(10)	-	-	-	-
Free Cash Flow	387	375	595	400	661	1,234	2,371

Source: Company data, Goldman Sachs Global Investment Research

China Jushi (600176.SS): Cost competitiveness to weather a short-term slowdown; initiate at Neutral

A global leader in GF production

China Jushi is the world's largest GF producer (c.22%/34% global/domestic market share as of 2021), with a comprehensive product offering, ranging from GF roving, fabrics to electronic yarns. It has made significant inroads into the overseas business, with 47% of revenue being generated from overseas operations in 1H22. We believe Jushi will continue to gain market share globally on cost competitiveness, but the recent pricing weakness arising from supply/demand imbalance will pressurize margins across the industry entering 2023. We estimate a revenue CAGR of 11% over 2021-2025E, mainly led by capacity expansion. At 9.3x PE (1-sd below historical avg), we believe the stock has priced in most negatives and offers balanced risk-reward. **Initiate at Neutral with 12m TP of RMB13.4/sh.**

Cost control remains a top priority

Jushi has consistently led its domestic peers in GPM by 5-8 ppts. In the past, cost reductions came mainly from roving products. Going forward, the company aims to achieve cost optimization across the GF sub-segments of thermoset roving, thermoplastic chopped strands and GF electronic fabrics, with cost advantage being at least 5 years ahead of its peers. We believe Jushi's cost competitiveness will be enhanced through: 1) continued improvement in production efficiency; 2) upstream integration to strengthen supply chain; and 3) technology advancements.

Pricing came off from a high base but long term outlook remains intact

We are optimistic on the long-term GF demand outlook, but the domestic market is facing near term supply pressure, where 900kt of new capacity came online in 2021, representing 17% of the supply growth. GF pricing have come off from a high base entering into 2Q22. With another 600-700kt capacity expected to come on stream in 2H22, coupled with lackluster demand from constructions and electronics sectors (c.50% of GF demand), we expect pricing to remain soft through 2023.

Valuation already pricing-in the short-term negatives; Neutral

Our target price of RMB13.4/sh is based on 10x FY2023 PE, equivalent to 1-sd below its 10-year average. We think our target multiple is justified given the company's lower core earning growth (8% CAGR in 2021-25E) trajectory compared to the last decade (c.35% CAGR). We cross-check our P/E valuation using EV/GCI, which considers how the market values the cash invested in a business (EV/GCI vs. CROCI) relative to the returns (value) created by the company from those assets (CROCI). The target price implies 2.1x EV/GCI on 17% CROCI, inline with 2016-2018 when the stock was trading at a similar EV/GCI (2.0-2.4x) vs CROCI (c.18%) level. Risks include: 1) slower/faster-than-expect demand recovery; 2) rising/declining raw material/fuel costs; 3) slower/faster-than-expected capacity expansion; 4) geopolitical tension that could affect its overseas operations; 5) Shortage in natural gas supply

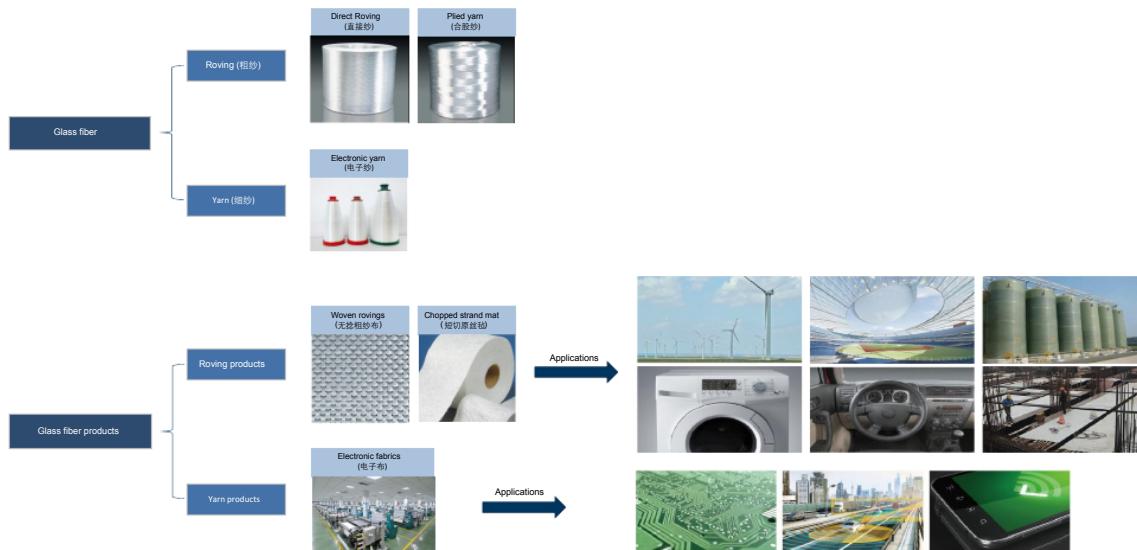
600176.SS	12m Price Target: Rmb13.4	Price: Rmb12.69	Upside: 5.6%		
Neutral	GS Forecast				
Market cap: Rmb50.8bn / \$7.1bn	Revenue (Rmb mn)	12/21 19,706.9	12/22E 20,313.0	12/23E 21,264.7	12/24E 25,497.1
Enterprise value: Rmb59.2bn / \$8.3bn	EBITDA (Rmb mn)	8,463.6	7,372.4	7,747.9	9,786.0
3m ADTV :Rmb388.6mn/ \$56.8mn	EPS (Rmb)	1.51	1.62	1.34	1.66
China	P/E (X)	11.7	7.8	9.5	7.7
China Advanced Materials & Construction	P/B (X)	3.1	1.9	1.7	1.5
	Dividend yield (%)	2.7	4.1	3.4	4.2
M&A Rank: 3	N debt/EBITDA (ex lease,X)	1.1	1.1	0.9	0.5
Leases incl. in net debt & EV?: Yes	CROCI (%)	21.6	20.9	16.7	17.6
	FCF yield (%)	3.3	5.4	7.9	10.6
		12/21	3/22E	6/22E	9/22E
	EPS (Rmb)	0.43	0.46	0.59	0.41

Source: Company data, Goldman Sachs Research estimates, FactSet. Price as of 10 Oct 2022 close.

The world's largest GF producer with a comprehensive range of product offering

Listed in 1999, China Jushi is the world's largest manufacturer of GF products with 2.4mt of capacity as of end-2021 (c.34% of China capacity). It is primarily engaged in the production of E-glass and related products, including GF rovings, chopped strands, woven rovings and electronic yarns and textiles in over 100 product categories and up to 1,000 specifications.

Exhibit 66: GF classification and downstream applications



Source: Company data, data compiled by Goldman Sachs Global Investment Research

Jushi has made significant inroads into the overseas market, with 47% of revenue generated from overseas operations in 1H22. The company has five production bases globally, with three located in domestic markets (Zhejiang, Jiangxi, Sichuan) and two in the overseas (Egypt, US) markets.



China Advanced Materials

Composites – Working behind the scene of energy transitions; Initiate on ZFSY, GW Compos and Jushi

China Advanced Materials

Insights into industry transformation driven by advancements in materials science.

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Yan Lin

+852-2978-7020 | yan.lin@gs.com
Goldman Sachs (Asia) L.L.C.

Cayle Song

+86(21)2401-8902 | cayle.song@gsggh.cn
Beijing Gao Hua Securities Company Limited

Nick Zheng, CFA

+852-2978-1405 | nick.zheng@gs.com
Goldman Sachs (Asia) L.L.C.

We broaden our China advanced material coverage by initiating on the composite sector, with a focus on **carbon fiber (CF)/glass fiber (GF)** (in order of preference), the two most important reinforcement materials within the composites value chain. Compared to GF, a steadily growing segment where China players have a leading market share globally, we prefer CF on a faster demand growth profile (to double by 2025E) driven by **import substitution** and **expanding use cases**. We provide in-depth and differentiated analysis in this report to address **how composites players are navigating the energy transition**, where we expect **wind industry to remain the largest end-used market** (46% of total) for CF by 2025E, whilst **demand from solar industry to witness the fastest growth** (34% CAGR), a niche application in a big industry that is often overlooked by the market. We initiate on two CF producers Zhongfu Shenying (ZFSY) and Guangwei Composites (GW Compos) at Buy with 12m TPs of Rmb55.7 (58% upside) and Rmb113.6 (43% upside) respectively, and China Jushi – the global GF market leader at Neutral, 12m TP of Rmb13.4 (6% upside). **Our top pick is ZFSY** for its strong position in high-performance products with more favorable end-market exposure towards new energy (50%+), where it has significant commercialization capability and plans to grow its capacity 4X by 2024. We are 4%/12% above consensus on 2023E/24E earnings reflecting the company's solid expansion strategies and promising demand outlook in the high-grade CF segment.

We identify three key themes at the sector level:

Globalization vs. import substitution: While Chinese GF producers have been expanding capacity overseas to overcome the ongoing trade restrictions, China is addressing its low self-sufficiency in CF, which we expect to rise to 65% by 2025E (vs. 15% a decade ago) on accelerating capacity expansion as well as commercialization of high-end products by leading local players.

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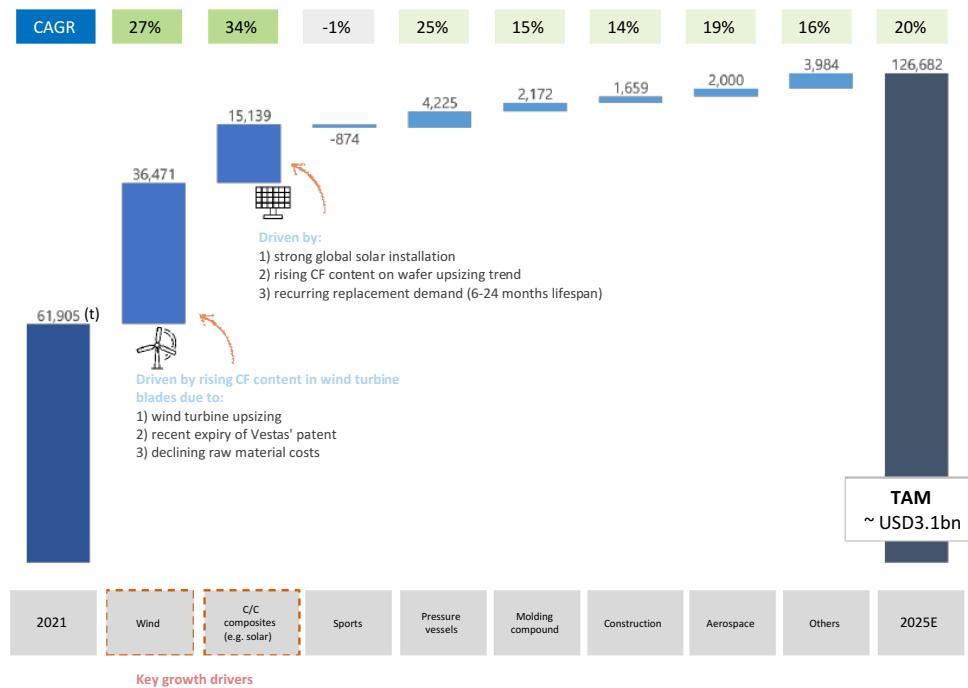
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Wind opportunity: While GF will likely remain the mainstream composite used for wind turbine blades (for better cost-to-performance), we expect the upsizing trend to drive higher use of CF, a lighter and stronger alternative. The recent expiry of a patent by Vestas for such design (in turbine blades) and declining raw material costs should accelerate the adoption by Chinese OEMs; we project 4/5X increase in CF content in onshore/offshore wind market and 27% CAGR in China's CF demand for wind industry by 2025E.

Next growth opportunities: We expect solar, where CF is increasingly used in thermal field system (to grow mono-crystalline silicon), to be the key growth driver (+34% CAGR) for China's CF demand on 1) strong global solar installation; 2) rising CF content on wafer upsizing trend; and 3) recurring replacement demand (6-24 months lifespan). Beyond 2025, auto industry could potentially see rising adoption of both CF and GF for automotive lightweighting trend as well as CF used for pressure tanks in fuel cell vehicles.

Thesis in chart: prefer CF over GF

Carbon Fiber: A 20% 2021-25E demand CAGR driven by: 1) Rise of self-sufficiency (from 47% in 2021 to 65% in 2025E); 2) 35% CAGR capacity expansion (from 2020-25E); 3) Expanding product coverage



Zhongfu Shenying (688295.SS)

BUY

TP: RMB55.7/sh
Mkt cap: US\$4.4bn
ADTV: US\$23m

GSe vs. Wind cons (EPS)

2022E: -6%
2023E: 4%
2024E: 12%

- Favorable end-market exposure towards new energy
- Commercialization capability in high-performance CF
- Plans to grow its capacity 4X by 2024E

Guangwei Composites (300699.SZ)

BUY

TP: RMB113.6/sh
Mkt cap: US\$5.7bn
ADTV: US\$75m

GSe vs. Wind cons (EPS)

2022E: -3%
2023E: -2%
2024E: 26%

- A leading player in every stage of the domestic CF development
- Successfully established a comprehensive industrial chain
- A beneficiary of wind industry development

Source: Wind, Company data, Goldman Sachs Global Investment Research, Gao Hua Securities Research

Pricing in this report is as of Oct. 10, 2022, unless specified otherwise.

PM Summary

By definition, a composite material consists of at least two distinct materials, with one acting as **reinforcement** (providing strength to the overall structure) and the other acting as **matrix** (holding the reinforcement material in place, [Exhibit 2](#)). Such a combination provides properties (e.g. strength, stiffness, conductivity, density etc.) superior to the standalone constituents therefore enabling a wide range of applications.

In this report, we focus on **glass fiber (GF)** and **carbon fiber (CF)**, the two most important reinforcement materials that are used to form fiber-reinforced composites. While GF has already become the most common reinforcement material used in over 50,000 applications across six primary end-markets (e.g. building/constructions, infrastructure, transportation, consumer electronics, industrial applications and new energy; [Exhibit 3](#)), CF has seen its use cases expanding and has emerged as a strategically critical advanced material.

We **prefer CF over GF producers**, as we expect the **CF industry will experience a faster growth with demand driven by import substitutions and expanding use cases**. We estimate China's **CF demand to double** to 127kt by 2025E (20% CAGR), with market size reaching RMB21.8bn/US\$3.1bn.

We have identified three key themes in this report that address the following questions:

1. What are the competitive landscapes and impacts from trade tensions?
2. How GF/CF producers will benefit from China's energy transition?
3. What are the future opportunities?

Three themes in focus

Tackling the ongoing trade tensions through globalization and import substitution

GF sector: Chinese GF producers have enjoyed an average of 9ppts margin premium compared to global peers over the last decade ([Exhibit 8](#)). Cost advantages arising from cheap access to raw material/labour and economies of scales have allowed Chinese manufacturers to gain market share globally. We note several countries have imposed a series of tariffs on certain GF products originating from China ([Exhibit 9](#)). The decision of building global capacity gives leading domestic producers extra flexibility to tackle the trade challenge and has proven to be a successful move. As manufacturers continue to gain overseas exposure, we believe **domestic leading GF producers will remain dominant in the global market**, with top 3 domestic producers having a combined global market share of >50% by 2025E (currently at ~42%).

CF sector: The ongoing export restriction measures imposed by Japan/US authorities have accelerated the pace of import substitutions, allowing domestic CF players to gain market share from leading overseas producers ([Exhibit 12](#)). As a result, the CF self-sufficiency rate grew from 15% in 2015 to 47% in 2021. **We expect the ratio to grow by an average of 4-5ppts per annum to reach 65% by end-2025E** ([Exhibit 13](#)). We believe this momentum will be supported by: 1) **accelerated capacity expansion**

(2015-2020: 9% CAGR vs. 2020-2025: 35%) ([Exhibit 16](#)); and 2) **expanding product coverage** with leading producers achieving **mass commercialization capability** in the high-performance CF segments (e.g. T700/800) ([Exhibit 14](#)) to cater to the broader end-market applications (e.g. solar, hydrogen pressure tank).

Capturing the wind opportunity

We believe GF composites will remain the mainstream composite material for wind turbine **blades** due to its **excellent mechanical properties** at a relatively **low cost**. However, we expect **CF composites will enjoy a faster growth to facilitate the wind turbine upsizing trend** ([Exhibit 20](#)). The adoption of CF in the **selected** structural parts (e.g. spar cap) of the wind turbine blades ([Exhibit 22](#)) using a **cost-effective fabrication (pultrusion) method** ([Exhibit 24](#)) has proven to be a commercially viable solution, with the carbon/glass **hybrid structure** taking advantage of CF's lightweight feature, meanwhile achieving a possible balance between cost and performance. This design has boosted CF consumption with wind turbine blades becoming the largest single downstream application (36% of 2021 CF demand) ([Exhibit 23](#)). Vestas (a leading wind turbine OEM), has a patent related to the adoption of pultrusion technology in the wind turbine design which expired in July 2022, opening up further opportunities for Chinese wind turbine OEMs to access this technology. With supply constraints easing, we expect the large tow T300 prices (e.g. the mainstream type of CF used in wind application) to gradually return to 2020 levels (decline by 25-35%) ([Exhibit 17](#)), that should attract further interest from domestic wind turbine OEMs. **We estimate CF demand for wind industry to grow by a CAGR of 27% for the next 3 years to reach 59kt, supported by higher CF adoption** (4%/10% for onshore/offshore wind market by end-2025E vs. 1-2% currently) ([Exhibit 28](#), [Exhibit 30](#), [Exhibit 31](#)), **with domestic consumption surpassing the export market in 2025E** ([Exhibit 29](#)). We believe wind energy industry will **remain the largest end-use industry** for CF by end-2025E in China, accounting for c.46% of the CF demand. Meanwhile, the use of CF in wind turbine blades should have limited impact on GF, given the size of substitution vs. GF's overall annual consumption.

Identifying the next growth opportunities

The potential for composite materials is vast and can be used in multiple applications by producers, this is especially true for CF composites. With GF composites being adopted in more than 50,000 applications, **the CF composites space still has a lot of undiscovered uses cases to be explored. We estimate the overall domestic CF demand to grow to 127kt in 2025 (20% CAGR), with market size reaching RMB21.8bn/US\$3.1bn**. We see early signs that C/C (carbon/carbon) composite could become the next growth driver for CF in China. C/C composite is a family of advanced composite material derived from CF reinforcement with carbon matrix. It was originally developed to be used in the aerospace industry, where **mechanical performance under high temperature matters**. In recent years, **we have seen robust growth prevailing in the civilian markets, especially in the solar energy industry** ([Exhibit 32](#)). This advanced material is being adopted in the thermal field systems of the crystal growth process (an early stage of the entire solar cell production cycle, [Exhibit 33](#)). **We estimate that solar thermal field system currently comprises c.55% of C/C**

composite content and is set to grow to 75% by 2025E to support the solar wafer size upsizing trend (Exhibit 35, Exhibit 38). Besides higher penetration, we expect demand for C/C composite will also be driven by: 1) **new solar installations at a global level** (Exhibit 37), as China has a majority market share in solar wafer production (owning 95%+ of the world's solar wafer capacity); 2) **replacement demand**, with components' lifespan ranging from 6 months to 2 years (Exhibit 34). Solar energy industry presents a significant opportunity for CF consumption. **We expect CF demand for C/C composite application to grow by 34% CAGR, reaching 22kt by end-2025E** (Exhibit 39). Beyond 2025, we believe the auto industry could take up the growth baton, supported by FCV (fuel cell vehicles) development (e.g. hydrogen storage) and automotive lightweighting trend (e.g. brake disc).

How to position - Stock ideas

We initiate coverage on three names: Zhongfu Shenying (Buy), Weihai Guangwei Composites (Buy) and China Jushi (Neutral), given their leading positions along the composite value chain. **Our top pick is ZFSY** for its strong position in high-performance products with more favorable end-market exposure towards new energy, where it has significant commercialization capability and plans to grow its capacity 4X by 2024.

Zhongfu Shenying (688295.SS): Gaining share in the growing civilian-use CF market; Buy

Zhongfu Shenying (ZFSY) is a leading CF producer (in capacity terms) in China, primarily engaged in the production of CF rovings, including both high strength and high modulus products, with downstream applications spanning across wind energy, pressure vessels and C/C composites. Its topline posted a solid 56% CAGR over 2018-2021, outstripping the capacity expansion (16% CAGR) and indicating a strong uptrend in pricing and utilization improvement. We believe T700 will be the fastest growing CF sub-segment in China for the next 3 years, driven by C/C composite demand where we are expecting a 34% CAGR by 2025E. ZFSY's current expansion plan will position it well to capture the energy transition opportunities through market share gain in the high-performance CF segment. We estimate a 46%/52% revenue/NPAT CAGR over 2021 to 2025E. **Initiate at Buy with a 12m TP of RMB55.7/sh.**

Guangwei Composites (300699.SZ): A beneficiary of wind industry development; Buy

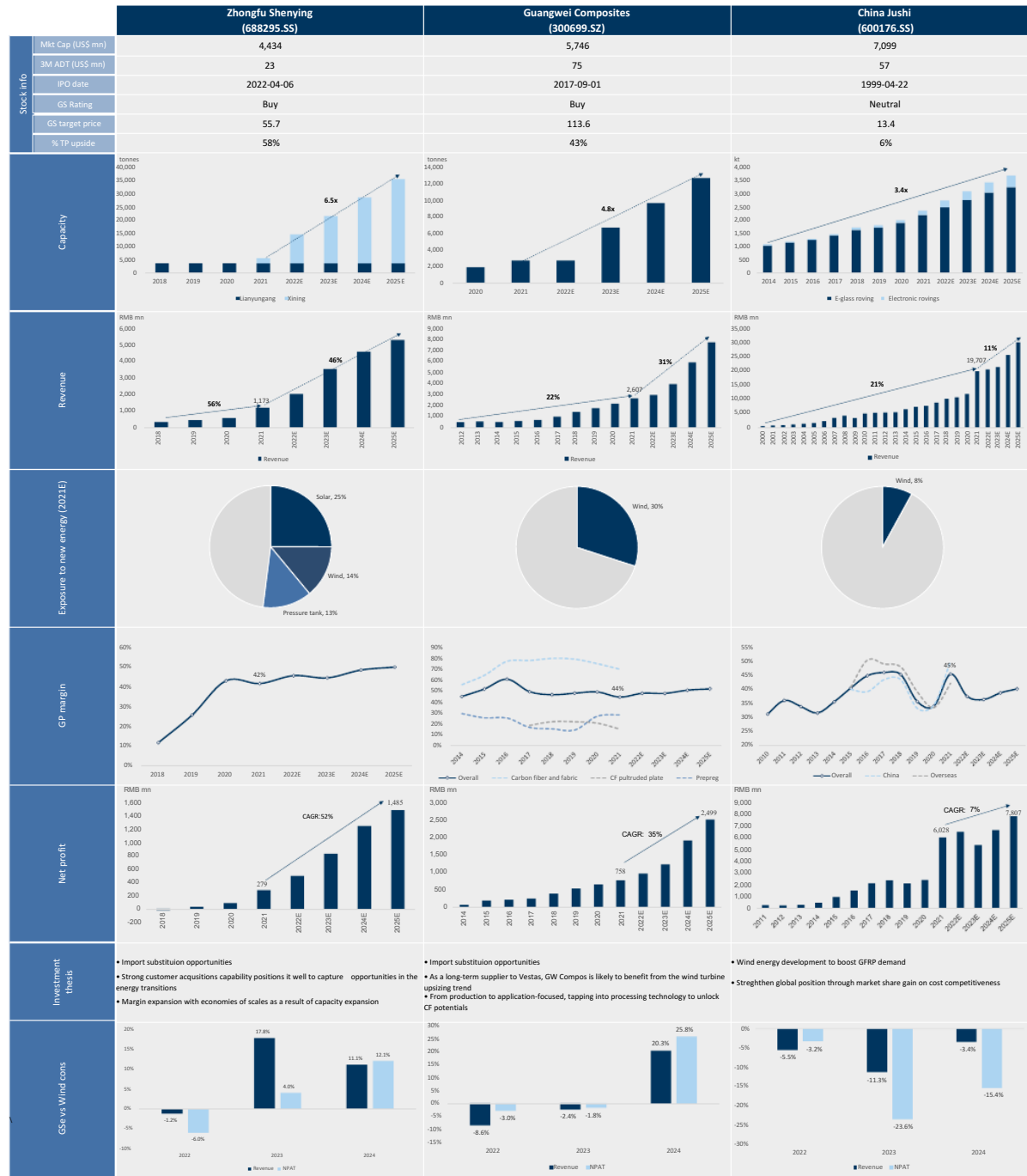
Weihai Guangwei Composites (GW Compos) is a leading player in every stage of the domestic CF development. It has emerged as a domestic leader and key contributor in setting national CF standards, **facilitating the CF commercialization and deployment in China**. The company has successfully established a **comprehensive industrial chain** among all CF producers in China, with businesses covering CF manufacturing, equipment and processing technologies. Leveraging its technical strength through the supply to the defense market, we expect GW Compos will gradually increase its exposure in the civilian market. As a long-term CF pultruded plate supplier to Vestas, **we believe GW Compos will benefit from the wind turbine upsizing trend** with more turbine OEMs adopting CF for wind turbine blade construction in the near future. We estimate NPAT to grow by 35% over 2021-2025E, outpacing topline growth (31% CAGR) on margin expansions. **Initiate coverage at Buy with a 12m TP of**

RMB113.6/sh.

**China Jushi (600176.SS): Cost competitiveness to weather a short-term slowdown;
Neutral**

China Jushi is the world's largest GF producer (c.22%/34% global/domestic market share as of 2021), with a comprehensive product offering, including GF roving, fabrics and electronic yarns. It has made significant inroads into the overseas business, with 47% of revenue generated from overseas operations in 1H22. We believe Jushi will continue to **gain market share globally on cost competitiveness**, but the recent pricing weakness arising from **supply/demand imbalance will pressurize margins** across the industry entering 2023. We estimate a revenue CAGR of 11% over 2021-2025E, mainly led by capacity expansion. At 9.3x PE (1-sd below historical avg), we believe the stock has priced in most negatives and is fairly priced. **Initiate at Neutral with a 12m TP of RMB13.4/sh.**

Three stocks in focus - our top pick is ZFSY

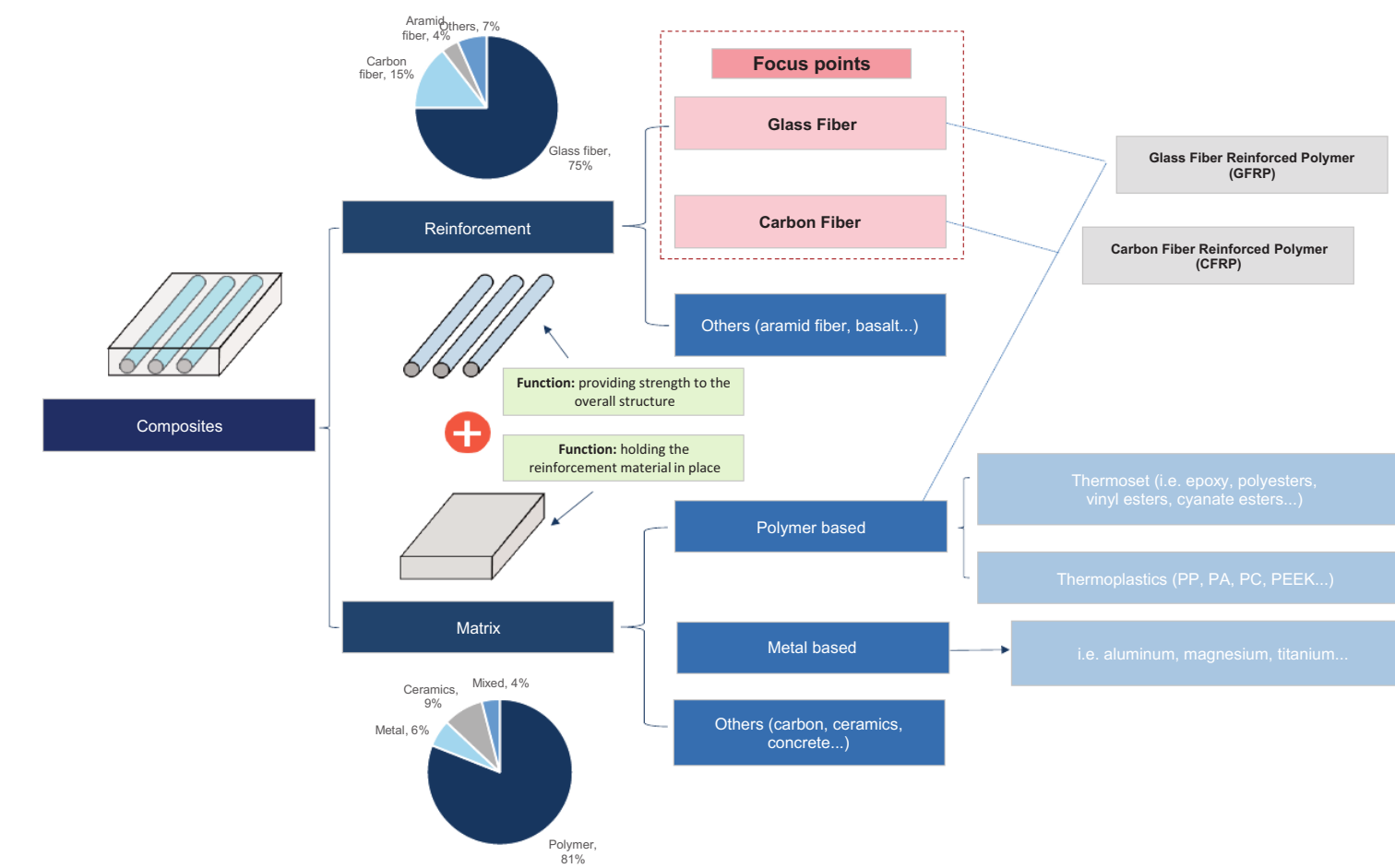
Exhibit 1: Three stocks in focus


Pricing as of Oct. 10, 2022

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

Overview of Composite Materials





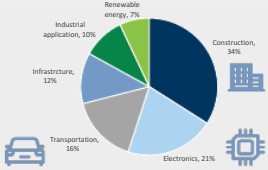
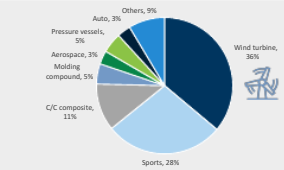

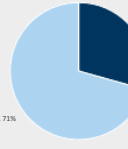
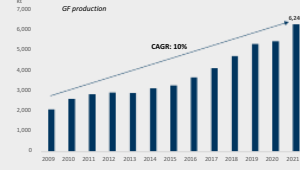
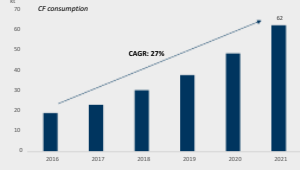
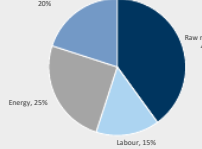
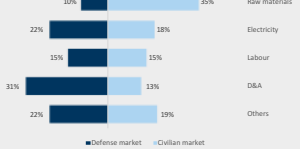
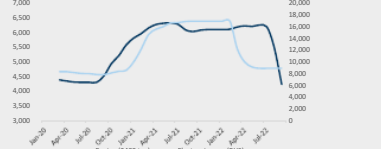
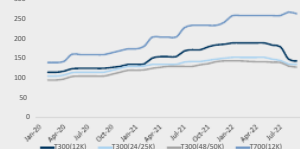




Exhibit 2: Overview of composite materials



Source: Goldman Sachs Global Investment Research, CSFCM

Glass Fiber (GF) vs. Carbon Fiber (CF)

Exhibit 3: GF vs CF

		Glass Fiber (GF)	Carbon Fiber (CF)
Related products			
			
		Roving	Carbon Fiber
		Chopped strands	Fabrics
		Fabrics/Mats	
End market breakdown (2021)			
Competitive landscape (2021)			
			Capacity by producer's country
GF composite vs. CF composite	Cost	Low	High
	Density	Medium density	Low density/lightweight
	Tensile Strength	Good	Excellent
	Modulus	Good	Excellent
	Conductivity	Insulative	Highly conductive
Growth profile			
Cost structure (2021)			
Price trend			
Key players	Global players		
	Domestic players		

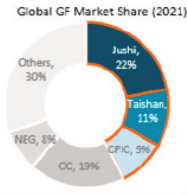
Source: Company data, Wind, Baiinfo, Goldman Sachs Global Investment Research

Three key themes in charts

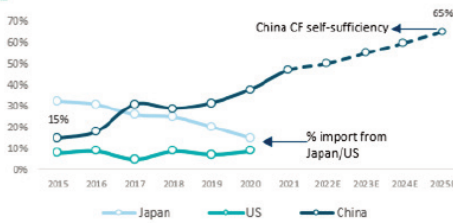
THEME 1

Tackling the ongoing trade tensions through globalization (GF) and import substitutions (CF)

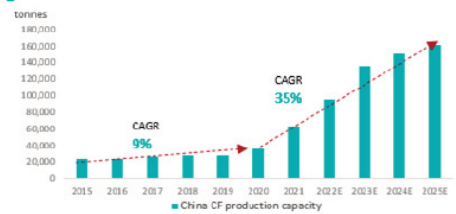
Through overseas expansion, Chinese GF producers will remain dominant



Trade tensions have accelerated CF import substitutions in China...



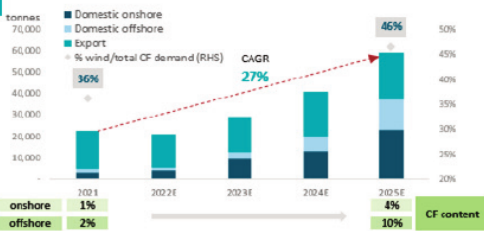
... supported by rapid capacity expansion by local players



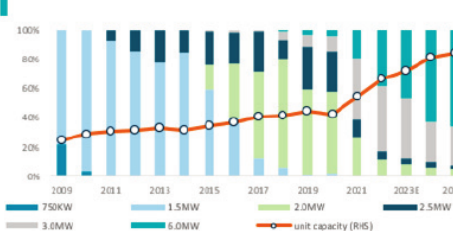
THEME 2

Capturing the wind opportunity

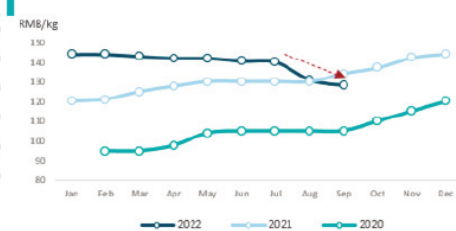
With rising CF content, China's CF demand for wind to grow 27% CAGR



... to support the wind turbine upsizing trend...



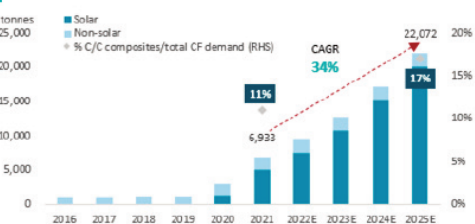
... declining raw material cost a tailwind for CF adoption



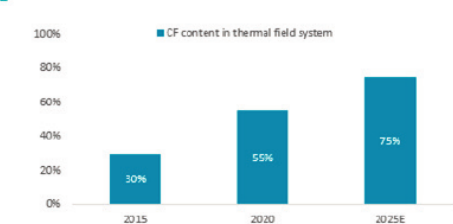
THEME 3

Identifying the next growth opportunities

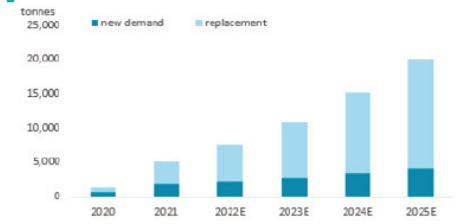
Solar industry will be the next key growth driver for China's CF demand...



...with above-solar-industry growth driven by: 1) CF content increase...



...and 2) recurring replacement demand for thermal field system



Source: Comany data, Wind, Baiinfo, Goldman Sachs Global Investment Research, Gao Hua Securities Research

13 October 2022

Global comp sheet

Exhibit 4: Global comp sheet

Company name	Ticker	Trading coy	GS Rating	TP (RMB)	upside (%)	Share price	Mkt cap (US\$ mn)	3M ADT (US\$ mn)	PE (x)			3-year EPS CAGR	PB (x)			ROE (%)			Divide
									2022E	2023E	2024E		2022E	2023E	2024E	2022E	2023E	2024E	
Glass fiber																			
Global																			
Owens Corning	OC.US	USD	Sell	74.0	-14%	86	8,236	86	6.7	7.6	6.9	6%	1.7	1.5	1.2	24.8	19.6	18.6	1.6
Nippon Electric Glass	5214.T	JPY	NC	-	-	2,587	1,767	11	9.7	9.3	9.1	-5%	0.5	0.5	0.4	6.3	5.0	5.1	4.6
Domestic																			
China Jushi	600176.SH	CNY	Neutral	13.4	6%	12.7	7,099	55	7.6	7.2	6.5	9%	1.8	1.6	1.3	24.3	21.5	20.2	4.0
Sinoma Tech	002080.SZ	CNY	NC	-	-	19.6	4,587	77	8.7	7.7	6.6	14%	1.9	1.6	1.3	21.6	20.1	19.5	3.4
Changhai Composite	300196.SZ	CNY	NC	-	-	13.6	774	10	7.6	6.4	5.3	22%	1.3	1.1	0.9	17.5	17.5	17.8	1.5
Shandong Fiberglass	605006.SH	CNY	NC	-	-	8.5	709	4	7.4	6.4	5.5	19%	1.7	1.3	1.1	22.7	21.6	20.8	3.1
Global Avg									8.2	8.4	8.0	1%	1.1	1.0	0.8	15.6	12.3	11.8	3.1
Domestic Avg									7.8	6.9	6.0	16%	1.7	1.4	1.2	21.5	20.2	19.6	3.0
Overall									8.0	7.7	7.0	8%	1.4	1.2	1.0				3.1
Carbon fiber																			
Global																			
Toray	3402.T	JPY	Buy*	1,050	41%	746.3	8,355	31	11.5	10.4	9.3	16%	0.8	0.8	0.7	7.1	7.5	7.8	2.4
Teijin	3401.T	JPY	NC	-	-	1410.0	1,915	7	9.9	8.7	8.1	14%	0.6	0.6	0.5	6.2	6.7	6.9	3.9
Hexcel	HXL	USD	Sell	46	-15%	54.1	4,547	32	42.1	27.2	19.7	115%	3.0	2.7	2.4	6.8	101.9	12.2	0.7
SGL Carbon	SGL.DE	EUR	NC	-	-	6.2	738	1	8.8	11.2	9.2	1%	1.6	1.4	1.3	17.5	12.3	13.6	0.0
GW Compos	300699.SZ	CNY	Buy	113.6	43%	79.3	5,746	75	42.0	33.2	27.2	26%	8.3	6.9	5.7	20.2	21.4	21.6	0.7
Zhongfu Shenyang	688295.SH	CNY	Buy	55.7	58%	35.3	4,434	23	60.5	39.9	28.5	59%	7.7	6.4	5.3	16.3	18.6	20.8	0.3
Sinofibers	300777.SZ	CNY	NC	-	-	45.1	2,769	45	41.7	29.8	23.8	60%	6.4	5.3	4.4	17.8	19.2	19.7	0.4
Jilin Tangu	836077.BJ	CNY	NC	-	-	46.1	2,053	3	20.4	14.3	10.9	62%	9.4	5.6	3.6	47.1	40.7	35.2	0.5
Global Avg									18.1	14.4	11.6	37%	1.5	1.4	1.3	9.4	32.1	10.1	1.8
Domestic Avg									41.1	29.3	22.6	52%	8.0	6.1	4.8	25.3	25.0	24.3	0.5
Overall									29.6	21.8	17.1	44%	4.7	3.7	3.0	17.4	28.5	17.2	1.1

NC = Not Covered; Pricing as of Oct. 10, 2022; *denotes stock on regional Conviction List

Source: Bloomberg, Wind, Company data, Goldman Sachs Global Investment Research

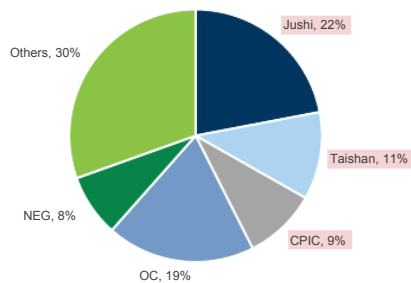
Three themes in focus

Tackling the ongoing trade tensions through globalization and import substitution

Glass Fiber industry: Going global

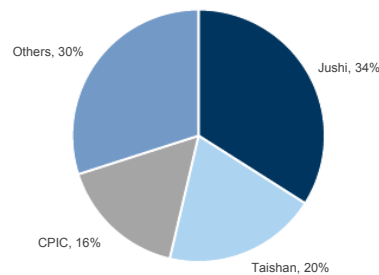
The Glass Fiber (GF) industry is a highly consolidated market both in China and globally, with the top-5 players having a combined market share of c.70% (as of 2021). This includes three Chinese manufacturers: China Jushi, Taishan Fiberglass, and Chongqing Polycomp International (CPIC). The proximity and cheap access to raw materials, coupled with low labor costs and economies of scale have allowed Chinese players to strengthen their market positions. **Historically, Chinese GF producers have enjoyed an average 9ppt margin premium compared to global peers.**

Exhibit 5: Market share of GF industry (Global) - 2021



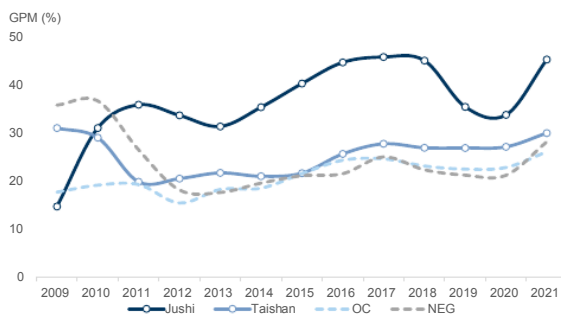
Source: Company data, Goldman Sachs Global Investment Research

Exhibit 6: Market share in GF industry (China) - 2021



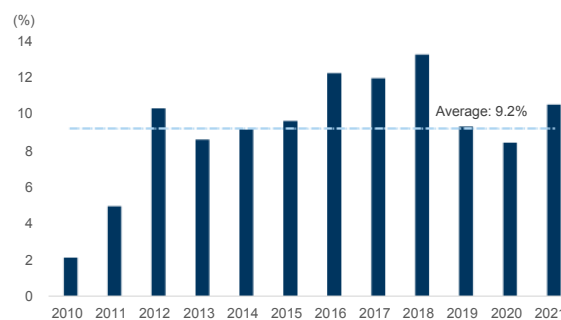
Source: Company data, Goldman Sachs Global Investment Research

Exhibit 7: GPM of leading GF producers



Source: Company data

Exhibit 8: GPM spread of leading Chinese GF producers vs global peers

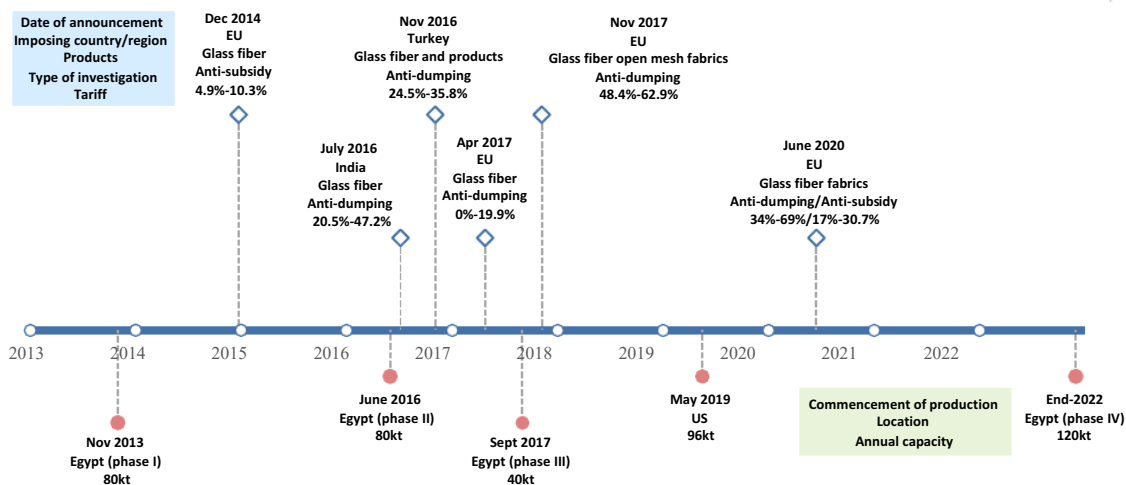


Source: Company data, Goldman Sachs Global Investment Research, Gao Hua Securities Research

Since the early 2010s, European Union countries, India, Turkey and the United States have imposed a series of anti-dumping and anti-subsidy measures on imports of certain GF products from China. To minimize this impact, Jushi has become the first manufacturer to build production plants outside of China. Jushi's first overseas plant,

located in the Suez Economic and Trade Cooperation Zone of Egypt, benefiting from easy access to Europe, Turkey, Middle East markets, commenced construction in 2011. The first phase of 80kt in capacity was put into operation in 2013. With the completion of the second/third phases of the project in 2016/2017, the annual production capacity of its Egyptian plants increased to 200kt. The ongoing trade tensions appear to have accelerated the pace of global expansion. Specifically, the construction cycle of Jushi's first three Egypt plants was shortened to 5 years compared to 8-10 years in the original plan. Following success in the Egyptian market, Jushi's second overseas base, in South Carolina in the US, began construction in 1Q2017 and commenced operation in 2019. The 4th phase of the Egypt plant, with an annual capacity of 120kt, is expected to come on stream at the end of 2022 with overseas operations accounting for 15% of its total capacity. As manufacturers continue to gain overseas exposure, **we believe Chinese leading GF producers will remain dominant in the global market.**

Exhibit 9: Timeline of anti-dumping and anti-subsidy measures vs. Jushi's overseas expansion

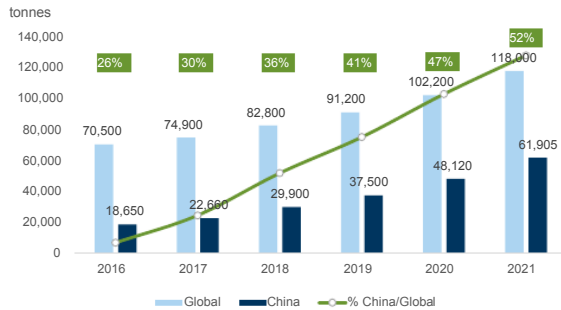


Source: Company data, data compiled by Goldman Sachs Global Investment Research, Gao Hua Securities Research

Carbon Fiber industry – import substitution

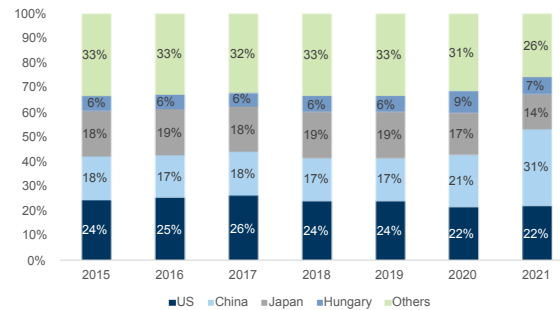
Unlike the GF sector, where Chinese producers have leading market share globally, the market landscape for Carbon Fiber (CF) sector is somewhat different. Chinese scientists began conducting research studies on CF materials in the 1960s, at around the same time as Japan, UK, and the US players, but development lagged behind global peers. Commercialization did not start until 2010s. China now consumes more than half of the world's CF composites, but only owns 1/3 of the world's capacity.

Exhibit 10: CF consumption (China vs. Global)



Source: Wind, CSFCM, Bainfo

Exhibit 11: CF capacity breakdown by country

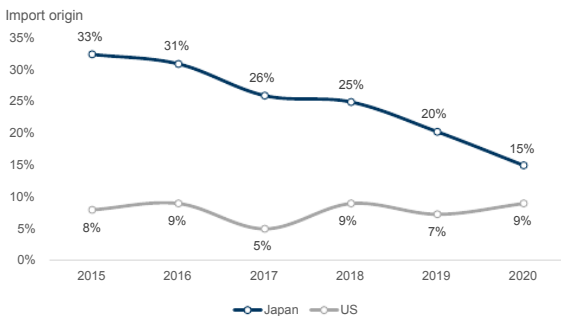


Source: Wind, CSFCM, Bainfo

In the past, the domestic CF market relied heavily on Japan. In 2015, 1/3 of the CF products consumed in China were imported from Japan. Both Japan and the US have regularly imposed export restriction measures on Chinese companies, particularly high-end products used for military purposes. As a recent example, in 2020, Toray (covered by Atsushi Ikeda), the leading Japanese CF maker received a warning from Japanese authorities, indicating that some of their CF products that had been exported to the Chinese market were sold to unauthorized parties. Following this incident, Toray suspended exports to China, causing supply disruptions in China's domestic market.

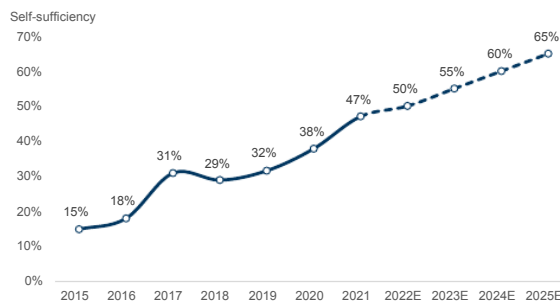
The ongoing export restrictions have accelerated the pace of import substitution with the self-sufficiency rate growing from 15% in 2015 to 47% in 2021. We expect China's CF self-sufficiency to grow by an average of 4-5ppts per annum to reach 65% by end-2025E, supported by growing product coverage and capacity expansion in the domestic market.

Exhibit 12: China's CF imports by country



Source: Wind, CFSCM

Exhibit 13: China's CF self-sufficiency rate

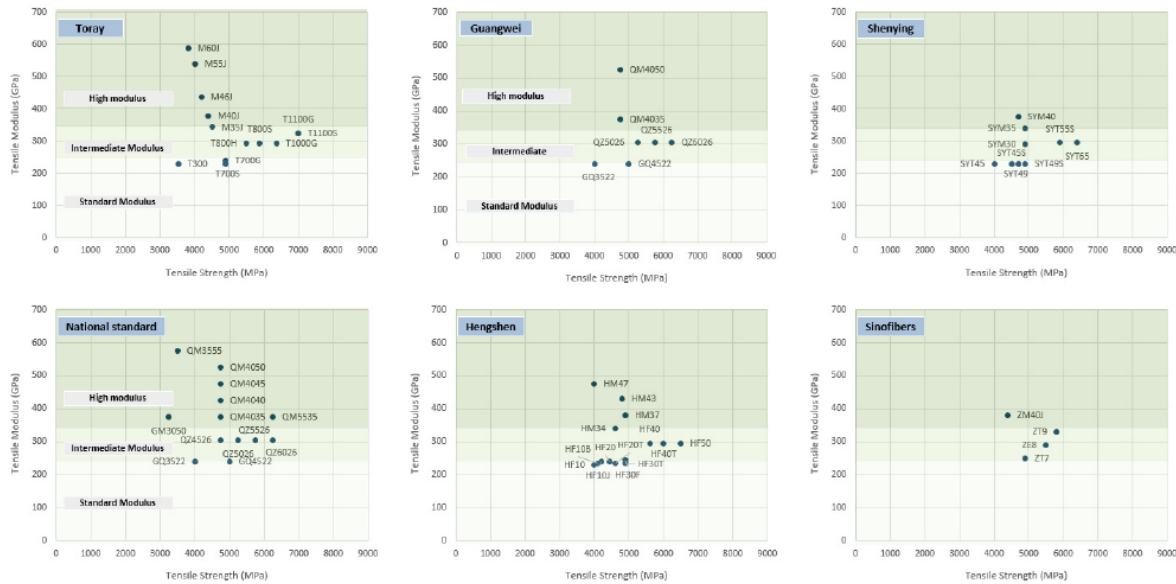


Source: Wind, CFSCM, Goldman Sachs Global Investment Research, Gao Hua Securities Research

With product and technology readiness, we believe visibility for import substitution is high. [Exhibit 14](#) shows the product portfolio of Toray and leading Chinese players. Toray's product classification is well recognized by industry players and is often used as a benchmark for product comparison. Toray produces high-strength CF ranging from standard modulus to intermediate and high modulus products. **Nowadays, leading**

Chinese producers are able to produce high-end products comparable to Toray's standards, capable of meeting broader end-market applications, although production stability still has room for improvement.

Exhibit 14: Product portfolio of Toray and leading Chinese CF producers



Source: Company data

Exhibit 15: Suitable end-market applications for different CF products

	Aircraft	Space	UAM	Automotive	Train	Marine	Pressure Vessel	Pipe	Electric Cable	Medical	Civil Engineering	Sporting Goods	Wind	Solar
T300	•		•	•	•	•				•		•	•	
T400	•													
T700	•	•	•	•	•	•	•	•	•	•	•	•		•
T800	•	•	•	•	•	•	•	•			•	•		
T1000		•		•										
T1100	•	•	•	•								•		
M35J												•		
M40J			•	•		•						•		
M46J		•		•		•				•	•	•		
M50J												•		
M55J		•		•						•		•		
M60J		•								•		•		

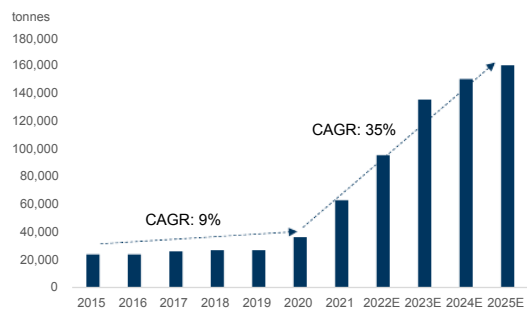
Source: Company data, Goldman Sachs Global Investment Research, Gao Hua Securities Research

CF Basics - product classification by mechanical property

- The T-series (T = "Tensile Strength") is characterized by high tensile strength and a standard to intermediate modulus. The number following the letter T denotes the approximate tensile strength in kgf/mm² or Ksi (T700 has a tensile strength of 711 Ksi).
- The M-series (M = "Modulus"), comes with high modulus features. The number following the letter M indicates the approximate tensile modulus in kgf/mm² (M55J has a tensile modulus of 55 x 103 kgf/mm²). (Source: Toray company website)

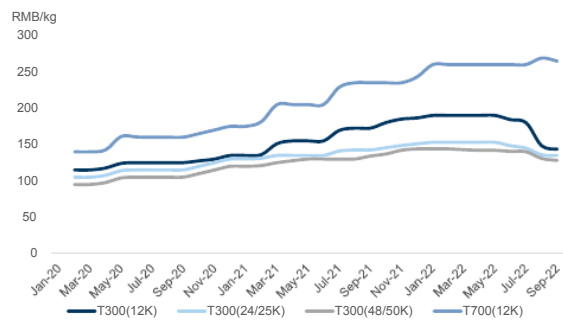
Capacity expansion in response to strong downstream demand and trade restrictions is another factor supporting import substitution momentum. China’s CF operating capacity reached 69kt in 2021, compared to 36kt a year earlier. **With existing announced capacity plans, operating capacity could reach c.161kt by 2025E.** We have started to see pricing trend divergence between low-grade (e.g. T300) and high-grade (e.g. T700 or above) CF products entering 3Q22. We expect prices to remain resilient for high-grade products entering 4Q22/1H23 given higher entry barriers, a longer product verification process, and limited suppliers with industrialization capabilities in T700 productions.

Exhibit 16: China's CF capacity projection



Source: Baiinfo, Goldman Sachs Global Investment Research, Gao Hua Securities Research

Exhibit 17: Domestic CF prices



Source: Baiinfo

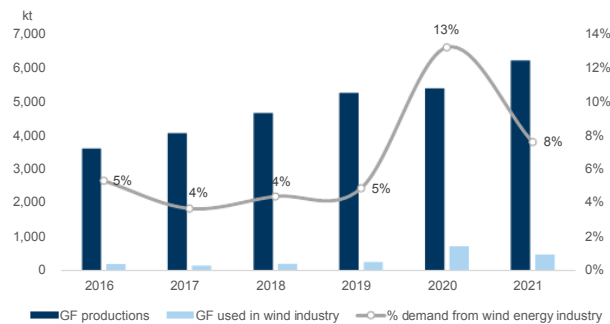
Capturing the wind opportunity

The role of composite materials in the wind industry

The selection of lightweight materials is important for wind turbine blade construction. The most widely used composite in wind turbine blades is GFRP (Glass Fiber Reinforced Polymer). Its wide-spread use in the market is attributed to its excellent mechanical properties at a relatively low cost. The GF sector has benefited from an increase in wind turbine installations over the past two years. As a rough rule of thumb, 1GW of wind capacity installations requires 10kt of GF consumption. China added 72GW/48GW of wind capacity in 2020/2021, respectively, implying 720kt/480kt of GF consumption, accounting for 13%/8% of total GF demand, up from previous levels of c.5%.

Our China Clean Energy team estimates China wind installation (by volume) to accelerate at 22% CAGR over 2022-25E, which would continue to support GF consumption. However, **we are seeing a more promising future for the CF sector, as it not only benefits from higher wind turbine installations but also rising CF content used in wind turbine blades in order to meet the recent wind industry trends.**

Exhibit 18: GF consumption and % demand from wind industry



Source: Wind

Latest trends in wind development

One clear trend in the wind industry is turbine and plant upsizing. Taking as an example, for Goldwind (covered by Chao Ji), China's largest wind turbine manufacturer, the most popular model prior to 2015 was the 1.5MW-rated turbine, accounting for c.60% of sales volume. Since 2016, the mainstream model had shifted to 2MW and more recently to 3MW. Our China clean energy team estimates that 6MW+ will become the next growth driver, making up more than 60% of Goldwind's sales volume.

Although turbine upsizing requires higher upfront costs, it brings the benefit of unit cost reduction when measured through a plant's entire lifespan, as higher rated turbines reduce the number of systems required to generate the same amount of energy across a wind farm, which sequentially leads to less component/materials cost as well as lower maintenance expenses.

Wind energy output depends on three key factors: 1) air density; 2) wind speed; and 3)

swept area of the turbine blade. The industry's race to produce a longer turbine blade is not only to meet the higher desired power output for the offshore wind market but also to compensate for slower wind speed as far as the onshore wind market is concerned.

Exhibit 19: The wind power equation

$$P = \frac{1}{2} \rho A V^3 = \frac{1}{2} \rho \pi r^2 V^3$$

where:

P is wind energy output

ρ is air density

A is the swept area

r is the blade length

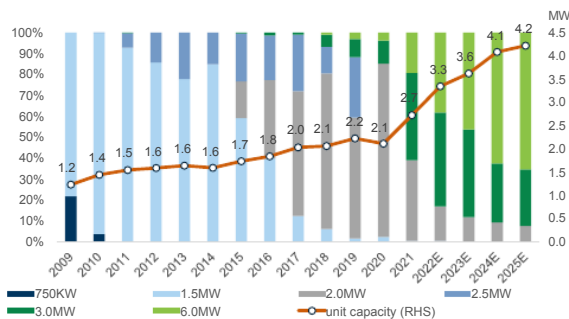
V is wind velocity

Source: Company data, Goldman Sachs Global Investment Research, Gao Hua Securities Research

Why CF is a promising alternative solution

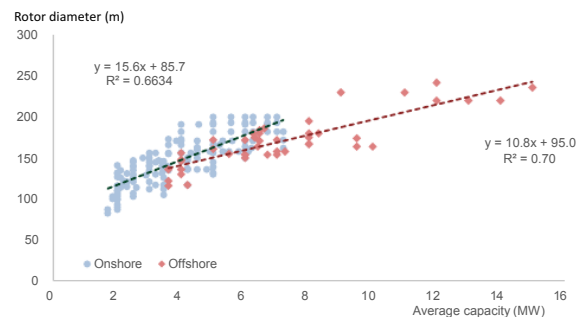
We have gathered specifications from over 200 wind turbine blade models that are offered by leading global and domestic wind turbine OEMs (in [Exhibit 21](#)). The longest wind turbine blade available in the market today is around 120m long, comparable to the length of a football pitch. A longer blade adds extra weight and is also more **susceptible to tip deflection**, hence **stiffness-to-weight ratio is a major consideration** from the material selection perspective. CF is considered to be a promising alternative solution to GF, given its low density and superior stiffness properties. However, the elevated cost compared to GF (>10 times more expensive) as well as supply chain restrictions also limit broader adoption.

Exhibit 20: Goldwind's product breakdown by rated power



Source: Company data, Goldman Sachs Global Investment Research, Gao Hua Securities Research

Exhibit 21: Specification of turbine blades produced by leading turbine OEMs

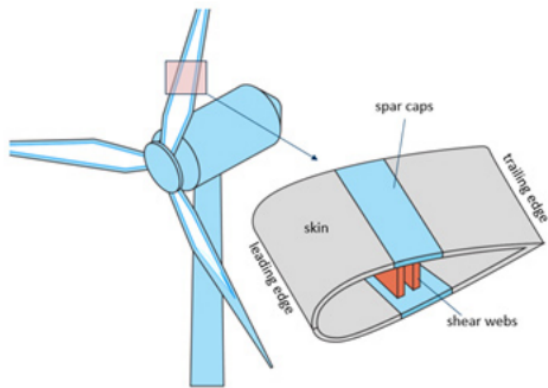


Source: Company data

The use of CF in the selected structural parts of the turbine blades has proven to be a commercially viable solution. **This carbon/glass hybrid structure takes advantage of**

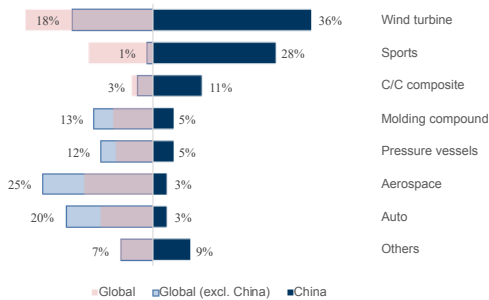
carbon fiber’s lightweight characteristics and achieves a possible balance between cost and performance. Vestas (covered by Ajay Patel), a leading global wind turbine OEM, uses CF on the spar caps (Exhibit 22) of the turbine blade. The spar cap, which serves as the backbone of the blade, is manufactured from the pultrusion method instead of the conventional resin infusion or resin transfer molding process.

Exhibit 22: Structure of wind turbine blade



Source: Goldman Sachs Global Investment Research, Gao Hua Securities Research

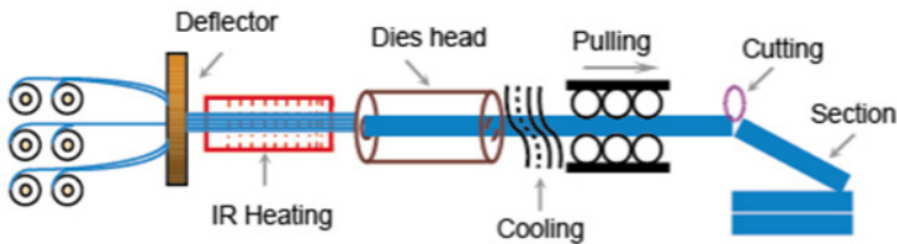
Exhibit 23: CF demand by end-market (measured by volume) - 2021



Source: Wind, CSFCM

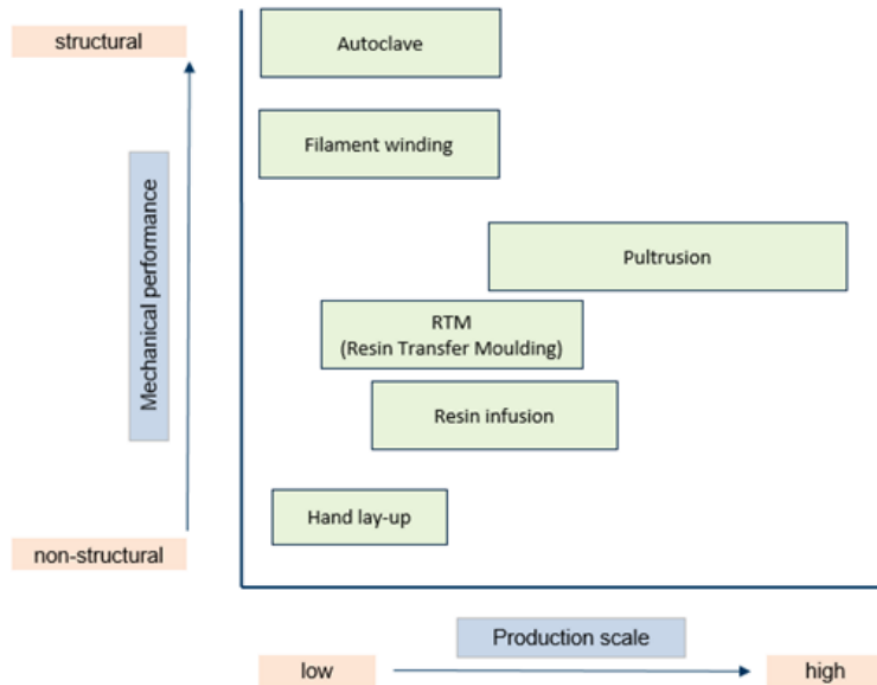
Pultrusion (pull + extrusion) is a low-cost and high-volume manufacturing process, suitable for producing long parts with **constant cross-section** and **continuous length**, which makes it an ideal fabrication process for spar caps. The successful implementation of this cost-effective method has boosted CF adoption in the wind energy industry. Wind turbine blades have become the largest (measured by production volume) single downstream application of CF both at national and global levels. Vestas has owned a patent, associated with the adoption of the technology, which expired in July 2022, **opening up further opportunities for Chinese wind turbine OEMs to access to this technology.**

Exhibit 24: Schematic illustration of pultrusion process



Source: Company data

Exhibit 25: Comparison of different composite manufacturing process

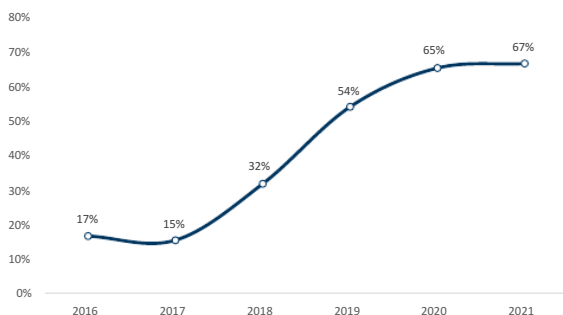


Source: Company data, compiled by Goldman Sachs Global Investment Research, Gao Hua Securities Research

We expect the wind energy will remain the largest end-use industry for CF by end-2025E in China

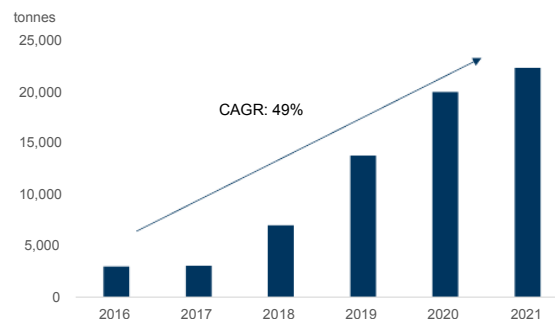
In 2021, China produced 22kt of CF for use in wind turbine blades, which accounted for roughly 2/3 of the world's demand for this end-market. However, little of this CF production was consumed by domestic turbine OEMs or blade manufacturers.

Exhibit 26: % of CF used in wind turbine blades produced in China



Source: Wind, CSFCM

Exhibit 27: CF consumption used in the wind energy industry



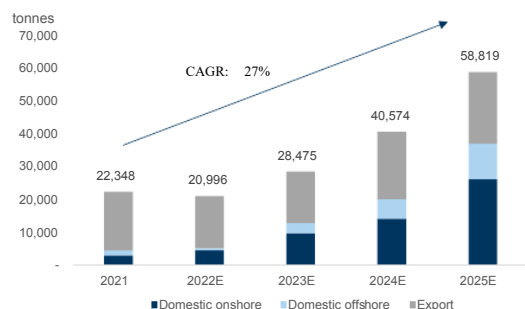
Source: Wind, CSFCM

We estimate demand for this segment to **grow by a CAGR of 27% for the next 3 years, reaching 59kt, with domestic consumption surpassing the export market in 2025**. We believe wind energy will remain the largest end-use industry segment for CF

by end-2025E in China, accounting for 46%/32% of the total demand measured by volumes/value, respectively. We have incorporated the following key assumptions into our demand analysis:

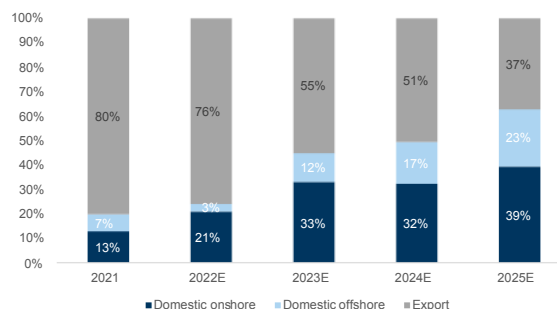
- Wind installations to maintain at a high level in China, with an average c.70GW-80GW to be added each year.
- We use Goldwind/Shanghai Electric's data as proxies for China's onshore/offshore markets respectively, given both companies are leaders in the respective fields. We derive future product mix based on the companies' historical sales mix and product pipelines.
- We extrapolate blade length assumptions from the regression model shown in [Exhibit 21](#)
- Based on the density of materials, we factor in a 30% weight reduction in switching from GF to CF
- CF content to grow to 4%/10% for onshore/offshore wind turbine blades by end-2025E
- For the export market, we assume CF demand to grow in-line with Vestas' deliveries, consistent with our Europe Utilities team's estimates.

Exhibit 28: Projection of CF consumption used in wind turbine blades



Source: Goldman Sachs Global Investment Research, Gao Hua Securities Research, Wind

Exhibit 29: CF consumption breakdown by destination



Source: Goldman Sachs Global Investment Research, Gao Hua Securities Research, Wind

We think the biggest source of uncertainty in our demand analysis could be from the CF content assumptions. Upside risks to our base case assumptions include:

- CF adoption extends from spar caps to other parts of the turbine blade
- Potential technology breakthrough that leads to improvement in fabrication efficiency and reduction in manufacturing costs

We have conducted a sensitivity analysis with different CF content assumptions for both onshore and offshore markets, and present our findings in [Exhibit 30](#) and [Exhibit 31](#).

Exhibit 30: Sensitivity analysis of different CF content assumptions

unit: tons								
% CF content (offshore)		1%	2%	3%	4%	5%	6%	7%
	2%	27,931	34,544	41,157	47,770	54,382	60,995	67,608
	4%	30,694	37,306	43,919	50,532	57,145	63,757	70,370
	6%	33,456	40,069	46,682	53,294	59,907	66,520	73,133
	8%	36,218	42,831	49,444	56,057	62,669	69,282	75,895
	10%	38,981	45,594	52,206	58,819	65,432	72,045	78,657
	12%	41,743	48,356	54,969	61,581	68,194	74,807	81,420
	14%	44,506	51,118	57,731	64,344	70,957	77,569	84,182
	16%	47,268	53,881	60,493	67,106	73,719	80,332	86,944

Source: Goldman Sachs Global Investment Research, Gao Hua Securities Research

Exhibit 31: Sensitivity analysis of different CF content assumptions

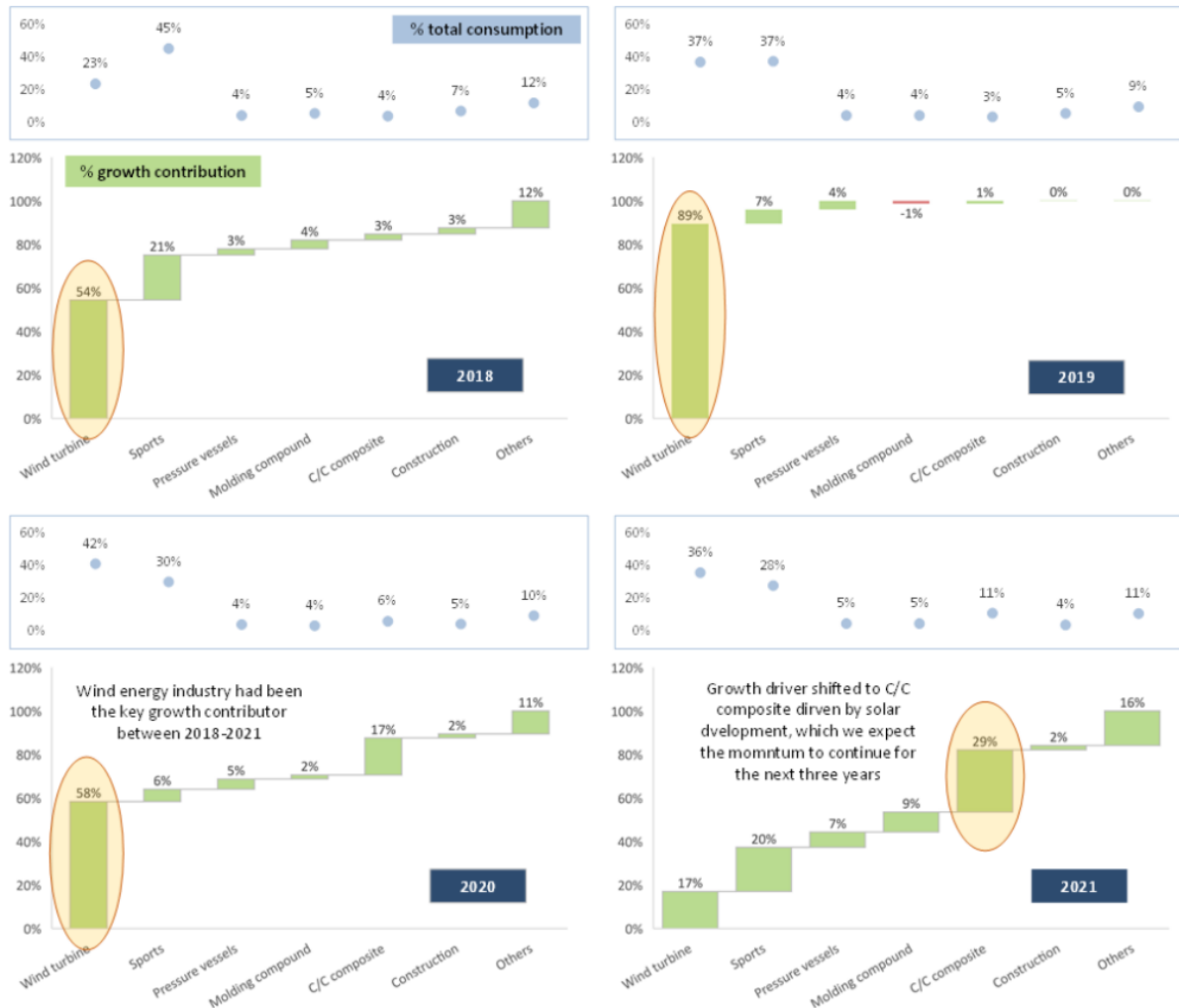
4-yr CAGR								
% CF content (offshore)		1%	2%	3%	4%	5%	6%	7%
	2%	6%	12%	16%	21%	25%	29%	32%
	4%	8%	14%	18%	23%	26%	30%	33%
	6%	11%	16%	20%	24%	28%	31%	34%
	8%	13%	18%	22%	26%	29%	33%	36%
	10%	15%	20%	24%	27%	31%	34%	37%
	12%	17%	21%	25%	29%	32%	35%	38%
	14%	19%	23%	27%	30%	33%	36%	39%
	16%	21%	25%	28%	32%	35%	38%	40%

Source: Goldman Sachs Global Investment Research, Gao Hua Securities Research

Identifying the next growth opportunities

With GF composites being adopted in more than 50,000 applications, the CF composite space still has a lot of undiscovered use cases to be explored. In the near term, we see **growing demand coming from the solar industry, driven by: 1) higher CF content used during the solar production process; 2) new solar installations at a worldwide level; and 3) replacement demand**. Beyond 2025, the auto industry could take up the growth baton, supported by FCVs (fuel cell vehicles) and the lightweight automotive trend.

Exhibit 32: CF growth contribution by end-market application



Source: Wind, Baiinfo

The role of composite materials in the solar energy industry

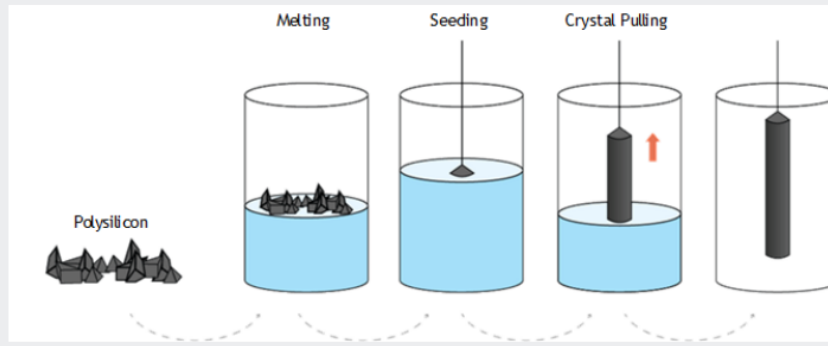
Composite materials consist of reinforcement and matrix. **C/C (carbon/carbon) composite is a family of advanced composites made from CF reinforcement with carbon matrix**. It was originally developed to be used in the aerospace industry, where **mechanical performance under high temperature matters**. The most common

applications include aircraft brake discs and rocket engine nozzles. **In recent years, we have seen robust growth prevailing in the civilian market segment, especially in the solar industry.** Specifically, this material is used in the thermal field system of the crystal growth process (an early stage of the entire solar cell production cycle).

Solar value chain: How does the monocrystalline growth process work?

In the mono-crystalline growth process ([Exhibit 33](#)), polysilicon is melted in a quartz crucible. A seed crystal silicon rod is dipped into molten silicon held by crucible to start the formation of a continuous single crystal. The seed is pulled upwards while rotating it, to **form a mono-crystalline ingot before cutting/slicing into wafer.**

Exhibit 33: Monocrystalline growth process



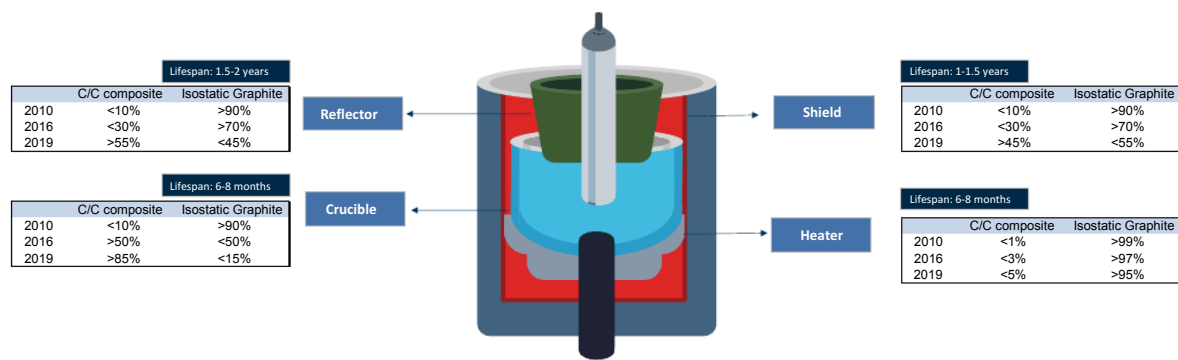
Source: Company data

The mono-crystalline growth process is conducted in a thermal field system

([Exhibit 34](#)), consisting of two crucibles, a heater, a reflector, three thermal shields and other accessories. Key functions of these components are:

- Crucible: used to hold the molten silicon; there are two types of crucibles made from different materials within a thermal heat field system. The material used to construct the inner layer of the crucible is quartz, as this material is chemically inert in contact with most substances, hence minimizing contamination. **The outer layer is used to protect the quartz crucible, hence needs to be made from materials with high strength.**
- Heater: to melt solid silicon
- Reflector: transfer heat and establish a temperature gradient to enable crystal growth process
- Thermal shield: to provide thermal insulation

Exhibit 34: A schematic diagram of thermal heat field system used for mono-crystalline silicon growth process

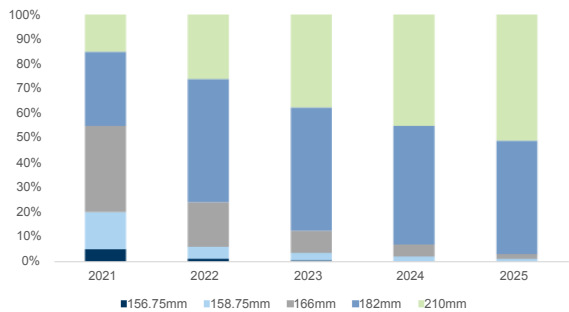


Source: Company data

Isostatic graphite was the most commonly used material for components within a thermal heat field. **The strength of graphite increases with temperature up to a certain limit, this unique feature makes it an indispensable material for high temperature applications.** However, this material has shown some limitations as solar cell manufacturers are actively **adopting larger wafer sizes** to optimize active space in the solar panel to meet the industry’s growing demand for higher power ratings and **achieve better efficiency.**

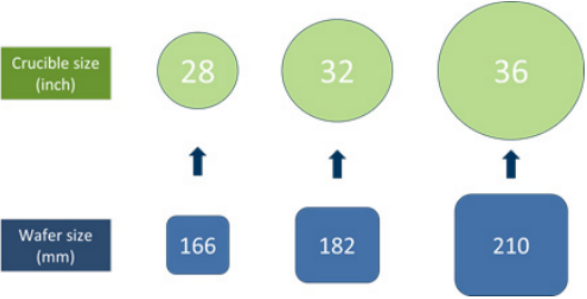
Upscaling wafer size needs to be supported by a large thermal heat field system. Our channel checks with industry experts suggest that **fabrication of graphite crucibles becomes challenging** when crucible sizes exceed 28 inches, hence there is an increasing need to **switch to C/C composites from a manufacturing perspective.** C/C composite also exhibits better resistance to cracking compared to isostatic graphite, this provides extra safety to the system as more molten silicon is held in a larger crucible. Given wafer manufacturers’ existing expansion plans, crucible sizes could increase to 28/32/36 inches to produce 166/182/210mm wafer sizes, respectively.

Exhibit 35: Projection of solar wafer size



Source: CPIA

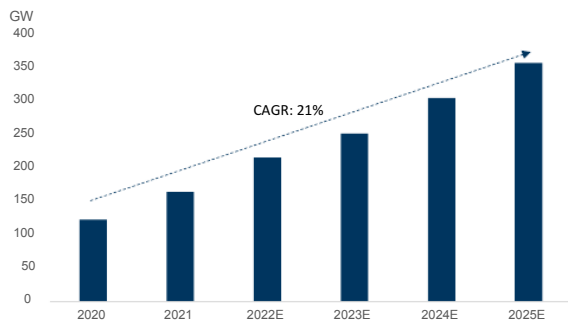
Exhibit 36: Wafer size vs. crucible size



Source: Company data

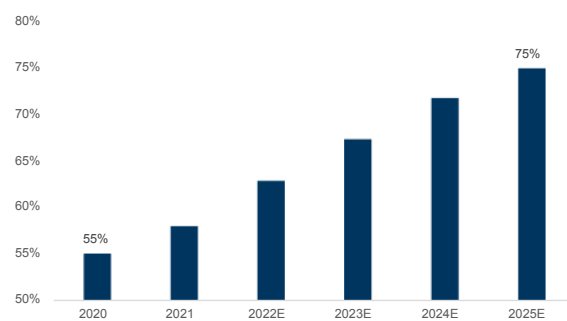
From our channel checks with thermal field components makers, **we estimate that solar thermal field system currently comprises c.55% of C/C composite content**, with crucible having the highest penetration (>90%), while heaters have the lowest penetration (c.5%). The low C/C composite adoption by heater is mainly due to the technological difficulty of achieving uniform resistance, and we believe isostatic graphite will remain as the mainstream material for this component in the near term. Other than that, we expect that by end-2025, all graphite crucibles will be replaced with C/C composite, and 80%+ of thermal shields and reflectors will also adopt this advanced material. This should **boost C/C composite content to 75%+ on the system level based on our forecast**. On top of higher penetration, demand for C/C composite will also likely be driven by new solar installations on a worldwide level, as China has a near monopoly position on solar wafer production (owning 95%+ of the world's solar wafer capacity). In addition, components within the solar thermal field system are exposed to harsh operating environments, and therefore can be considered consumables, with lifespans ranging from 6 months to 2 years.

Exhibit 37: New global solar installations



Source: Bloomberg, Goldman Sachs Global Investment Research, Gao Hua Securities Research

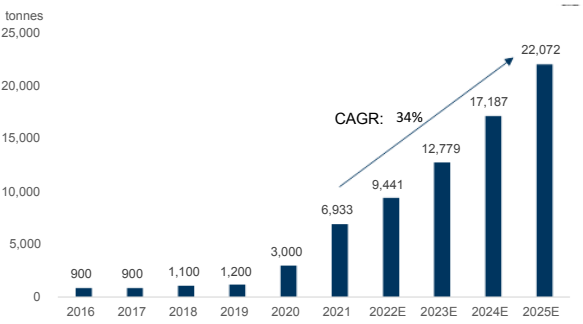
Exhibit 38: C/C composite content for solar thermal field



Source: Company data, Goldman Sachs Global Investment Research, Gao Hua Securities Research

The global solar industry presents a significant opportunity for CF consumption. **We expect CF demand for C/C composite applications to grow from 6.9kt in 2021 to 22kt by end-2025**, contributing to c.17% of the total CF demand. On the back of the energy transitions, we estimate the overall domestic CF demand to **grow from 62kt in 2021 to 127kt in 2025, with market size reaching RMB21.8bn**.

Exhibit 39: Projection of CF demand for C/C composite



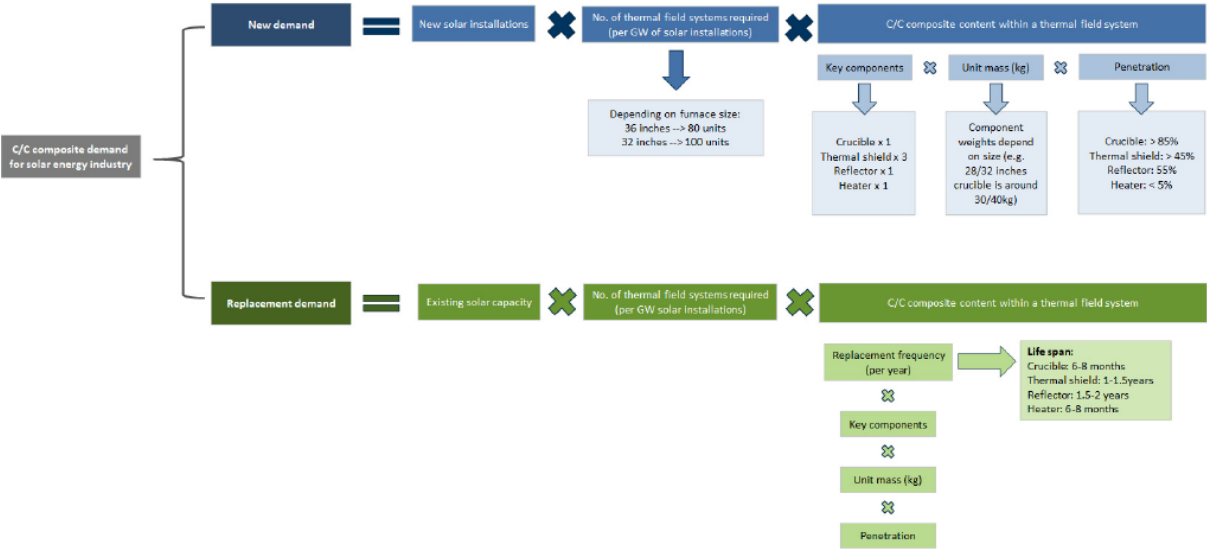
Source: Company data, Goldman Sachs Global Investment Research

Exhibit 40: Demand increment by end-market (2021-2025E)



Source: Goldman Sachs Global Investment Research

Exhibit 41: Methodology of projecting C/C composite demand used in solar energy industry



Source: Goldman Sachs Global Investment Research, Gao Hua Securities Research

Zhongfu Shenying (688295.SS): Gaining share in the growing civilian-use CF market; initiating at Buy

A leading CF supplier targeting the civilian market; initiating at Buy

Founded in 2006, Zhongfu Shenying (ZFSY) is a leading CF producer (in capacity terms) in China, primarily engaged in the production of CF rovings, including both high strength and high modulus products, with downstream applications spanning across wind energy, pressure vessels and C/C composites. Its topline posted a solid 56% CAGR over 2018-2021, outstripping the capacity expansion (16% CAGR) and indicating a strong uptrend in pricing and utilization improvement. We believe T700 will be the fastest growing CF sub-segment in China for the next 3 years, driven by C/C composite demand where we are expecting a 34% CAGR. ZFSY's current expansion plan (4x increment between 2021-2024E) will position it well to capture the energy transition opportunities through market share gain in the high-performance CF segment. We estimate a 46%/52% revenue/NPAT CAGR over 2021 to 2025E. **Initiate at Buy with a 12m TP of RMB55.7/sh.**

Realizing economies of scale with capacity expansion

The company's strong market position can be attributed to the successful adoption of the "dry jet wet spinning" process, that substantially improves manufacturing efficiency, hence boosting production capabilities. Currently, ZFSY has an annual production capacity of 14.5kt, and is set to grow to 28.5kt by 2024. We estimate a margin uptrend (1H22 GPM: 45% vs 2025E: ~49%) to be supported by economies of scale, with unit cost reduction coming from: 1) labour cost; 2) D&A expense; 3) electricity consumption.

Well positioned in the fastest growing CF sub-segment

We believe T700 will be the fastest growing CF sub-segment in China for the next 3 years, driven by C/C composite demand where we are expecting a 34% CAGR. We expect based on ZFSY's current expansion plan it will continue to gain market share (currently 50%) in the high-performance CF segment, particularly given its solid track record of customer acquisitions (e.g. ZFSY is a supplier to the largest C/C composites and hydrogen pressure tanks producers).

Valuation and risks

Our target price of RMB55.7/sh is based on 43x FY2025 PE, discounted back to 2023E at 10.2% CoE. Given the lack of long-term historical trading data for ZFSY, our target multiple is at a c.43% premium to GW Compos' target multiple. We think a premium is justified given a faster earnings growth trajectory. Specifically, we estimate ZFSY's earnings to grow by 33% CAGR over 2025-2028E (as part of our DCF cross-check) vs. GW Compos at 23%, implying a 1.3x PEG for both companies. Key downside risks include: slower-than-expected demand growth in the high-end civilian market; slower-than-expected capacity ramp up; pick up in import of high performance CF; quality issues relating to ZFSY's product; delays in product launch.

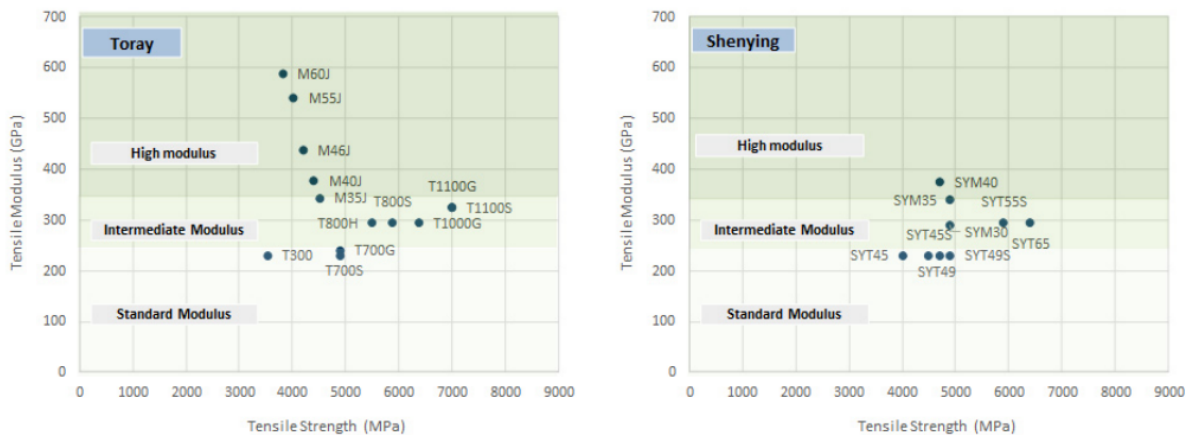
688295.SS	12m Price Target: Rmb55.7	Price: Rmb35.25	Upside: 58%		
Buy	GS Forecast				
Market cap: Rmb31.7bn / \$4.4bn	Revenue (Rmb mn)	12/21	12/22E	12/23E	12/24E
Enterprise value: Rmb31.8bn / \$4.4bn	EBITDA (Rmb mn)	1,173.4	2,007.1	3,525.3	4,567.1
3m ADTV :Rmb158.8mn/ \$23.2mn	EPS (Rmb)	0.35	0.57	0.92	1.39
China	P/E (X)	NM	61.3	38.3	25.4
China Advanced Materials & Construction	P/B (X)	NM	7.1	6.8	5.9
	Dividend yield (%)	--	0.7	1.2	1.8
M&A Rank: 3	N debt/EBITDA (ex lease,X)	3.4	0.0	0.4	0.5
Leases incl. in net debt & EV?: No	CROCI (%)	20.0	22.2	22.6	25.8
	FCF yield (%)	#VALUE!	(3.9)	(0.2)	0.3
		3/22	6/22	9/22E	12/22E
	EPS (Rmb)	0.14	0.12	0.22	0.09

Source: Company data, Goldman Sachs Research estimates, FactSet. Price as of 10 Oct 2022 close.

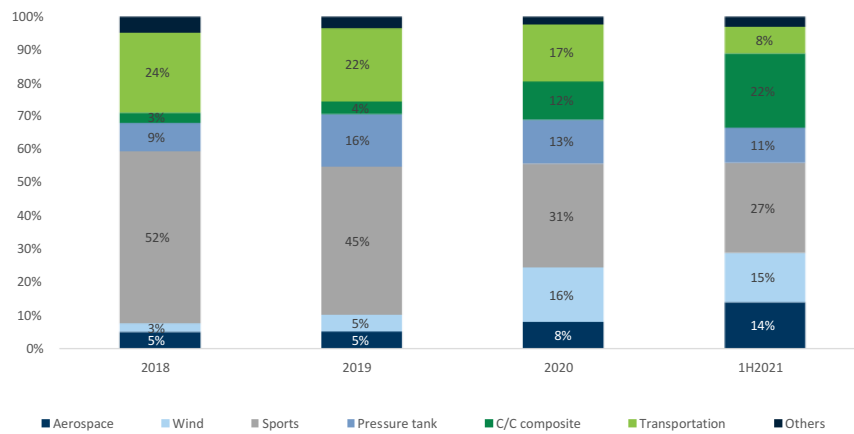
Leading CF producer targeting civilian market

Founded in 2006 and listed in 2022, ZFSY is one of the biggest CF producers in China. The company has production bases in Lianyungang (Jiangsu) and Xining (Qinghai), with a combined capacity of 14.5 kt as of 1H2022. It is primarily engaged in the production of CF rovings, including high strength (T300, T700, T800) and high modulus products, with downstream application spanning across aerospace, wind energy, sporting goods, pressure tanks, C/C composites and transportation.

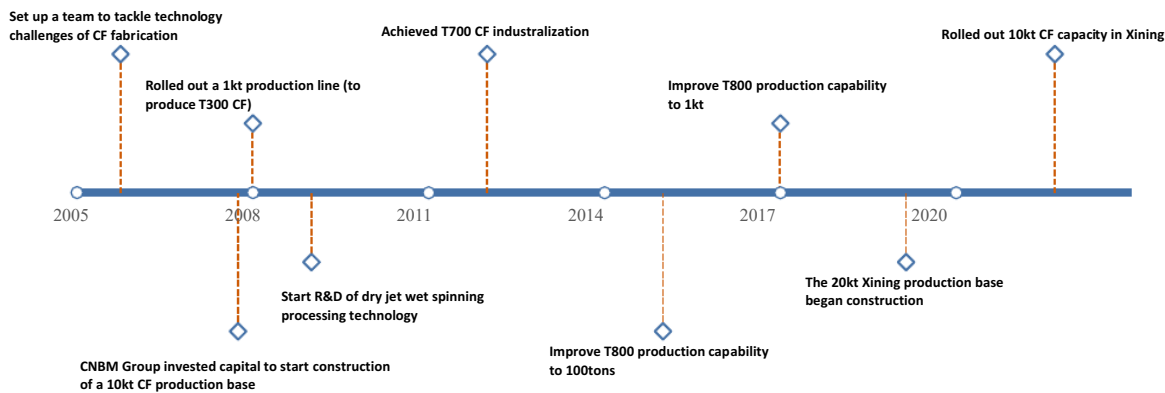
Exhibit 42: ZFSY's product portfolio and specification mapping with Toray's standards



Source: Company data, compiled by Goldman Sachs Global Investment Research, Gao Hua Securities Research

Exhibit 43: ZFSY revenue breakdown by end-market

Source: Company data

Exhibit 44: History of product development

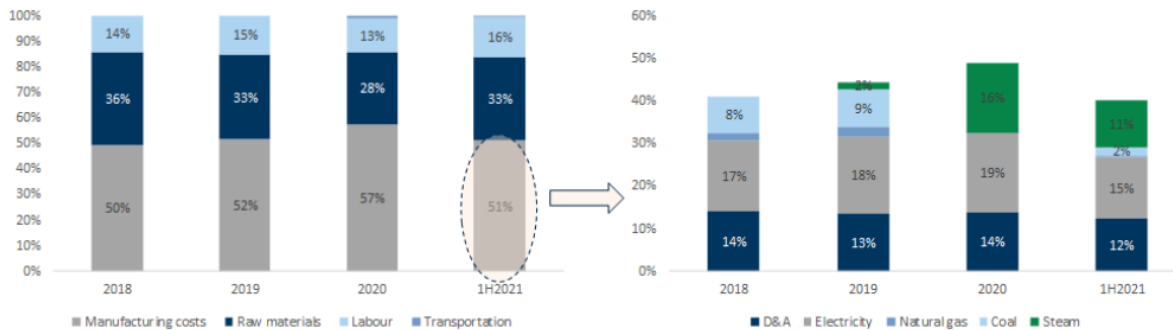
Source: Company data, compiled by Goldman Sachs Global Investment Research, Gao Hua Securities Research

Further cost savings from improving manufacturing process

ZFSY is one of the few domestic CF suppliers that has achieved industrialization capability in T700 (or above) high-performance CF productions. According to the company, it has currently more than 50% of the domestic market share in this segment. We think ZFSY's strong market position in this segment is due to the successful adoption of the "dry jet wet spinning process" (for more details, please refer to the Appendix section, [Exhibit 101](#)), which substantially improves the spinning speed (to >

400m/mins) compared to the wet spinning process (~100m/mins), hence leading to a higher manufacturing efficiency, and sequentially lower unit production cost. We expect further unit cost reduction with the newly deployed Xining plant gradually ramping up. The phase I of the Xining plant has a combined capacity of 11kt, with the individual lines capable of producing 3kt CF annually, which is by far the most efficient CF production facility in China. The phase II (14kt) is scheduled to roll out in 2023. We expect source of unit cost reduction will be primarily coming from: labour cost (c.15% of COGS), D&A (c.13% of COGS) and electricity expense (c.18% of COGS).

Exhibit 45: ZFSY's cost structure



Source: Company data

Well positioned in the fastest growing CF sub-segment

We believe T700 will be the fastest growing CF sub-segment in China for the next 3 years, driven by C/C composites where we are expecting a 34% CAGR. ZFSY's current expansion plan suggests that it will continue to gain market share in the high-end civilian market, particularly given its solid track record of customer acquisitions. The company has a more balanced client mix (top 5 contributed to 40% of revenue in 1H21) compared to other domestic listed CF producers due to its civilian market focused business model. Even though ZFSY's clients are not well-known household names, a lot of them are domestic leaders in their fields, such as the largest C/C composites producer and hydrogen tank manufacturer.

Valuation and risks

Initiating at Buy with a 12m target price of RMB55.7/sh

We use a discounted P/E methodology in line with our broader China Chemicals coverage. Our target price of RMB55.7/sh is based on 43x FY2025 PE, discounted back to 2023E at 10.2% CoE. Given the lack of long-term historical trading data for ZFSY, we derive our target multiple based on the target multiple for GW Compos (30X) and assigning a premium to factor in ZFSY's faster long-term growth (33% CAGR over 2025-2028E as part of our DCF vs. GW Compos at 23%, implying a 1.3x PEG for both companies). We think a premium is justified given the company's faster earnings growth trajectory.

We have cross-checked our PE valuation using a DCF methodology, which is an appropriate analysis in our view as DCF can reflect the company's long-term cash flow/earnings growth potential. We project the company's cash flow until 2030E, and discount it back based on 8.9 % WACC, assuming 1.1x beta based on industry's 2-year historical average. We assume a terminal growth of 3%, in line with our broader China Chemicals coverage. Our DCF cross-check suggests a 12-month implied theoretical valuation of RMB54.9/sh, largely consistent with the TP derived under our PE methodology.

Risks to our investment view

Industry risks

- **Slower-than-expected economic activity:** which could lead to weaker-than-expected demand for CF, hence impact our estimates for the company's sales volume and pricing.
- **Slower-than-expected investment in the new energy industry:** more than half of ZFSY's revenue is derived from the new energy sectors. We see downside risk to earning from slower-than-expected energy transitions.
- **Slower-than-expected capacity expansion:** which could lead to slower import substitution
- **Trade tensions:** a relaxation in trade tension may lead to rising import and slowdown in the pace of import substitutions.
- **Rise in raw material/fuel costs:** this could impact producers' margin if they cannot fully pass through the cost hikes to downstream customers. Higher raw material costs may lead to higher composites prices, which could result in slow CF adoptions.

Company-specific risks

- **Faster capacity expansion by other competitors:** which could lead to market share loss for the company. This may also affect company's bargaining/pricing power within the CF value chain.
- **Quality issues relating to ZFSY's product:** which could lead to significant damage to its track record and therefore slower-than-expected progress in gaining market

share.

- **Delays in product launch:** this may constrain ZFSY's ability to meet the increasing demand from its customers, hence leading to a slower-than-expected revenue growth.

Exhibit 46: Upside/downside potential to DCF-derived valuation

DCF calculation	2019A	2020A	2021A	2022E	2023E	2024E	2025E	2026E	2027E	2028E	2029E	2030E
EBIT	23	83	297	609	961	1,459	1,776	2,339	3,093	4,053	4,860	5,594
yoy chg%		262%	258%	105%	58%	52%	22%	32%	32%	31%	20%	15%
- EBIT x tax rate	-	-	(17)	(91)	(144)	(219)	(266)	(351)	(464)	(608)	(729)	(839)
+ Depreciation and amortization	55	50	90	208	325	427	526	616	695	771	845	916
- Increase/(decrease) in net working capital	(50)	49	(66)	71	430	52	149	25	1	1	61	29
- Increase in capital expenditure	(68)	(917)	(1,164)	(2,001)	(1,646)	(1,654)	(1,659)	(1,397)	(1,330)	(1,303)	(1,274)	(1,216)
FCFF (Rmb mn)	(40)	(735)	(859)	(1,203)	(73)	66	526	1,232	1,996	2,914	3,763	4,483
yoy chg%		1735%	17%	40%	-94%	-190%	701%	134%	62%	46%	29%	19%
Terminal value												77,744
Present value					(70)	58	425	913	1,358	1,819	2,157	43,262
DCF Valuation												
Firm Value	49,922											
- Net debt	463											
- Minority interest	13											
Equity Value	49,445											
Number of shares	900											
Implied PV per share	54.9											
WACC Calculation												
Equity component												
Equity risk premium						6.5%						
Risk free rate						3.0%						
Beta						1.10						
Cost of equity						10.2%						
Debt component												
Cost of debt						5.0%						
Tax rate						18.0%						
After-tax cost of debt						4.1%						
Long-run debt-to-capital ratio						20.0%						
WACC						8.9%						
Terminal growth rate						3.0%						

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

Financials

Income statement

- **Revenue:** We expect ZFSY to deliver a revenue CAGR of 46% over 2021-25E, mainly led by capacity expansion. We have factored in 28% blended price hikes in 2022E to reflect strong pricing and tight supply in the high-end market. We have assumed blended ASP to decline by 2-6% over 2023E to 2025E, with price reductions coming from wind/sports industry exposure. ASPs associated with pressure tank and C/C exposures should remain relatively resilient.
- **Margin:** We expect 4ppts margin expansion in 2022E, as acrylonitrile (AN) prices have fallen by 25% yoy ytd. We expect further margin improvement when capacity gradually ramps up.
- **NPAT:** We expect NPAT to grow by a CAGR of 52% over 2021-2025E, faster than the topline growth, due to margin expansion.
- **GSe vs consensus** - We are 6% lower than Wind consensus on 2022E NPAT which we believe reflects our conservative margin assumption. For 2023/2024E NPAT, we are 4%/12% above consensus likely driven by our expectations for ZFSY to be able to ramp up capacity quickly to meet increasing downstream demand.

Exhibit 47: Income statement

Zhongfu Shenyang (688295.SS)							
Rmb in millions (PRC GAAP)							
	2019A	2020A	2021A	2022E	2023E	2024E	2025E
Revenue	415	532	1,173	2,007	3,525	4,568	5,275
Carbon fiber	411	528	1,163	1,992	3,505	4,542	5,245
Sales volume (t)	3,422	3,761	6,142	9,277	17,277	23,777	27,777
ASP (RMB/t)	120,118	140,254	189,419	214,666	202,851	191,026	188,819
Others	4	5	11	16	21	26	31
COGS	(309)	(303)	(685)	(1,091)	(1,956)	(2,352)	(2,637)
Gross profit	106	229	488	916	1,569	2,216	2,639
% GPM	25.6%	43.0%	41.6%	45.6%	44.5%	48.5%	50.0%
Business Taxes	(6)	(9)	(10)	(26)	(46)	(60)	(69)
Selling Expenses	(6)	(3)	(4)	(15)	(26)	(34)	(39)
Admin Expenses	(72)	(82)	(177)	(266)	(536)	(663)	(755)
Impairment loss of assets	-	(52)	0	0	0	0	0
Operating income	23	83	297	609	961	1,459	1,776
Net finance income	(19)	(14)	(27)	(48)	(2)	(2)	(10)
Share of Profit of Associates & JCEs	-	-	-	-	-	-	-
Other gains/losses	22	17	25	24	24	24	-
Profit before tax	26	85	295	586	984	1,482	1,765
Income tax	-	-	(16)	(88)	(148)	(222)	(265)
Net Profit	26	85	279	498	836	1,260	1,500
Minority Interest	-	-	-	(5)	(8)	(13)	(15)
Net Profit Attributable to Shareholders	26	85	279	493	828	1,247	1,485
EPS	0.06	0.14	0.35	0.57	0.92	1.39	1.65
NPM (%)	6.3%	16.0%	23.8%	24.6%	23.5%	27.3%	28.2%
% yoy	n.a	226%	227%	77%	68%	51%	19%

Source: Company data, Goldman Sachs Global Investment Research

Balance sheet

- **Net gearing:** We expect the net gearing to remain low at below 20% until 2025E.
- **ROE:** We expect ROE to gradually improve from 18% in 2022E to 26% in 2025E.

with margin expansion

Exhibit 48: Balance sheet

Zhongfu Shenying (688295.SS)							
Rmb in millions (PRC GAAP)							
	2019A	2020A	2021A	2022E	2023E	2024E	2025E
PP&E	687	1,677	2,696	4,500	5,693	6,796	7,808
Intangible Assets	136	130	190	183	315	441	563
Other Non Current Assets	2	14	146	141	137	134	132
Non Current Assets	824	1,822	3,032	4,824	6,144	7,371	8,504
Cash and Cash Equivalents	235	148	320	2,524	3,090	3,454	4,259
Receivables	7	0	1	1	2	2	2
Inventories	38	31	154	145	391	254	469
Other Current Assets	65	151	218	516	512	718	650
Current Assets	345	330	693	3,187	3,994	4,428	5,380
Total Assets	1,169	2,152	3,724	8,011	10,139	11,800	13,884
Short-term Borrowings	72	56	576	900	1,200	1,320	1,500
Payables	108	304	534	800	1,343	1,492	1,687
Other Current Liabilities	98	178	129	329	508	546	712
Current Liabilities	278	538	1,239	2,030	3,051	3,357	3,900
Long-term Borrowings	97	469	1,059	1,553	2,198	2,858	3,572
Other Non Current Liabilities	123	188	191	191	191	191	191
Non Current Liabilities	220	658	1,250	1,744	2,389	3,049	3,763
Total Liabilities	497	1,195	2,489	3,774	5,440	6,406	7,663
Total Shareholders' Equity	671	957	1,235	4,237	4,699	5,393	6,221
Share Capital	1,015	800	800	900	900	900	900
Reserves and REs	(344)	157	435	3,332	3,785	4,467	5,280
Other Comprehensive Income	-	-	-	-	-	-	-
Treasury Stock	-	-	-	-	-	-	-
Minority Interests	-	-	-	5	13	26	41
Total Equity	671	957	1,235	4,237	4,699	5,393	6,221
Total Liabilities and Equity	1,169	2,152	3,724	8,011	10,139	11,800	13,884
Net Debt (Net Cash)	(34)	441	1,316	35	463	944	1,099
Net Debt / Total Equity	-5.1%	46.1%	106.5%	0.8%	9.9%	17.5%	17.7%
Book Value Per Share	0.66	1.20	1.54	4.70	5.21	5.96	6.87

Source: Company data, Goldman Sachs Global Investment Research

Cash flow statement

- **Capex:** We assume Rmb1.5bn-2.0bn annual capex over 2022E to 2025E to support company's current expansion plan.
- **FCF:** With a gradual improvement in OCF, we expect FCF to turn positive in 2024E

Exhibit 49: Cash flow statement

Zhongfu Shenying (688295.SS)							
Rmb in millions (PRC GAAP)							
	2019A	2020A	2021A	2022E	2023E	2024E	2025E
Net Profit	26	85	279	493	828	1,247	1,485
Depreciation and Amortization	55	50	90	208	325	427	526
Total Change in Working Capital	(50)	49	(66)	71	430	52	149
Inventories	11	7	(123)	8	(245)	137	(215)
Receivables	(38)	(11)	(146)	(299)	3	(206)	68
Payables	(15)	36	172	362	673	121	296
Other Change in Working Capital	(7)	16	31	-	-	-	-
Others	22	66	28	53	10	15	25
Operating Cash Flow	53	249	331	825	1,594	1,741	2,186
Capex	(68)	(917)	(1,164)	(2,001)	(1,646)	(1,654)	(1,659)
Disposals	0	0	0	-	-	-	-
Acquisitions	-	-	-	-	-	-	-
Divestitures	-	-	-	-	-	-	-
Other Investing Cash Flow	1	-	(6)	10	76	93	104
Investing Cash Flow	(66)	(916)	(1,170)	(1,991)	(1,570)	(1,562)	(1,555)
Issuance of Equity Capital	400	200	-	2,727	-	-	-
New Borrowings	223	767	1,233	1,500	2,000	2,200	2,500
Repayment of Borrowings	(448)	(389)	(176)	(577)	(1,006)	(1,355)	(1,540)
Dividend Distribution	(18)	(16)	(39)	(223)	(375)	(565)	(673)
Other Financing Cash Flow	46	20	(7)	(58)	(78)	(95)	(114)
Financing Cash Flow	203	581	1,011	3,370	541	185	173
Change in Cash and Cash Equivalents	190	(86)	172	2,204	565	365	805
Effect of Changes in FX Rate	0	0	0	-	-	-	-
Free Cash Flow	(15)	(667)	(833)	(1,175)	(52)	87	528

Source: Company data, Goldman Sachs Global Investment Research

Guangwei Composites (300699.SZ): A beneficiary of wind industry development; Initiate at Buy

Vertical integration differentiates it from domestic peers; Initiating at Buy

Founded in 1992, Weihai Guangwei Composites (GW Compos) has been a leading player in every stage of the domestic CF development. It has emerged as a domestic leader and key contributor in setting CF standards, facilitating the CF industrialization and deployment in China and gaining market share in an overseas-players dominated market earlier. Over the past 30 years, GW Compos has successfully established one of the most comprehensive industrial chain among all CF producers in China, with business covering CF manufacturing, equipment and fabrication technologies. Leveraging its technical strength through the supply to the defense market, we expect GW Compos will gradually increase its exposure in the civilian market. We estimate NPAT to grow by 35% CAGR over 2021-2025E, outpacing topline growth (31% CAGR) on margin expansion. **Initiate at Buy with a 12m TP of RMB113.6/sh.**

The current product mix to benefit from favorable pricing trend

We expect to see further divergence in pricing trend entering into 2023, with ample new supply coming on stream in the low-end (T300) market, whilst supply/demand dynamics to remain tight in the high-end market. This is favorable for GW Compos, as its pultruded plate business (c.30% of FY21 revenue), which relies on external sourcing of T300 CF (as raw materials) will likely enjoy margin expansions. Leveraging on its competitive advantage, we expect GW Compos will continue to focus on high-performance CF productions, a market with a much higher entry barrier and a more resilient pricing outlook.

Tapping into processing technology to unlock CF potentials

With import substitution accelerating, we believe broader CF adoption will rely on: 1) utilizing existing mature fabrication methods and extending to new use cases; and 2) innovation and improvement in composite processing technology. As a long-standing supplier to Vestas, we believe GW Compos has already proven its capability in composite fabrications. The company aims to gradually transition from a production-focused to application-focused CF supplier and continue to target at the high value-added market. The recent acquisition of Guangsheng (a company involved in the production of rocket/missile engine casing using filament winding process) highlights GW's intention towards tapping into the composite processing technology to unlock CF potentials, in our view.

Valuation and risks

Our target price of RMB113.6/sh is derived using a target multiple of 30x on 2025E EPS, discounted back to 2023E at 10.2% CoE. The target PE multiple is lower than GW Compos' historical average to reflect a gradual transition into the civilian market. Key risks include: 1) Slower-than-expected economic activity; 2) Slower-than-expected capacity expansion; 3) Rise in raw material/fuel costs;

300699.SZ	12m Price Target: Rmb113.6	Price: Rmb79.32	Upside: 43.2%		
Buy	GS Forecast				
Market cap: Rmb41.1bn / \$5.8bn	Revenue (Rmb mn)	12/21 2,607.3	12/22E 2,914.3	12/23E 3,902.6	12/24E 5,888.1
Enterprise value: Rmb39.1bn / \$5.5bn	EBITDA (Rmb mn)	945.5	1,183.2	1,531.7	2,383.2
3m ADTV :Rmb518.4mn/ \$75.3mn	EPS (Rmb)	1.46	1.83	2.35	3.67
China	P/E (X)	51.2	43.3	33.8	21.6
China Advanced Materials & Construction	P/B (X)	9.4	8.6	7.4	6.0
	Dividend yield (%)	0.7	0.8	1.0	1.6
M&A Rank: 3	N debt/EBITDA (ex lease,X)	(2.1)	(1.7)	(1.5)	(1.2)
Leases incl. in net debt & EV?: Yes	CROCI (%)	24.7	27.0	29.4	38.2
	FCF yield (%)	1.5	1.0	1.6	3.0
		3/22	6/22E	9/22E	12/22E
	EPS (Rmb)	0.40	0.58	0.68	0.19

Source: Company data, Goldman Sachs Research estimates, FactSet. Price as of 10 Oct 2022 close.

One of the most vertically integrated CF manufacturers in China

Founded in 1992, GW Compos is the first A-share listed CF producer and the earliest domestic private enterprise to implement the localization of CF. Over the past 30 years, the company has successfully established one of the most complete industrial chain ([Exhibit 100](#)) with a comprehensive product coverage among all CF producers in China. It is engaged in the production of CF roving, prepreg, woven fabrics, CF pultruded plate, as well as supply of CF related machinery.

GW Compos has been a leading player in every stage of the domestic CF development. It has emerged as a domestic leader and key contributor in setting CF standards, facilitating the CF industrialization and deployment in China gaining market share in an overseas-players dominated market earlier.

Exhibit 50: CF national and industry standards

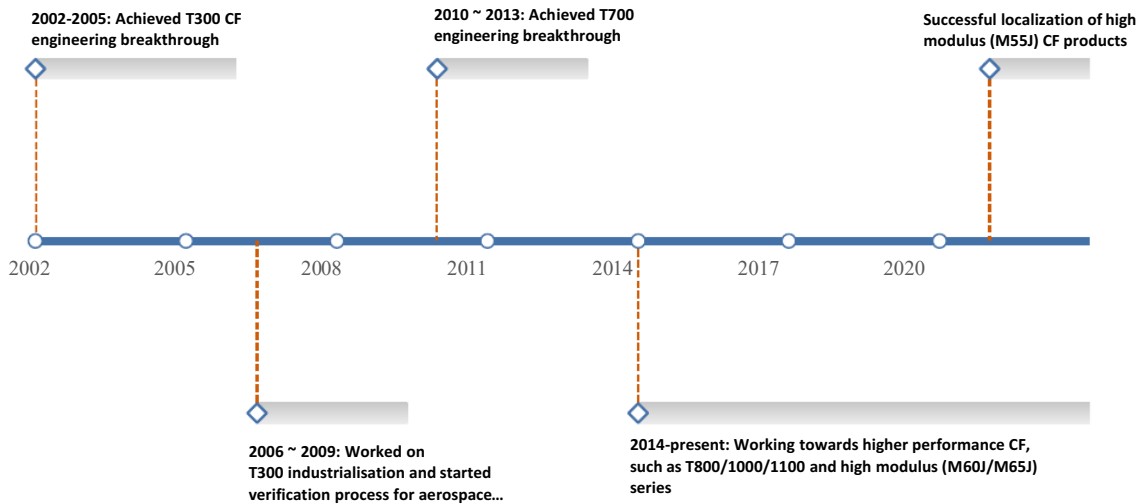
Standard name	Standard name (Chinese)	Standard type
PAN-based carbon fibre	聚丙烯腈基碳纤维	National standard
Carbon fiber prepreg	碳纤维预浸料	National standard
Technical specifications of high temperature carburetor for carbon fiber production	碳纤维生产用高温碳化炉技术条件	Industry standard
Technical specifications of graphing furnace for high modulus Carbon Fiber Production	高模量碳纤维生产用石墨化炉技术条件	Industry standard
Multiaxial fiber warp knitted fabric	多轴向纤维经编织物	Association standard
High modulus PAN-based carbon fibre	高模型聚丙烯腈基碳纤维	Association standard

Source: Company data

It started CF research and development in 2002, and achieved T300 CF engineering breakthrough following 3 years of continuous efforts. Between 2006 to 2009, GW Compos had been focusing on T300 industrialization and started verification process for aerospace applications. In 2013, it achieved the shift from T300 to T700 engineering breakthrough. Since then, the company has been intensively working towards higher performance CF, such as T800/1000/1100 and high modulus (M60J/M65J) series.

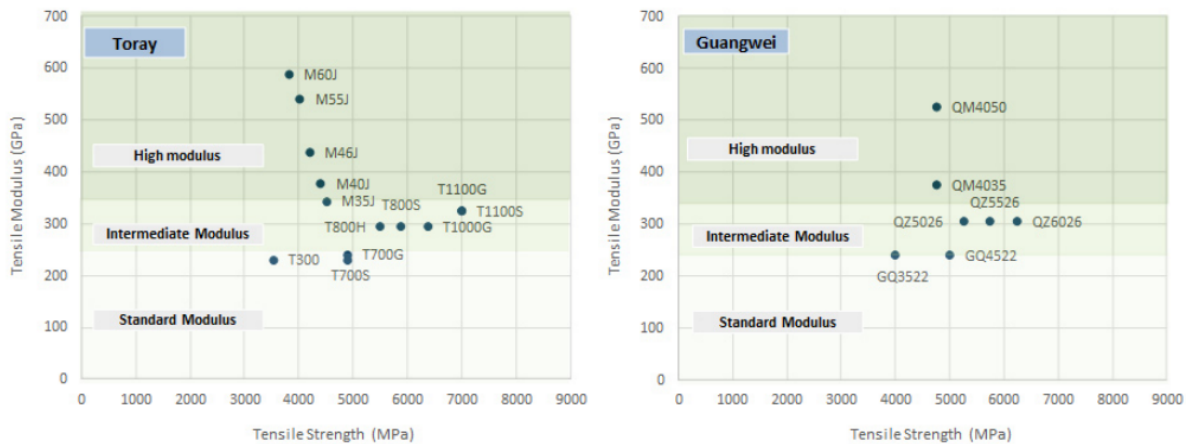
GW Compos is able to leverage its technology know how and industrialization capability, and is actively seeking opportunities to developed products for the military and civilian markets, diversifying its revenue stream.

Exhibit 51: GW Compos' product development milestone



Source: Company data

Exhibit 52: Guangwei's product portfolio and specification mapping with Toray's standards

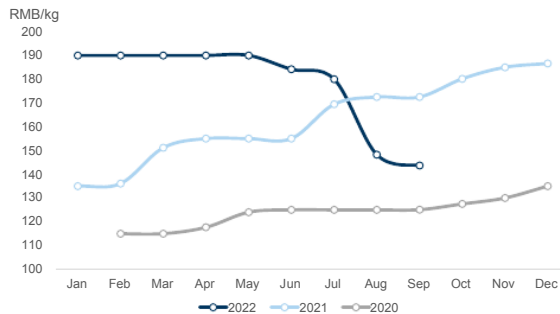


Source: Company data, data compiled by Goldman Sachs Global Investment Research, Gao Hua Securities Research

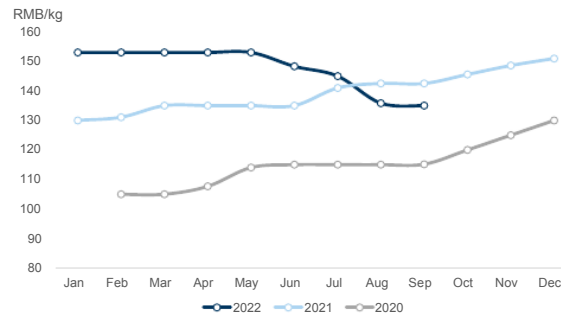
Aggressive supply additions affected low-end products, while S/D for high-end product remained tight

Robust demand and constrained foreign supply had driven CF prices in 2020/2021, with

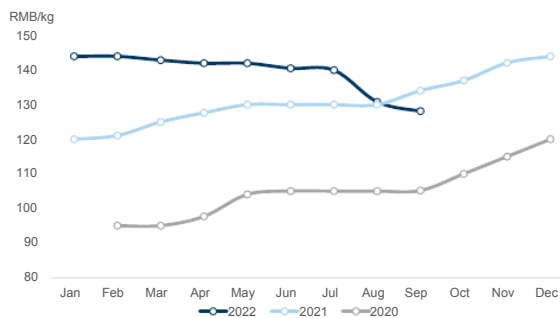
CF roving prices up by an average of c.60% over the two-year period. Despite ample new supply, prices remained resilient during most of 1H22, before T300 prices declined in June. T300 prices have already dropped by 7-20% from the peak, and lower than the same period last year. In contrast, T700 prices have seen a mild improvement. We believe this is due to the higher entry barriers compared to T300 and limited CF producers that have T700 mass/stable production capability. In addition, there is also robust demand from certain applications that use T700 CF, such as C/C composites (used in solar energy industry) and pressure vessels.

Exhibit 53: T300 (12K) CF prices

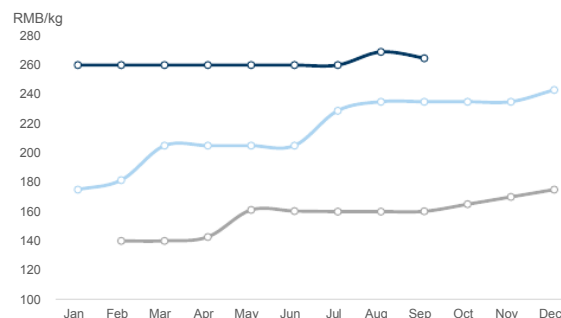
Source: Baiinfo

Exhibit 54: T300 (24/25K) CF prices

Source: Baiinfo

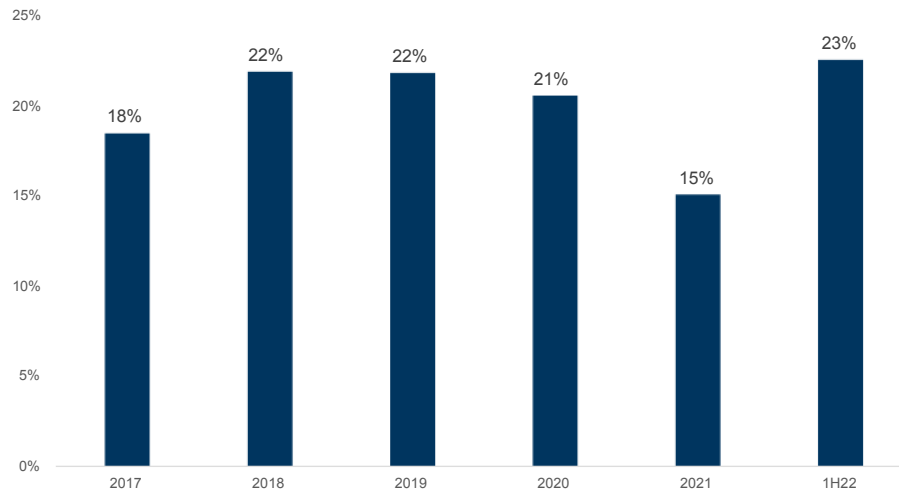
Exhibit 55: T300 (48K) CF prices

Source: Baiinfo

Exhibit 56: T700 (12K) CF prices

Source: Baiinfo

We do not think the industry's aggressive supply additions will pose risk to GW Compos at this stage, instead GW Compos could be a potential beneficiary with an increase in supply of large tow T300 grade CF. Its pultruded plate business (accounting for c.30% of company's FY21 topline) is fabricated from large tow T300 CF, which were sourced from external suppliers. The segment margin (down 6ppts yoy to 15% in 2021) was severely hit by rising raw material (T300 CF) cost due to tighter supply.

Exhibit 57: GPM of pultruded plate business

Source: Company data

To minimize supply chain disruptions, the under-construction Baotou (Inner Mongolia) plant was originally planned for large tow CF production. However, with easing supply in this segment, GW Compos has adjusted its plan to focus on T700/800/1000 production. We think GW will benefit from the softening T300 prices, meanwhile enjoying pricing premium in the more resilient high-end market.

CF Basics - product classification by tow size

- Small tow (小丝束):
 - Definition: CF rovings that contain $\leq 24,000$ (24K) filaments, such as 1K, 3K, 6K, 12K, 24K
 - Global players: Toray, Toho, Mitsubishi Chemical
- Large tow (大丝束):
 - Definition: CF rovings that contain $\geq 48K$ filaments
 - Global players: SGL, Zoltek (acquired by Toray)

(Source: Company data)

Tapping into processing technology to unlock CF potential

The potential of CF is vast and would broaden as producers deploy it in wider applications. As localization accelerates, we think broader CF adoption will rely on: 1) innovation and improvement in composite processing technology; and 2) utilization of existing mature fabrication methods and extension to new use cases. We have already seen some successful examples led by GW Compos. The adoption of pultrusion method has greatly boosted CF consumption in wind turbine blades in recent years. As a

long-standing supplier to Vestas, we believe GW Compos has a proven capability in composite fabrications.

Going forward, the company expects to gradually transition from a production-focused to application focused CF supplier and continue to target at the high value added market. GW Compos' recent acquisitions (Guangsheng and Lanke) will complement its existing business, strengthening its presence along the CF value chain, in our view.

Valuation and risk

Initiating at Buy with 12m target price of RMB113.6/sh

We use a discounted P/E methodology in line with our broader China Chemicals coverage. Our target price of RMB113.6/sh is derived using a target multiple of 30x on 2025E EPS, discounted back to 2023E at 10.2% CoE. The target PE multiple is lower than GW Compos' 5-year historical average of 45x to reflect a gradual transition into the civilian market. We benchmark our target multiple to the historical trading averages of Hexcel (a US CF producer; covered by Noah Poponak) and AVIC Jonhon (similar split between defense vs. civil; covered by Jacqueline Du).

We cross-check our PE valuation using DCF methodology, which we think can reflect the company's long-term cash flow/earning growth potential. We project the company's cash flow until 2030E, and discount it back to 2023E based on 10.2% WACC, assuming 1.1x beta based on industry's 2-year historical average. We assume a terminal growth of 3% in line with our broader China Chemicals coverage. The DCF cross check implies a per share value of RMB125.2/sh, 10% higher than our TP derived using the PE methodology.

Risks to our investment view

Industry risks

- **Slower-than-expected economic activity:** which could lead to weaker-than expected demand for CF, hence impact sales volume and pricings.
- **Slower-than-expected capacity expansion:** which could lead to market share loss for the company. We see downside risk to earnings on slower capacity expansion.
- **Trade tensions:** which could impact the pace of import substitution for CF.
- **Rise in raw material/fuel costs:** this could impact producers' margin if they cannot fully pass through the cost hikes to downstream customers. Higher raw material costs may lead to higher composites prices, which could result in slow CF adoptions.

Company-specific risks

- **Faster capacity expansion by other competitors:** which could lead to market share loss for the company. This may also affect company's bargaining/pricing powers within the CF value chain.
- **Delays in product launch:** this may constrain the company's ability to meet the increasing demand from its customers, hence leading to a slower-than-expected revenue growth.
- **Weakness in defense demand:** GW Compos has substantial amount of revenue generated from defense market, a highly restrictive area with a lack of data disclosure (e.g. pricing, volume, customer breakdown). Any decline in defense spending or loss of market share would present downside risks to our TP and estimates.

Exhibit 58: Valuation cross-check using DCF methodology

DCF calculation	2019A	2020A	2021A	2022E	2023E	2024E	2025E	2026E	2027E	2028E	2029E	2030E
EBIT	498	646	798	997	1,309	2,120	2,833	3,691	4,588	5,357	6,115	7,866
yoy chg%		30%	24%	25%	31%	62%	34%	30%	24%	17%	14%	29%
- EBIT x tax rate	(71)	(75)	(89)	(112)	(160)	(280)	(402)	(561)	(697)	(814)	(929)	(1,196)
+ Depreciation and amortization	80	94	147	187	223	263	296	329	363	398	432	468
- Increase/(decrease) in net working capital	149	244	321	(250)	(260)	(289)	95	52	(10)	99	82	71
- Increase in capital expenditure	(366)	(581)	(601)	(438)	(469)	(589)	(463)	(484)	(550)	(517)	(544)	(612)
FCFF (Rmb mn)	290	329	576	384	643	1,225	2,358	3,028	3,693	4,523	5,156	6,598
yoy chg%		13%	75%	-33%	67%	91%	93%	28%	22%	22%	14%	28%
Terminal value												95,049
Present value					612	1,059	1,852	2,159	2,390	2,658	2,750	49,228
DCF Valuation												
Firm Value	62,709											
- Net debt	(2,325)											
- Minority interest	112											
Equity Value	64,922											
Number of shares	518											
Implied PV per share	125.2											
WACC Calculation												
Equity component												
Equity risk premium						6.5%						
Risk free rate						3.0%						
Beta						1.10						
Cost of equity						10.2%						
Debt component												
Cost of debt						5.0%						
Tax rate						18.0%						
After-tax cost of debt						4.1%						
Long-run debt-to-capital ratio						0.0%						
WACC						10.2%						

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

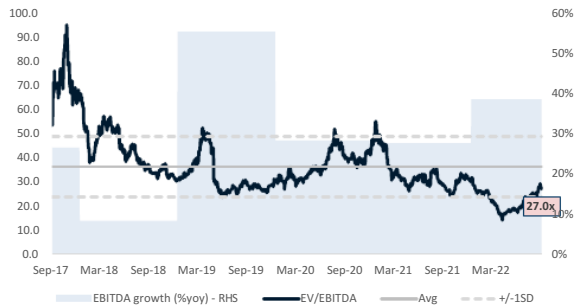
Valuation charts

Exhibit 59: 5-year forward PE



Source: Company data, Goldman Sachs Global Investment Research

Exhibit 60: 5-year forward EV/EBTIDA



Source: Company data, Goldman Sachs Global Investment Research

Exhibit 61: 5-year forward PB



Source: Company data, Goldman Sachs Global Investment Research

Exhibit 62: Dividend yield



Source: Company data, Goldman Sachs Global Investment Research

Financials

Income statement

- **Revenue:** We expect GW Compos to deliver a revenue CAGR of 31% over 2021-25E, mainly led by capacity expansion. We have factored in stagnated price movement in 2022E/2023E to reflect product mix shift to the civilian market, offset by resilient pricing and tight supply in the high-performance CF market. We have assumed a mild price decline (~2%) from 2024E following cost reductions.

Exhibit 63: Income statement

Weihai Guangwei (300699.SZ)							
Rmb in millions (PRC GAAP)							
	2019A	2020A	2021A	2022E	2023E	2024E	2025E
Revenue	1,715	2,116	2,607	2,914	3,903	5,888	7,713
% yoy	26%	23%	23%	12%	34%	51%	31%
Carbon fiber and fabrics	798	1,078	1,275	1,503	2,224	3,819	5,250
% yoy	32%	35%	18%	18%	48%	72%	37%
% revenue	47%	51%	49%	52%	57%	65%	68%
CF pultruded plate	673	718	808	802	948	1,111	1,296
% yoy	29%	7%	13%	-1%	18%	17%	17%
% revenue	39%	34%	31%	28%	24%	19%	17%
Prepreg	177	236	359	414	443	465	488
% yoy	-2%	34%	52%	15%	7%	5%	5%
% revenue	10%	11%	14%	14%	11%	8%	6%
Other products	51	70	145	171	252	433	596
Other business	16	13	20	24	35	60	83
Cost of Sales	(892)	(1,074)	(1,449)	(1,515)	(2,035)	(2,897)	(3,700)
Gross Profit	823	1,042	1,158	1,399	1,867	2,992	4,013
% GPM	48%	49%	44%	48%	48%	51%	52%
% yoy	29%	27%	11%	21%	33%	60%	34%
Carbon fiber and fabric	633	810	893	1,053	1,461	2,494	3,426
% GPM	79%	75%	70%	70%	66%	65%	65%
CF pultruded plate	147	148	122	152	179	209	243
% GPM	22%	21%	15%	19%	19%	19%	19%
Prepreg	25	64	101	144	154	162	170
% GPM	14%	27%	28%	35%	35%	35%	35%
Other products	12	10	33	39	57	98	135
% GPM	24%	15%	23%	23%	23%	23%	23%
Other business	6	10	9	11	16	27	38
% GPM	40%	74%	45%	45%	45%	45%	45%
Business Taxes	(19)	(18)	(21)	(24)	(32)	(49)	(64)
Selling Expenses	(33)	(19)	(17)	(19)	(46)	(98)	(167)
Admin Expenses	(281)	(364)	(328)	(366)	(491)	(740)	(969)
Impairment loss of assets	8	6	7	8	10	15	20
Operating income	498	646	798	997	1,309	2,120	2,833
Net Finance Expense	(7)	(17)	(10)	45	45	45	47
Share of Profit of Associates & JCEs	(7)	6	2	2	2	2	2
Other gains/losses (net)	124	90	61	24	27	18	23
Profit before tax	608	725	852	1,067	1,382	2,184	2,904
Income tax	(86)	(84)	(95)	(119)	(169)	(288)	(412)
Net profit	522	641	756	947	1,214	1,896	2,492
Minority Interest	-	1	2	3	4	6	7
Net Profit Attributable to Shareholders	522	642	758	950	1,217	1,902	2,499
EPS	1.01	1.24	1.46	1.83	2.35	3.67	4.82
NPM (%)	30%	30%	29%	33%	31%	32%	32%
% yoy	39%	23%	18%	25%	28%	56%	31%

Source: Company data, Goldman Sachs Global Investment Research

- **Margin:** We expect 3.6ppts yoy margin expansion in 2022E, thanks to the margin recovery in pultruded plate business with lower raw material (e.g. T300 large tow) cost. We expect further margin expansion of c.2ppts each year from 2024E with economies of scale and potentially lower production cost of its new Baotou plant.
- **NPAT:** We expect NPAT to grow by a CAGR of 35% over 2021-2025E, faster than the topline growth, due to margin expansion.
- **GSe vs consensus** - Our 2022E/2023E are largely inline with Wind consensus (~2-3% diff.). For 2024, we are 26% above consensus, driven by our expectation for the company to ramp up capacity quickly to meet increasing downstream demand.

Balance sheet

- **Net gearing:** We expect the company to remain in a net cash position until 2025E.
- **ROE:** We expect ROE to improve from 20% in 2021 to 30% in 2025E, driven by improved profitability.

Exhibit 64: Balance sheet

Weihai Guangwei (300699.SZ)							
Rmb in millions (PRC GAAP)							
	2019A	2020A	2021A	2022E	2023E	2024E	2025E
PP&E	1,067	1,435	1,835	2,094	2,347	2,684	2,858
Intangible Assets	146	260	234	228	222	217	211
Other Non Current Assets	136	107	197	212	227	223	224
Non Current Assets	1,349	1,802	2,266	2,533	2,796	3,124	3,293
Cash and Cash Equivalents	869	1,485	1,949	2,077	2,362	3,000	4,572
Receivables	251	243	403	319	644	647	1,255
Inventories	297	286	412	335	668	522	694
Other Current Assets	1,296	832	529	852	929	1,623	1,274
Current Assets	2,713	2,846	3,293	3,583	4,602	5,792	7,796
Total Assets	4,063	4,649	5,559	6,116	7,399	8,916	11,088
Short-term Borrowings	-	-	-	16	16	16	16
Payables	234	240	335	346	491	700	922
Other Current Liabilities	239	270	424	322	652	706	1,011
Current Liabilities	473	510	759	683	1,159	1,422	1,949
Long-term Borrowings	-	-	-	10	20	28	36
Other Non Current Liabilities	340	422	535	535	535	535	535
Non Current Liabilities	340	422	535	546	555	563	571
Total Liabilities	813	932	1,294	1,229	1,714	1,985	2,520
Total Shareholders' Equity	3,245	3,636	4,146	4,772	5,573	6,825	8,469
Share Capital	518	518	518	518	518	518	518
Reserves and REs	2,753	3,144	3,647	4,272	5,073	6,325	7,970
Other Comprehensive Income	1	(13)	(19)	(19)	(19)	(19)	(19)
Treasury Stock	(27)	(13)	-	-	-	-	-
Minority Interests	4	81	118	116	112	107	99
Total Equity	3,249	3,717	4,265	4,887	5,685	6,931	8,569
Total Liabilities and Equity	4,063	4,649	5,559	6,116	7,399	8,916	11,088
Net Debt (Net Cash)	(869)	(1,485)	(1,946)	(2,051)	(2,325)	(2,954)	(4,518)
Net Debt / Total Equity	-26.8%	-40.0%	-45.6%	-42.0%	-40.9%	-42.6%	-52.7%
Book Value Per Share	6.26	7.01	8.00	9.21	10.75	13.17	16.34

Source: Company data, Goldman Sachs Global Investment Research

Cash flow statement

- **Capex:** we expect a steady increase in capex to support company's expansion plan.
- **FCF:** we expect FCF to stay in the positive territory.

Exhibit 65: Cash flow statement

Weihai Guangwei (300699.SZ)							
Rmb in millions (PRC GAAP)							
	2019A	2020A	2021A	2022E	2023E	2024E	2025E
Net Profit	522	642	758	950	1,217	1,902	2,499
Depreciation and Amortization	80	94	147	187	223	263	296
Total Change in Working Capital	149	244	321	(250)	(260)	(289)	95
Inventories	(102)	11	(126)	77	(333)	146	(172)
Receivables	90	67	133	(239)	(402)	(698)	(259)
Payables	162	166	315	(88)	474	262	526
Other Change in Working Capital	-	-	-	-	-	-	-
Others	2	(24)	(30)	(49)	(50)	(52)	(56)
Operating Cash Flow	753	956	1,196	837	1,129	1,823	2,835
Capex	(366)	(581)	(601)	(438)	(469)	(589)	(463)
Disposals	1	1	7	-	-	-	-
Acquisitions	(3,187)	(4,580)	(4,121)	-	-	-	-
Divestitures	3,376	5,026	4,155	-	-	-	-
Other Investing Cash Flow	22	20	9	(9)	(9)	7	9
Investing Cash Flow	(154)	(114)	(550)	(447)	(478)	(583)	(455)
Issuance of Equity Capital	-	-	-	-	-	-	-
New Borrowings	-	-	26	26	26	26	26
Repayment of Borrowings	-	-	-	(3)	(16)	(17)	(18)
Dividend Distribution	(185)	(259)	(259)	(325)	(416)	(650)	(854)
Other Financing Cash Flow	4	78	37	39	39	38	38
Financing Cash Flow	(181)	(182)	(196)	(263)	(367)	(602)	(807)
Change in Cash and Cash Equivalents	419	661	451	128	285	639	1,572
Effect of Changes in FX Rate	4	(9)	(10)	-	-	-	-
Free Cash Flow	387	375	595	400	661	1,234	2,371

Source: Company data, Goldman Sachs Global Investment Research

China Jushi (600176.SS): Cost competitiveness to weather a short-term slowdown; initiate at Neutral

A global leader in GF production

China Jushi is the world's largest GF producer (c.22%/34% global/domestic market share as of 2021), with a comprehensive product offering, ranging from GF roving, fabrics to electronic yarns. It has made significant inroads into the overseas business, with 47% of revenue being generated from overseas operations in 1H22. We believe Jushi will continue to gain market share globally on cost competitiveness, but the recent pricing weakness arising from supply/demand imbalance will pressurize margins across the industry entering 2023. We estimate a revenue CAGR of 11% over 2021-2025E, mainly led by capacity expansion. At 9.3x PE (1-sd below historical avg), we believe the stock has priced in most negatives and offers balanced risk-reward. **Initiate at Neutral with 12m TP of RMB13.4/sh.**

Cost control remains a top priority

Jushi has consistently led its domestic peers in GPM by 5-8 ppts. In the past, cost reductions came mainly from roving products. Going forward, the company aims to achieve cost optimization across the GF sub-segments of thermoset roving, thermoplastic chopped strands and GF electronic fabrics, with cost advantage being at least 5 years ahead of its peers. We believe Jushi's cost competitiveness will be enhanced through: 1) continued improvement in production efficiency; 2) upstream integration to strengthen supply chain; and 3) technology advancements.

Pricing came off from a high base but long term outlook remains intact

We are optimistic on the long-term GF demand outlook, but the domestic market is facing near term supply pressure, where 900kt of new capacity came online in 2021, representing 17% of the supply growth. GF pricing have come off from a high base entering into 2Q22. With another 600-700kt capacity expected to come on stream in 2H22, coupled with lackluster demand from constructions and electronics sectors (c.50% of GF demand), we expect pricing to remain soft through 2023.

Valuation already pricing-in the short-term negatives; Neutral

Our target price of RMB13.4/sh is based on 10x FY2023 PE, equivalent to 1-sd below its 10-year average. We think our target multiple is justified given the company's lower core earning growth (8% CAGR in 2021-25E) trajectory compared to the last decade (c.35% CAGR). We cross-check our P/E valuation using EV/GCI, which considers how the market values the cash invested in a business (EV/GCI vs. CROCI) relative to the returns (value) created by the company from those assets (CROCI). The target price implies 2.1x EV/GCI on 17% CROCI, inline with 2016-2018 when the stock was trading at a similar EV/GCI (2.0-2.4x) vs CROCI (c.18%) level. Risks include: 1) slower/faster-than-expect demand recovery; 2) rising/declining raw material/fuel costs; 3) slower/faster-than-expected capacity expansion; 4) geopolitical tension that could affect its overseas operations; 5) Shortage in natural gas supply

600176.SS		12m Price Target: Rmb13.4		Price: Rmb12.69		Upside: 5.6%	
Neutral		GS Forecast					
			12/21	12/22E	12/23E	12/24E	
Market cap: Rmb50.8bn / \$7.1bn		Revenue (Rmb mn)	19,706.9	20,313.0	21,264.7	25,497.1	
Enterprise value: Rmb59.2bn / \$8.3bn		EBITDA (Rmb mn)	8,463.6	7,372.4	7,747.9	9,786.0	
3m ADTV :Rmb388.6mn/ \$56.8mn		EPS (Rmb)	1.51	1.62	1.34	1.66	
China		P/E (X)	11.7	7.8	9.5	7.7	
China Advanced Materials & Construction		P/B (X)	3.1	1.9	1.7	1.5	
		Dividend yield (%)	2.7	4.1	3.4	4.2	
M&A Rank: 3		N debt/EBITDA (ex lease,X)	1.1	1.1	0.9	0.5	
Leases incl. in net debt & EV?: Yes		CROCI (%)	21.6	20.9	16.7	17.6	
		FCF yield (%)	3.3	5.4	7.9	10.6	
			12/21	3/22E	6/22E	9/22E	
		EPS (Rmb)	0.43	0.46	0.59	0.41	

Source: Company data, Goldman Sachs Research estimates, FactSet. Price as of 10 Oct 2022 close.

The world's largest GF producer with a comprehensive range of product offering

Listed in 1999, China Jushi is the world's largest manufacturer of GF products with 2.4mt of capacity as of end-2021 (c.34% of China capacity). It is primarily engaged in the production of E-glass and related products, including GF rovings, chopped strands, woven rovings and electronic yarns and textiles in over 100 product categories and up to 1,000 specifications.

Exhibit 66: GF classification and downstream applications



Source: Company data, data compiled by Goldman Sachs Global Investment Research

Jushi has made significant inroads into the overseas market, with 47% of revenue generated from overseas operations in 1H22. The company has five production bases globally, with three located in domestic markets (Zhejiang, Jiangxi, Sichuan) and two in the overseas (Egypt, US) markets.