



Regional analysis Solar energy industry

**Green energy transition –
Prospects for solar industry**

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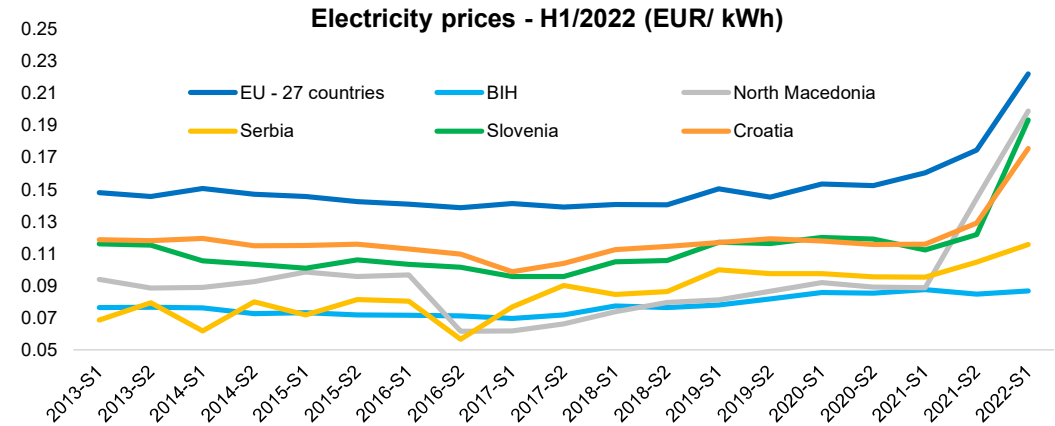
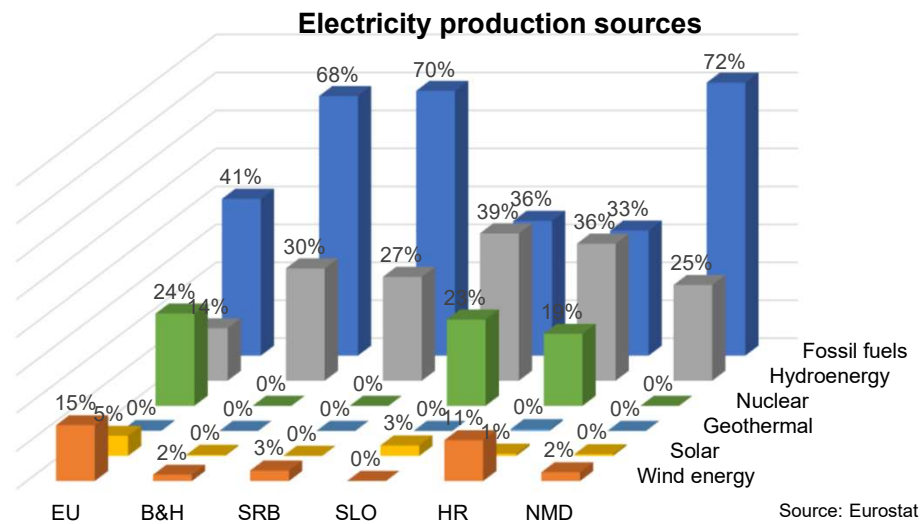
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Green transition necessity

The concept of energy sustainability has never been more relevant than today. At the time of writing of this report, world business and political leaders are preparing for the annual meeting in Davos, World Economic Forum. In annual WEF's report (Global Risk Report 2023) besides geopolitics and cost of living, climate changes are again/still in focus. That said, we are analyzing the share and impact of fossil fuels and renewable sources in production of electricity, with focus on solar energy and where is the Adria region in this context.

The World still dominantly relies on fossil sources in production of electricity. In the Adria region, there is mixed picture with Slovenian and Croatian shiny example of low share of fossil fuels. B&H, Serbia and N. Macedonia are dealing with extremely high usage of fossil fuels (and negligible usage of renewable sources other than hydro power). Fossil fuels usage at around 70% in total electricity production is the reason why these three countries are everyday struggling with the high level of pollution.

Another problem today represents **spiking electricity prices**. In Europe, prices are reaching levels not seen in the past 10 years, pushed by growing prices of natural gas due to geopolitical issues and war in Ukraine. In Adria region we see mixed picture – consumers in Serbia and BIH are enjoying very low prices thanks to high subsidies (at the last end on the list of European countries), while in Slovenia, Croatia and N. Macedonia prices are at the average of EU.



Until recently, climate changes were only an ecological problem, but today, when business and economy intensely experience the negative consequences as well, concept of sustainability is increasingly becoming important. Shift to renewable sources in electricity production is one of the solutions, but our focus in the report will be solar energy as clean and fast solution, economical and of scalable character (can be used on an industrial scale but also to power single household).

Economics of renewable sources

Before focusing on solar industry, we will display the economics of all renewables. The **global power capacity for renewables was at 3.1 TW in 2021**, which is 38% of total available capacities for electricity production in the world. Installed capacity more than doubled during last decade, with only 1.3 TW installed capacity in 2011. Growth of renewable installation has exploded over the recent years thanks to technology development, with installation becoming cheaper and affordable for wider use. China has 1TW installed renewable capacity which represents 32% of total world's capacity and is a leading country by a number of new instalments. Behind China, there is USA with approx. 0.3TW capacity. In Europe, all countries in the old continent encompass total renewable capacity of 647 GW, up by 6.5% as compared to 2020 and by 39% as compared to 2015. To better display that new capacity installation of solar industry is the one gaining the most traction is that in 2021 solar industry was the fastest growing segment of renewables with an increase of 130 GW worldwide (23 GW in Europe) compared to 2020 i.e. half of total newly installed renewable capacity. Globally, **solar capacity is today estimated at 1 TW and it is by 3x higher than in 2018 and by 500x higher than in 2002.**

The key reason of such industry growth is the fact that **renewables become price competitive to fossil fuels**. When we are talking about solar energy (but the same stands for other renewable sources), technology following learning curve provided this change - by increasing number of solar installations, the price was declining by the same rate. In other words, with a growing interest for usage, technology improvements, higher number of companies producing panels, it was created a competitive market that led to prices down. Solar industry is a great example of so-called learning-by-doing. More importantly, cheaper technology led to cheaper electricity production from solar. According to IRENA (International Renewable Energy Agency), solar PV instalment costs and LCOE dropped by 82% and 88% respectively in the past decade. Solar PV had the strongest decline rates – from the most expensive source of energy they became the one of the cheapest. The global weighted average LCOE of solar PV utility drop from 0.417 USD/kW to 0.048 USD/kW.15,57

	Total installed costs USD/kW			LCOE** - USD/kW Levelized costs of energy		
	2010	2021	Δ	2010	2021	Δ
Bioenergy	2,714	2,353	-13%	0.078	0.067	-14%
Geothermal	2,714	3,991	47%	0.05	0.068	34%
Hydropower	1,315	2,135	62%	0.039	0.048	24%
Solar PV	4,808	857	-82%	0.417	0.048	-88%
CSP*	9,422	9,091	-4%	0.358	0.114	-68%
Onshore wind	2,042	1,325	-35%	0.102	0.033	-68%
Offshore wind	4,876	2,858	-41%	0.188	0.075	-60%

Table data by © IRENA; *Concentrated PV solar energy; **LCOE - Net present value of discounted total lifetime energy income of generator needed to cover discounted total lifetime costs

Given current energy crises and growing prices of fossil fuels, as per estimation of IRENA, fossil gas and CO2 costs are expected at higher level than it is weighted average LCOE of solar PV utility.

Countries in Adria region are on the very end of the list of European countries as per installed capacity. Renewable capacities are increasing with a special note on solar. As compared to 2015, solar recorded 3-digit % growth in most of countries. But still, capacities are far below other countries in Europe (such as Germany which is leading country in Europe as per installed capacity) despite potential Adria region has.

	Renewable capacity (MW)			Solar capacity (MW)		
	2015	2021	Δ	2015	2021	Δ
Slovenia	1,419	1,606	13%	238	367	54%
Croatia	2,713	3,454	27%	48	109	127%
B&H	1,725	1,977	15%	8	53	563%
Serbia	2,439	2,964	22%	16	52	225%
N. Macedonia	716	963	34%	17	94	453%
Europe	464,891	647,398	39%	99,605	185,877	87%
World	1,851,651	3,063,926	65%	228,054	849,473	272%

Solar production potential

In order to display the potential of solar capacity expansion in the region, we will use data calculated by methodology developed by Global Solar Atlas (World Bank) on the photovoltaic (PV) power generation potential (PVO_{UT}). PV potential indicates the kWh of electricity that would be generated by a PV system with 1kW peak installed capacity (data take into account number of factors that affect module performance through solar radiation, temperature and PV simulation calculation models). For Adria region, PVO_{UT} data are in favourable range between 3.5 and 4.5 kWh/kWp, which shows that **most of countries in Adria region are better positioned as compared to many countries in Europe, having higher production capacity potential** (please note that below listed other countries are those with the highest installed solar capacity). Another element to watch for is seasonality index – ratio between the highest and lowest average monthly photovoltaic power potential values. The seasonality index also confirms more favourable position of countries in Adria region, with lower seasonality in solar production during year.

	PVO _{UT} (kWh/kWp/daily)	Seasonality index
Slovenia	3.43	2.87
Croatia	3.63	2.91
BIH	3.57	2.73
Serbia	3.52	2.99
N. Macedonia	3.88	2.47
Germany	2.96	4.37
Italy	3.99	2.36
Spain	4.41	1.93
France	3.39	2.97
Netherlands	2.86	4.33
UK	2.61	5.13

PVO_{UT} - estimated solar PV power generation potential i.e. long-term average of daily totals of electricity production from a 1 kW-peak grid-connected solar PV power plant

Seasonality index - ratio between the highest and lowest average monthly photovoltaic power potential values in an average year.

Source: SOLARGIS; ESMAP. 2020. Global Photovoltaic Power Potential by Country. Washington, DC: World Bank.

The downside of solar projects is that they require a large area of land. In small countries such as countries of Adria region a solution could be found with installing floating solar PV plants in the case of Croatia (in the Adriatic Sea) or with the dual use of land in a scheme known as Agrivoltaics. Coexistence of crop and energy production on the same land is a new project of MK Group in Serbia and first of this kind in SEE region. This will be the biggest agri-solar project in Europe with total projected investment value of EUR 340mln and capacity of 660MW.

For development going forward, we find important the improvement in regulatory and operational frame through more ambitious solar energy targets to be implemented by most of Adria's country and more importantly, ensured connection of solar capacity to the power network and balanced grid. Considering limitations of power network, additional investments into construction, modernization and expansion can represent main limitation factor for faster development of the industry.

Peer analysis

Solar energy market is differently developed among countries of Adria region. While our peer sample includes companies from all five Adria countries, in Serbia and Bosnia and Herzegovina we see the market at early stage of development: operated by distributors/installers of solar equipment/panels (no producers of equipment yet) with average lifespan of companies up to 10 years.

The sector is more developed in Slovenia and Croatia with producers of the solar equipment leading the sector, while in N. Macedonia we take a look at Piksel Group i.e. a local solar electricity production plant. Thus, for our peer analysis, we selected companies with the highest turnover and the longest business tradition as relevant representatives of the solar regional market.

Company name	Sales			Sales growth			EBITDA margin			EBIT margin			ROE			ROIC			Net debt/EBITDA		
	EUR in thousands			%			%			%			%								
	2019	2020	2021	2019	2020	2021	2019	2020	2021	2019	2020	2021	2019	2020	2021	2019	2020	2021	2019	2020	2021
Bisol SLO (prod.)	38,474	44,614	38,344	(4.5)	16.0	(14.1)	10.8	17.4	10.1	4.3	11.7	3.8	8.0	25.2	6.7	5.2	15.4	4.2	1.8	0.6	1.3
Solvis HR (prod.)	38,502	42,534	51,160	-3.19	10.5	20.3	5.8	15.0	14.7	3.8	12.4	12.0	21.4	70.1	48.3	5.9	23.1	20.2	10.1	2.2	3.4
Piksel Group NMD (prod.)	1,019	1,060	2,828	n.a.	4.1	166.8	17.1	14.1	19.3	13.4	6.8	16.7	n.a.	21.1	120.2	n.a.	n.a.	46.0	n.a.	n.a.	n.a.
MT Komex SRB (distr.)	599	1,737	4,800	70	189.8	176.3	18.8	19.5	23.8	17.9	19.2	23.6	119.1	99.2	104.6	104.7	82.6	78.6	(2.0)	0.0	(0.1)
ETMax B&H (distr.)	2,533	3,471	6,951	331.7	37.0	100.2	30.7	21.7	23.3	28.7	19.8	21.5	93.5	(55.4)	72.1	53.9	32.4	43.5	0.5	1.6	1.0
Median	2,533.0	3,471.0	6,951.0	n.a.	37.0	100.3	17.1	17.4	19.3	13.4	12.4	16.7	57.5	25.2	72.1	29.9	27.7	43.5	1.2	1.1	1.1
Average	16,225.4	18,683.2	20,816.6	n.a.	15.1	11.4	16.6	17.5	18.2	13.6	14.0	15.5	60.5	32.1	70.4	42.4	38.4	38.5	2.6	1.1	1.4

Source: Company financial reports, Bloomberg Adria analysis

Average sales growth rate of our peer group shows that the industry has been growing in the past 2 years, however growth was led by 3-digit yoy rates by distribution companies. These companies also record higher margins than companies involved in production. Still, the whole industry is strongly profitable, with average peer 3-year EBITDA and EBIT margins at 17.5% and 14% respectively. While margins were under pressure by elevated input costs in 2022, in 2023 we expect stronger margins thanks to decrease of polysilicon and other raw material prices in 2H, as well as lower shipping costs.

Bisol Group from Slovenia is the first solar PV modules factory in Adria region, established in 2004. Almost 90% of production is exported, mainly to most developed European countries. It is the only company in this peer group that recorded drop in sales in 2021, which the company explains by supply chain issues as a consequence of COVID pandemic. Due to lower revenues and increase of raw material prices, profitability shrunk as well. Croatian peer, **Solvis**, also involved in production of PV modules, managed to realize sales increase followed by stable profitable margins. It is dominantly export oriented as well. Both companies expect higher revenues in 2022 on the back of rapidly growing industry, pushed by energy crises. Both companies are

planning further expansion of capacities as current are at maximum utilization in order to properly respond on growing demand. Solvis disposes with 300MW capacity and in its annual reports announced further expansion to 400MW. European solar market is very competitive and there is strong pressure on profitability from Chinese cheaper products. Producers from China enjoy high incentives from their state, while those in EU are worse positioned with high taxes weighing on the overall profitability. This is expected to remain main challenge in following years as well. Uncompetitive market conditions forced one of worlds leading producers such as Maxeon to close their European facilities. **Piksel Group** from N. Macedonia is a relatively young company (established in 2018) involved in production of PV modules, with the business already now delivering on strong margins and returns. It disposes with a 250MW capacity. In 2021 it almost tripled sales revenues - concerning available capacity and the peer growth development, we see the company with a good potential for further growth. Serbia and B&H are yet to get their first producers of solar panels. First production PV modules plant in Serbia, will be built in Velika Plana. However, as per announcements, complete raw material (solar cells, tempered glass, EVA foil, etc.) will be imported.

Outlook

The 2022 was another record year when investments into new solar capacity are concerned. Global solar capacities expanded for about 47% compared to 2021, according to newest BloombergNEF data. The key obstacles for further expansion of solar industry are successful connection of RES, grid balancing (which entails large additional investments by each country) and more proactive local regulation. Still, we see the overall industry with further growth potential in the upcoming years. **Solar will be the fastest growing energy segment in 2023, with estimated 20-30% increase yoy globally.**

In Europe, which is a strong benchmark and leading mechanism for Adria region countries as well, we see **its proactive role in green energy transition process (REPower EU plan) and decreasing effect of climate changes as the key driver of further development.** In 2022, the EU adopted a plan to increase consumption of energy from renewable sources to 45% by 2030, which in our opinion will bring intensive development to the industry thanks to engagement of significant material and human resources in this sector, and further concentration of know-how and therefore reduction of investment costs. The **competitive and decreasing costs of solar energy production (LCOE)** is another key driver that we see leading to the advantages and primacy of solar over other sources of energy. **Short period from development of project to installation and utilization,** we believe will decide on the choice over other available energy sources as well. The last but not least, supportive **state incentive policy,** which we expect to be more aggressive (grants for construction, speeding the process of issuing permits, tax benefits through tax credits) should result in growing interest and wider usage and therefore faster transition towards renewable sources.

Glossary

Term	Definition	Formula
ROE	Return on Equity	Net income/average total shareholder's equity
ROA	Return on Assets	Net income/average total assets
ROIC	Return on Invested Capital	(EBIT - income tax)/ average invested capital
INVESTED CAPITAL	Invested Capital	Short-term debt + long-term debt + provisions + long-term payables + deferred tax liabilities
AR DAYS	Accounts receivables days	Average accounts receivables/Sales revenues*365
AP DAYS	Accounts payables days	Average accounts payables/(cost of materials + cost of services)*365
INVENTORY DAYS	Inventory days	Average inventory/cost of materials*365
CCC	Cash Conversion Cycle	AR days + Inventory days - AP days
INTEREST COVERAGE RATIO	Interest coverage ratio	EBIT/interest paid
CURRENT RATIO	Current ratio	Current assets/current liabilities
NET DEBT/EBITDA	Net debt/EBITDA	(Long-term debt + short-term debt - cash)/EBITDA
NET DEBT/EBIT	Net debt/EBIT	(Long-term debt + short-term debt - cash)/EBIT

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