

Solar Energy – European Inverter and Energy Storage Market

Inverter Orders, Prices Fall

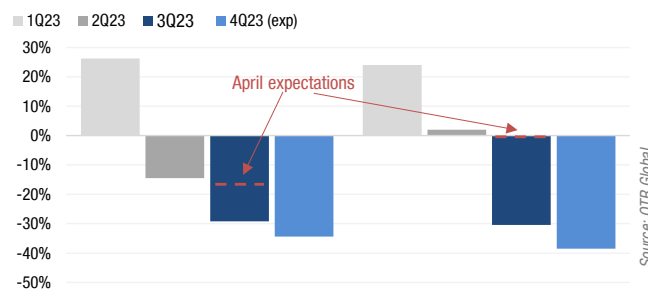
String and microinverter unit orders in Europe during 3Q23 fell below sources' July expectations because of excessive inventories and slowing residential demand, and Chinese manufacturers gained share because of aggressive pricing in a weak market.

- 3Q23 string inverter orders down 27%–32% yy, microinverter orders down 28%–33% (below July expectations for both); inventory levels excessive for 13 sources who responded; residential demand hurt by deteriorating credit availability
- 3Q23 lead times decreased qq for 12 of 15 sources because of increasing production in China and Europe, weakening demand
- 3Q23 string inverter prices down 12%–15% yy (vs. up 6%–9% in 2Q23, below expectations in July) because of Chinese competition; microinverter prices down 3%–6% yy (vs. up 8%–13% in 2Q23)
- Huawei, Sungrow (300274 CH), Solis (300763 CH) gained share with aggressive pricing; SEDG, S92 GR lost share; ENPH lowering prices qq, increasing communication, expanding distribution in Germany
- Area to Watch: 4Q23 string and microinverter prices expected down qq because of continued competition from Chinese OEMs

KEY DATA

Inverter Orders YY

(on average)



“The Chinese are in a price war, but all Westerners — including [Israel’s] SolarEdge — do their best to shut their eyes as long as possible.”

German distributor

RESEARCH LEAD

SYLVAIN GAVARD

SOURCES & BACKGROUND

15 sources in France, Germany and Spain, comprising 9 with inverter distributors and 6 with solar installation, integration and development companies, representing more than 6 GW of solar installations in Europe and worldwide during 2022

REPEAT SOURCES 10 from OTR Global’s July report

INTERVIEWS Sept. 5–28

AVERAGES Straight

Solar Energy – European Inverter and Energy Storage Market

Inverter Orders Fall

Market conditions in the European solar market deteriorated q3 for 10 of 15 sources during 3Q23, limited by the excessive inverter (and PV panel) inventories built before Chinese supply suddenly improved and Chinese manufacturers started cutting inverter and PV panel prices in 2Q23. Sources also said the value of their inventories has continued to decrease as Chinese inverter and PV panel prices continued to drop during 3Q23. All 13 sources who responded said their inventory levels for string and microinverters were excessive. Furthermore, six of 12 sources in Germany and France said demand from the residential market slowed q3 because of increasing interest rates and deteriorating credit availability.

String Inverters: Sources said their 3Q23 unit orders for string inverters in general decreased an average 27%–32% yy, deteriorating from the 12%–17% decrease in 2Q23 and below sources' July expectations of down 13%–18%. The three sources in Spain (the second-largest European solar market) remained the most pessimistic because of delays of national and European subsidies for new solar installations that added to their excessive inventories.

Sources said their 3Q23 unit orders of **SMA Solar Technology AG's** string inverters decreased an average 44%–49% yy and unit orders for **SolarEdge Technologies Inc.'s** string inverters decreased 62%–67% yy. Sources said both manufacturers suffered from increasing competition from Chinese manufacturers — particularly SolarEdge — because of long lead times and high prices, consistent with OTR Global's July findings.

Microinverters: Orders for microinverters decreased an average 28%–33% yy during 3Q23, deteriorating from flat–up 3% in 2Q23 and below the 1%–4% increase sources expected in July. Consistent with OTR Global's previous findings, sources said their microinverter orders did not decrease in line with their string inverter orders because their inventories had not been built up as much as for string inverters since there had been no shortage of microinverters. However, sources said microinverter demand also suffered from decreasing credit availability in all countries, as well as growing competition from the Chinese.

Sources said **Enphase Energy Inc.'s** 3Q23 yy orders were similar to category trends because the company is not yet facing as much microinverter competition from Chinese manufacturers as are string inverter manufacturers and Enphase decreased its prices q3.

Quotes

"Inverter inventory levels are crazy high everywhere in Europe, and so are PV panel inventory levels. Everyone has excess inventories of everything, and everyone does crazy moves in terms of margins in order to empty inventories that were built at a time when prices were high. Everyone was also taken by surprise by the loss of momentum in solar PV installation growth in the last few months." *French distributor*

"Since this summer, the number of new residential projects has significantly calmed down. The energy-shortage panic is over, and electricity as well as gas prices are even decreasing. This slowed demand from the residential market because customers are no longer willing to pay any price for a PV installation." *German installer*

"We see a total oversupply from China in Spain and all over Europe. And although PV panel and inverter prices are historically low, business has been very lousy these past months. ... We see a shakeout in the market, and a number of companies — including dealers and installers — will exit the market." *Spanish distributor*

Solar Energy – European Inverter and Energy Storage Market

“We had to take some SMA orders in at the end of Q2 and beginning of Q3 because of the purchase group we belong to. But thank God we didn’t order as much as the others did because demand started to lose momentum in Q2 already.” *German distributor*

“The problem is that by the time we order PV panels and inverters from Chinese manufacturers, their prices have already decreased, so our inventory further loses value.” *French distributor*

“Apart from the distributors, Western PV panels and inverter manufacturers are the big losers because of the very violent price competition from the Chinese manufacturers.” *French distributor*

“An SMA 10 KW hybrid string inverter costs €2,800, plus an extra electronic feature of €600. **Sungrow [Power Supply Co. Ltd. (300274 CH)]** offers the very same overall feature for €2,000. **Huawei [Technologies Co. Ltd.]** offers a simpler technology for €1,630. ... I see hard times coming for Western inverter manufacturers.” *German installer*

“We work with [**Advanced Process Systems Corp. (265520 KS)**]’s microinverter only. [Its] prices are 50% cheaper than Enphase’s because one of their microinverters can handle two panels, while Enphase’s can only handle one.” *French installer*

“We have Enphase in our catalogs, of course, and we could buy or sell them for our installers. Prices even decreased a bit quarter to quarter — even for the IQ8s. But our installers show no interest. The IQ8 can’t even use their off-grid function yet.” *German distributor*

(Note: Enphase’s off-grid Sunlight Backup system, designed to be used with the IQ8 to generate power during a power outage even without energy storage equipment, cannot yet be used in Europe because of safety regulations concerning potential “islanding,” when solar panel systems still produce electricity that goes into the grid during a grid blackout.)

Outlooks Deteriorate

European sources expect their 4Q23 unit orders to decrease 32%–37% yy for string inverters and 36%–41% yy for microinverters, and they expect their 2023 unit purchases to decrease 5%–8% yy for string inverters and 14%–19% for microinverters. Seven of 10 repeat sources revised their 2023 string inverters outlooks downward, while only one revised it upward. For microinverters, three of seven repeat sources revised their 2023 outlooks downward, while none had improved their forecasts.

Sources in Germany (the largest European solar market, with 7.9 GW installed in 2022) expect an average 10–11 GW to be installed in 2023, in line with expectations 90 days ago for six of nine sources but below for three. Sources in Spain (the second-largest European solar market, with 7.5 GW installed in 2022) could not make project their country’s 2023 installations, but all three said their outlook had deteriorated during the last 90 days. Two sources in France (the fifth-largest European solar market, with 2.7 GW installed in 2022) expect 3 GW to be installed in 2023, in line with their July expectations.

2024 Outlook: German sources also expect Germany to install an average 10–11 GW of new solar PV installations in 2024, above or in line with expectations 90 days ago for three sources each, but below for two. (Spanish and French sources could not provide a forecast on their countries 2024 installations.)

Solar Energy – European Inverter and Energy Storage Market

Quotes

“We’ve had ups and downs in 1H23 because of the discussions regarding the new German heating law, and the second half of this year will be weaker than I expected 90 days ago.”
German distributor

“There’s basically no business in Spain at the moment in the solar market. Everything is stuck, for a number of reasons: The European subsidies are stuck in the national bureaucracy, and inventories are full. As a matter of fact, 30%–35% of all installers over here are about to abandon their solar business. And I know of eight to 10 distributors — significant players — that will fold their business in Spain.” *Spanish distributor*

“In my opinion, there is no way Enphase nor SolarEdge can meet their sales objectives in Europe in 2023 given the excessive inventories in Europe and growing competition from the Chinese.” *French distributor*

“We hoped for a faster growth of sales of Enphase microinverters in 2023, but it takes time to get a brand known.” *German installer*

“My outlook for 2023 and 2024 new installations in Germany has deteriorated because demand this summer was weaker than expected. Electricity prices are decreasing, while interest rates keep increasing. The consumption and investment mood are deteriorating in many fields already, and I fear the new subsidies implemented by the German government to support residential installations might have come too late.” *German distributor*

Lead Times, Prices Fall

Inverter lead times (all categories) decreased qq for 12 of 15 sources during 3Q23. String inverter lead times averaged one to four weeks (compared with three to six weeks in 2Q23) and microinverter lead times averaged between immediate delivery and 3 weeks (compared with one to four weeks in 2Q23). Sources said string and microinverter lead times decreased qq because of increasing supply from almost all manufacturers — especially Chinese manufacturers — and because 3Q23 demand lost momentum qq. Two said SolarEdge stood out as the only string inverter manufacturer whose lead times remained extremely long, building on OTR Global’s 2Q23 findings.

String Inverter Prices: Sources said string inverter prices decreased an average 12%–15% yy, a deterioration from the 6%–9% increase sources reported in 2Q23 and worse than the 3%–6% growth sources expected in July. German and French sources said Chinese manufacturers’ price decreases ranged from 25% to 40% qq, while Western manufacturers’ prices only slightly decreased. (In July, sources said Chinese manufacturers’ prices were down 10%–20% qq). Sources expect 4Q23 string inverter prices to decrease an average 15%–18% yy, with Chinese prices expected to decrease again qq.

Microinverter Prices: Sources said 3Q23 microinverter prices decreased 3%–6% yy on average, below the 8%–13% growth sources reported in 2Q23. Sources said microinverter prices were not under the same pricing pressure as string inverters because there are still only a few credible Chinese manufacturers active in that segment, including **Hoymiles Power Electronics Inc.** (688032 CH), but that growing competition coupled with slowing residential demand compelled Enphase to decrease its microinverter prices qq. Two sources reported prices down 10% qq. Sources also expect 4Q23 microinverter prices in general to decrease 2%–5% yy on average.

Solar Energy – European Inverter and Energy Storage Market

Quotes

“Six months ago, we would buy string inverters at €0.28 per watt, and now we are only at €0.17per watt. The gap is so huge that it’s not even possible to compensate — we just lose money on the inventory we have. And I hear of Chinese inverter prices that could be at €0.12 per watt by December. Such a shakedown has never been seen in the photovoltaic industry history. It’s a real catastrophe for distributors that have inventory. We are dragging dead inventory.” *French distributor*

“I expect the Chinese manufacturers to break the market. A hybrid string inverter from Huawei is now cheaper than a standard string inverter from SMA.” *French installer*

“Officially, SolarEdge decreased prices for its string inverters by only 4% quarter to quarter.” *German distributor*

“I just saw an offer of Enphase in the Netherlands that is also valid in Germany for a 10% discount.” *German distributor*

“Enphase did not officially lower prices for their microinverters; they only offer sporadic incentives. If they were to lower prices, they would do it in October, when they really have to because they realize they won’t meet their targets in Europe. ... Hoymiles did not really lower prices. They are in a transition period with their new microinverter generation, and what they did is offer a more efficient microinverter technology at the same price as the older technology. The price difference between an Enphase microinverter and a Hoymiles microinverter is about 30%, but one Hoymiles inverter can handle two PV panels, while Enphase can handle only one. So, the real price difference is 60%.” *French distributor*

“The Chinese are in a price war, but all Westerners — including [Israel’s] SolarEdge — do their best to shut their eyes as long as possible.” *German distributor*

Chinese OEMs Gain Share, SolarEdge Loses

Chinese manufacturers were mentioned most often as gaining share in 3Q23, with Huawei cited by seven sources, **Sungrow Power Supply Co. Ltd.** (300274 CH) cited by five and **Ginlong Technologies Co. Ltd.**’s (300763 CH) Solis cited by four. Nevertheless, two sources said Huawei lost share, while sources cited concerns about Sungrow’s deteriorating customer service.

Sources had mixed opinions about Enphase because the manufacturer does a lot of marketing, decreased its 3Q23 prices qq, and has grown its exclusive distribution network, and faces less competition from Chinese competitors. However, the price of its IQ7 and IQ8 inverters are higher than those of Advanced Process Systems and Hoymiles, and demand from the residential end market is suffering from increasing interest rates in all countries.

SMA was cited more often as losing than gaining, a deterioration from OTR Global’s 2Q23 findings because of increasing Chinese competition, as well as remaining long lead times for some of its string inverters.

SolarEdge was mentioned most often as losing share, a continuation of OTR Global’s 2Q23 findings because of long lead times and high prices.

No European source mentioned **Tesla Inc.** as gaining or losing share, as none has ever seen it in that market.

Inverter Manufacturer Market Share During 3Q23

(number of sources)

	GAINED	LOST
Huawei	7	2
Sungrow	5	-
Solis	4	-
Fronius	5	2
GoodWe	3	1
Kostal	3	1
Hoymiles	2	-
Sofarsolar	2	-
Enphase	3	2
SMA	3	6
SolarEdge	1	7

Solar Energy – European Inverter and Energy Storage Market

Quotes

“I see hard times coming for our Western inverter producers — same as what already happened in the PV panel market a few years ago. The Westerners are great in terms of technologically and service, but the Chinese get better all the time.” *German installer*

“Huawei is clearly gaining share with us because of price. We’re always looking for new solutions and we are currently testing **Sofar [Solar Co. Ltd.]** hybrid string inverters and batteries.” *French installer*

“If you buy six inverters from Huawei, you get two for free.” *Spanish distributor*

“SMA is too expensive, and SMA every now and then still has delivery issues in some special segments.” *German installer*

“Enphase currently is ramping up its marketing efforts. They just did their first TV spot some weeks ago in Germany. But they need to grow their distribution channels.” *German distributor*

“Enphase’s formerly extremely successful Dutch distribution partner just entered the German market in the beginning of 2023 and is working on building a similar network in Germany. But it will be hard because German installers don’t like microinverter systems at all.” *German distributor*

“Enphase is losing share for sure. I hear and read many complaints of installers having quality issues.” *German distributor*

“Historical players are losing share with us because of prices. SolarEdge is a catastrophe at the moment. We’ve had only one experience with SolarEdge — on a public tender with deciders that absolutely wanted to have optimizers on their installation, but we just couldn’t make it work. And SolarEdge is just unable to tell us why it does not work. Their after-sales service is awful; you never get the same answer depending on who you talk to.” *French installer*

“Our main optimizer provider is Huawei. We didn’t get along with SolarEdge’s communication style and service.” *German installer*

“I see SolarEdge as the big loser this year. SolarEdge is doing a bit better in terms of availability, but that’s because they lost a high number of distributor customers, as well as a high number of large installer accounts. All other distributors in Europe I talk to share the same concerns about SolarEdge: Their product is excellent, but the issue is their problematic commercial approach, their supply problems in the past 12 months, and the price increases they implemented in the past two years that were completely unacceptable and unjustifiable.” *French distributor*

“For large projects above 100 kW peak, the price difference between SolarEdge and its Chinese competitors is too high. So, for systems above 100 kW peak, no one chooses them any longer.” *German distributor*

“Tesla is not present in France. Four or five years ago, they contacted us to become installers of Tesla, but I’ve never heard back from them again about their Powerwall or their inverters — which I’ve never seen, by the way.” *French installer*

Solar Energy – European Inverter and Energy Storage Market

Energy Storage Share Gainers

Pylon Technologies Co. Ltd. (688063 CH) was cited most often (by four sources) as gaining energy storage share during 3Q23, followed by Enphase, **Fenecon GmbH** and Huawei (by three sources each), an improvement from OTR Global's July findings for Enphase because three of nine German sources said they benefitted from their package offer with inverters, and they increased their communication efforts.

BYD Co. Ltd. (1211 HK) was mentioned most often as losing share in 3Q23 (by three sources, including two German sources who said BYD was now focusing on the EV market), while SMA and

LG Chem Ltd. (051910 KS) each were cited by two German sources.

Quotes

"Huawei and Sofar are gaining share with us because we were looking for energy storage solutions for large PV installations, while SMA is losing because of its high prices. Prices for energy storage solutions have not changed in the past three months, but I expect prices to start decreasing in the next three months." *French installer*

"All prices are now a bit more flexible for storage as well." *German installer*

"Chinese OEMs just deliver and deliver. For example, we got four containers full of Pylontech energy storage without having ordered them." *Spanish distributor*

"LG Chem is not very popular here in their home market because they are about the last ones who stick to lithium-ion technology. In storage systems, people are afraid of temperature for safety reasons." *German distributor*

Contributors: Alex Georgalas, Birgit Heitfeld and Miriam Leunissen

Solar Energy – European Inverter and Energy Storage Market

ON MARKET CONDITIONS

“Some countries like Spain and Poland — which installed a lot of GW in 2002 — are also in extreme difficulties in terms of demand. Even in Germany, the government had to put some more incentives in to prevent a catastrophe.” *French distributor*

“For our customers, the situation is perfect, but for us who sit on massive inventory levels and have to earn some money, it’s not funny. Bankruptcies may arise among companies having to write off too much of their money.” *German distributor*

ON INVENTORIES

“The level of excessive inventories in Europe as a whole is catastrophic. Right now, in Europe, there is enough in inventory to meet the needs for a full year. And what is even more frightening is that there is one year worth of inventory that is currently being shipped.” *French distributor*

“Everyone has excess inventories of everything because everyone thought that there would be shortages this year, just like last year. That led PV panel manufacturers and inverter manufacturers to open new lines of production, and now that the market is not growing as fast as it was last year, there is oversupply.” *French distributor*

“We’re stocked up to the roof. We continue to have four times as much inventory as we normally have.” *Spanish installer*

ON ENERGY STORAGE

“Enphase might slightly have gained share because they seem to have found new partners at the Intersolar exhibition [June 14–16 in Munich].” *German distributor*

“I’ve never installed any Enphase battery, but I know of customers that have had problems with them. Enphase is OK to replace those defective batteries, but the problem is to find installers that are willing to do the work with Enphase batteries.” *French installer*

“There was an increase of demand for energy storage solutions in December last year, when everybody was afraid of power outages because of the situation with the nuclear park in France, but now it’s over because electricity production is back to normal.” *French distributor*

ON CHINESE SUPPLY

“The European Union made a statement on Sept. 13 regarding measures that needed to be taken against Chinese EV manufacturers flooding the European market with their subsidized electric vehicles, but [the statement] barely mentioned the solar industry, although it’s a major, major problem for Western manufacturers. This is really frightening.” *French distributor*

Solar Energy – European Inverter and Energy Storage Market

1. How much of your business is utility-side installations and to distributed generation installations?

	UTILITY	RESIDENTIAL
91%–100%:	-	7
71%–80%:	1	1
61%–70%:	1	2
51%–60%:	1	1
31%–40%:	1	1
21%–30%:	2	1
11%–20%:	1	1
1%–10%:	3	-
0%:	4	-
No response:	1	1
Average:	22%–27%	73%–78%

2a. Did 3Q23 solar industry market conditions and demand in your region improve, remain the same or deteriorate qq?

Improved:	3
Remained the same:	2
Deteriorated:	10
OTR Comparative Index:	-47
2Q23 index:	-73

Note: The OTR Comparative Index is a quantitative representation of qualitative responses. The Index is calculated by subtracting the “worse” from the “better” responses, dividing by the total responses and multiplying by 100. An Index below zero indicates a negative trend; above zero indicates a positive trend.

2b. Are your 3Q23 inverter inventory levels excessive, sufficient or insufficient?

Excessive:	13
Sufficient:	-
Insufficient:	-
No response:	1
Not applicable:	1

3a. Did 3Q23 lead times for solar inverters (all categories) increase, remain the same or decrease qq?

Increased:	-
Remained the same:	3
Decreased:	12

3b. What are current lead times for string and micro inverters?

	STRING	MICRO
11–15 weeks:	1	-
6–10 weeks:	-	1
1–5 weeks:	9	6
Less than 1 week:	3	2
None:	1	2
Down:	1	-
Don't know:	-	2
No response:	-	1
Not applicable:	-	1
Average:	1–4 weeks	0–3 weeks
2Q23 average:	3–6 weeks	1–4 weeks

Solar Energy – European Inverter and Energy Storage Market

4. Did your 3Q23 string inverter unit orders (all brands) increase, stay the same or decrease yy? Did your 3Q23 SMA and SolarEdge string inverter unit orders increase, remain the same or decrease yy?

	CATEGORY	SMA	SOLAREEDGE
Up 1%–5%:	-	-	1
Up:	2	1	-
Flat:	3	1	2
Down:	1	1	1
Down 6%–10%:	1	1	-
Down 16%–20%:	2	1	1
Down 21%–25%:	2	2	-
Down 26%–30%:	2	-	-
Down 41%–50%:	-	1	-
Down 81%–90%:	1	1	1
Down 91%–100%:	1	2	6
Not applicable:	-	4	3
Average:	Down 27%–32%	Down 44%–49%	Down 62%–67%
July expectations:	Down 13%–18%	-	-
2Q23 average:	Down 12%–17%	Down 29%–34%	Down 31%–36%

5. Did your 3Q23 micro inverter unit orders (all brands) increase, remain the same or decrease yy? Did your 3Q23 Enphase microinverter unit orders increase, remain the same or decrease yy?

	CATEGORY	ENPHASE
Up:	1	1
Flat:	5	3
Down 6%–10%:	2	-
Down 11%–15%:	-	1
Down 21%–25%:	1	1
Down 81%–90%:	1	1
Down 91%–100%:	2	1
Not applicable:	3	7
Average:	Down 28%–33%	Down 30%–35%
July expectations:	Up 1%–4%	-
2Q23 average:	Flat–up 3%	Flat–up 3%

6. Do you expect your 4Q23 string and micro-inverter unit orders (all brands) to increase, remain the same or decrease yy?

	STRING	MICRO
Up:	1	1
Flat:	1	4
Down:	2	1
Down 6%–10%:	1	-
Down 11%–15%:	1	-
Down 16%–20%:	2	1
Down 21%–25%:	2	1
Down 26%–30%:	1	-
Down 41%–50%:	2	1
Down 71%–80%:	1	-
Down 81%–90%:	1	1
Down 91%–100%:	-	2
Not applicable:	-	3
Average:	Down 32%–37%	Down 36%–41%

Solar Energy – European Inverter and Energy Storage Market

7a. Do you expect your 2023 string and micro-inverter unit purchases (all brands) to increase, remain the same or decrease yy?

	STRING	MICRO
Up 26%–30%:	-	1
Up 16%–20%:	1	-
Up 11%–15%:	2	1
Up 6%–10%:	4	-
Up 1%–5%:	1	-
Up:	1	1
0%:	1	5
Down 6%–10%:	1	1
Down 11%–15%:	1	-
Down 31%–40%:	1	-
Down 41%–50%:	1	1
Down 61%–70%:	1	1
Down 91%–100%:	-	1
Not applicable:	-	3
Average:	Down 5%–8%	Down 14%–19%
July expectations:	Down 5%–8%	Up 5%–8%

7b. Has your 2023 string and micro inverter purchase outlook improved, remained the same or deteriorated during the last 90 days?

Improved:	1	-
Remained the same:	2	6
Deteriorated:	11	6
No response:	1	-
Not applicable:	-	3

8a. How many GW do you expect your country to install during 2023?

	GERMANY	SPAIN	FRANCE
12.1–13 GW:	1	-	-
11–12 GW:	4	-	-
8.1–9 GW:	2	-	-
7–8 GW:	1	-	-
2.1–3 GW:	-	-	2
Don't know:	1	2	1
No response:	-	1	-
Average:	10–11 GW	Not averaged	Not averaged
Official 2022 installations*:	7.9 GW	7.5 GW	2.7 GW

* Source: SolarPower Europe

8b. Has your 2023 installation outlook for your country improved, remained the same or deteriorated during the past 90 days?

Improved:	-	-	-
Remained the same:	6	-	2
Deteriorated:	3	3	1

Solar Energy – European Inverter and Energy Storage Market

8c. How many GW do you expect your country to install in 2024?

	GERMANY	SPAIN	FRANCE
12.1–13 GW:	1	-	-
11.1–12 GW:	1	-	-
10.1–11 GW:	2	-	-
9.1–10 GW:	3	-	-
8.1–9 GW:	1	-	-
2.1–3 GW:	-	-	-
Don't know:	1	2	3
No response:	-	1	-
Average:	10–11 GW	Not averaged	Not averaged

8d. Has your 2024 installation outlook for your country improved, remained the same or deteriorated during the past 90 days?

Improved:	3	-	-
Remained the same:	3	-	-
Deteriorated:	2	1	1
No response:	1	2	2

9. Did 3Q23 string and micro-inverter prices (all brands) increase, remain the same or decrease yy?

	STRING	MICRO
Up:	-	-
Flat:	1	4
Down:	2	1
Down 1%–5%:	1	3
Down 6%–10%:	3	2
Down 11%–15%:	6	1
Down 16%–20%:	1	-
Down 31%–40%:	1	-
No response:	-	1
Not applicable:	-	3
Average:	Down 12%–15%	Down 3%–6%
July expectations:	Up 3%–6%	Not averaged
2Q23 average:	Up 6%–9%	Up 8%–13%

10. Do you expect 4Q23 string and micro-inverter prices (all brands) to increase, remain the same or decrease yy?

	STRING	MICRO
Up:	-	-
Flat:	-	2
Down:	4	2
Down 1%–5%:	2	5
Down 6%–10%:	1	-
Down 11%–15%:	6	-
Down 16%–20%:	1	-
Down 56%–60%:	1	-
Don't know:	-	3
Not applicable:	-	3
Average:	Down 15%–18%	Down 2%–5%

Solar Energy – European Inverter and Energy Storage Market

11. Which inverter manufacturer gained or lost share during 3Q23?

	GAINED	LOST
Huawei:	7	2
Sungrow:	5	-
Solis:	4	-
Fronius:	5	2
GoodWe:	3	1
Kostal:	3	1
Hoymiles:	2	-
Sofar:	2	-
Enphase:	3	2
SMA:	3	6
SolarEdge:	1	7
Other:	6	-

Note: Some sources gave more than one answer.

12. Which energy storage manufacturer gained or lost share during 3Q23?

Pylon Tech:	4	-
Enphase:	3	-
Fenecon:	3	-
Huawei:	3	1
Sungrow:	2	-
SolarEdge:	1	1
BYD:	2	3
SMA:	1	2
LG Chem:	-	2
Other:	6	-

Note: Some sources gave more than one answer while others did not respond.

Solar Energy – European Inverter and Energy Storage Market

ANALYST CERTIFICATION

The Author(s) of this research report certify that all of the views expressed in the report accurately reflect their personal views about any and all of the subject securities and that no part of the Author(s) compensation was, is or will be, directly or indirectly, related to the specific recommendations or views expressed in this report.

ADDITIONAL DISCLOSURES

READ THIS ©2023 OTR Global LLC (OTR). All rights reserved. OTR is an investment adviser. This report was produced for the exclusive use of OTR and its clients and may not be reproduced, electronically or via hard copy or relied upon, in whole or in part, without written consent. The information herein is not intended to be a complete analysis of every material fact respecting any company or industry relating to the subject discussed, nor by itself is it sufficient upon which to base an investment decision. OTR uses a set of symbols to reflect the business conditions (which may include but are not limited to market share, product pricing, competition, inventory, sales and orders) of a given company or industry: Thumb Up denotes a positive story, Thumb Down denotes a negative story, and Fist denotes a mixed story. These symbols are neither ratings nor recommendations to buy, sell, or hold a security. OTR does not financially compensate sources for participating in its research reports. OTR conducts industry events where sources who participated in OTR's research reports may be compensated or have their expenses paid by OTR to attend the industry event. Additionally, sources who participate in OTR's research reports may directly interact with clients at these OTR industry events.

Additional information available upon request.