Technology Collaboration Programme
by iea

International Energy Agency
Photovoltaic Power Systems Programme

Task 1 Strategic PV Analysis and Outreach

PVPS

National Survey Report of PV Power Applications in AUSTRIA

2023

Hubert Fechner

Austrian PV Technology Platform

What is IEA PVPS TCP?

The International Energy Agency (IEA), founded in 1974, is an autonomous body within the framework of the Organization for Economic Cooperation and Development (OECD). The Technology Collaboration Programme (TCP) was created with a belief that the future of energy security and sustainability starts with global collaboration. The programme is made up of 6.000 experts across government, academia, and industry dedicated to advancing common research and the application of specific energy technologies.

The IEA Photovoltaic Power Systems Programme (IEA PVPS) is one of the TCP's within the IEA and was established in 1993. The mission of the programme is to "enhance the international collaborative efforts which facilitate the role of photovoltaic solar energy as a cornerstone in the transition to sustainable energy systems." In order to achieve this, the Programme's participants have undertaken a variety of joint research projects in PV power systems applications. The overall programme is headed by an Executive Committee, comprised of one delegate from each country or organisation member, which designates distinct 'Tasks,' that may be research projects or activity areas.

The IEA PVPS participating countries are Australia, Austria, Belgium, Canada, China, Denmark, Finland, France, Germany, Israel, Italy, Japan, Korea, Malaysia, Morocco, the Netherlands, Norway, Portugal, South Africa, Spain, Sweden, Switzerland, Thailand, Turkiye, and the United States of America. The European Commission, Solar Power Europe, the Solar Energy Research Institute of Singapore and Enercity SA are also members.

What is IEA PVPS Task 1?

The objective of Task 1 of the IEA Photovoltaic Power Systems Programme is to promote and facilitate the exchange and dissemination of information on the technical, economic, environmental and social aspects of PV power systems. Task 1 activities support the broader PVPS objectives: to contribute to cost reduction of PV power applications, to increase awareness of the potential and value of PV power systems, to foster the removal of both technical and non-technical barriers and to enhance technology co-operation. An important deliverable of Task 1 is the annual "Trends in photovoltaic applications" report. In parallel, National Survey Reports are produced annually by each Task 1 participant. This document is the Austrian National Survey Report for the year 2023. Information from this document will be used as input to the annual Trends in photovoltaic applications report.

Authors

- **Main Content: H**ubert Fechner, Austrian Technology Platform Photovoltaic
  - **Data:** Most PV-related Data from: Innovative Energietechnologien in Österreich Marktentwicklung 2023; Biomasse, Photovoltaik, Solarthermie, Wärmepumpen und Windkraft, Report of the Austrian federal ministry of Climate Action, Environment, Energy, Mobility, Innovation and Technology; Authors: P. Biermayr, C. Dißauer, M. Eberl, Enigl, H. Fechner, B. Fürnsinn, M. Jaksch-Fliegenschnee, K. Leonhartsberger, S. Moidl, E. Prem, C. Schmidl, C. Strasser, W. Weiss, M. Wittmann, P. Wonisch, E. Wopienka

COVER PICTURE

Agri-PV System Energiepark Bruck/Leitha, Austria

TABLE OF CONTENTS

1 INSTALLATION DATA

The PV power systems market is defined as the market of all nationally installed (terrestrial) PV applications with a PV capacity of 40 W or more. A PV system consists of modules, inverters, batteries and all installation and control components for modules, inverters and batteries. Other applications such as small mobile devices are not considered in this report. For the purposes of this report, PV installations are included in the 2023 statistics if the PV modules were installed and connected to the grid between 1 January and 31 December 2023, although commissioning may have taken place at a later date.

1.1 Applications for Photovoltaics

Discussions about Austria's dependence on Russian natural gas combined with a growing climate debate as well as uncertainty about the future development of electricity prices were the most important triggering factors for a very special development in the Austrian photovoltaic sector in 2023.

The high electricity prices on the stock exchange in 2022 and 2023 and people's concerns about exploding energy costs, combined with a lack of availability (supply and personnel bottlenecks), led to a probably unique situation that pushed economic considerations into the background and also led to unprecedented levels of investment in PV and electricity storage.

Rooftop systems in particular were realised quite quickly, but various large-scale systems were also connected to the grid in 2023. Market demand in the residential sector was so high at times that waiting times of up to a year and, in some cases, greatly inflated overall system prices were observed.

1.2 Total photovoltaic power installed

Market Data acquisition is done by a project of a group of academic stakeholders on behalf of the Austrian ministry of Climate Action, Environment, Energy, Mobility, Innovation and Technology. This national survey is dedicated to the technologies of PV, wind, solarthermal, heat pumps and bioenergy and is done annually on a very comparable basis since the year 1992.

The survey is based on data from the various national and regional funding agencies and the green electricity processing agency (OeMAG) as well as on surveys among planners, producers and installers. The market figures are also coordinated with the surveys of the regulatory authority, receiving data from electricity grid operators as well as the national data bank which proofs the origin of the electricity.

Centralized: any PV installation which only injects electricity and is not associated with a consumer (no self-consumption)

Decentralized: any PV installation which is embedded into a customer’s premises (self-consumption mainly with surplus grid feed-in)

Table 1: Annual PV power installed during calendar year 2023

		Installed PV capacity in 2023 [MW]	AC or DC
	Decentralized	2294	DC
	Centralized	308	DC
	Off-grid	1	DC
	Total	2603	DC

Table 2: PV power installed during calendar year 2023

			Installed PV capacity [MW]	Installed PV capacity [MW]	AC or DC
Grid-connected	BAPV	Residential	2229	n.a.	DC
		Commercial		n.a.	DC
		Industrial		n.a.	DC
	BIPV	Residential	65	n.a.	DC
		Commercial		n.a.	DC
		Industrial		n.a.	DC
	Utility-scale	Ground-mounted	308	n.a.	DC
		Floating		24,5	DC
		Agricultural		n.a.	DC
Off-grid		Residential	1	n.a.	.
		Other		n.a.	-
		Hybrid systems		n.a.	-.
Total			2603		DC

Table 3: Data collection process

If data are reported in AC, please mention a conversion coefficient to estimate DC installations.	Data are reported in DC

Is the collection process done by an official body or a private company/Association?	For PV data responsible: University AS Technikum Vienna
Link to official statistics (if this exists)	https://nachhaltigwirtschaften.at/de/publikationen/schriftenreihe-2024-17-marktentwicklung-energietechnologien.php
	The survey was carried out by evaluating all national and regional funding agencies via a survey of planners and installers; Furthermore, a comparison was made with the figures from the regulator (E-Control), which determines these from the annual statutory reports from the network operators.

Table 4: The cumulative installed PV power in sub-markets

Year	Off-grid [MW] (including large hybrids)	Grid-connected distributed [MW] (BAPV, BIPV)	Grid-connected centralized [MW] (Ground, floating, agricultural…)	Total [MW]
1992	0,338	0,187	0	**0,525**
1993	0,423	0,346	0	**0,769**
1994	0,59	0,453	0	**1,043**
1995	0,755	0,586	0	**1,341**
1996	0,888	0,831	0	**1,719**
1997	0,992	1,196	0	**2,188**
1998	1,193	1,648	0	**2,841**
1999	1,393	2,189	0	**3,582**
2000	1,649	3,219	0	**4,868**
2001	1,835	4,263	0	**6,098**
2002	1,962	8,357	0	**10,319**
2003	2,131	14,66	0	**16,791**
2004	2,645	18,415	0	**21,06**
2005	2,895	21,126	0	**24,021**
2006	3,169	22,416	0	**25,585**
2007	3,224	24,477	0	**27,701**
2008	3,357	29,03	0	**32,387**
2009	3,605	48,991	0	**52,596**
2010	3,812	91,686	0	**95,498**
2011	4,502	182,67	0	**187,172**
2012	4,722	358,163	0	**362,885**

2013	5,19	620,784	0	**625,974**
2014	5,489	779,757	0	**785,246**
2015	5,535	931,563	0	**937,098**
2016	6,487	1089,529	0	**1096,016**
2017	6,963	1262,008	0	**1268,971**
2018	7,197	1439,935	8	**1455,132**
2019	7,697	1676,296	18,1	**1702,093**
2020	8,197	2030,337	30,5	**2042,934**
2021	8,697	2659,9	114	**2782,6**
2022	9,197	3511,68	270,82	**3791,7**
2023	10,197	5808,68	578,82	**6394,7**

Table 5: Other PV market information

	2023
Number of PV systems in operation in Austria	About 400.000 by end of 2023 (out of that 128.812 new PV Systems in 2023 at the 16 largest network operators covering mor than 85% of the electricity users)
Decommissioned PV systems during the year [MW]	No numbers available
Repowered PV systems during the year [MW]	No numbers available

Table 6: PV power and the broader national energy market

	Data	Year (last year of available data)
Total power generation capacities in 2023 [GW]	31,374	31.12.2023
Total renewable power generation capacities (including hydropower) [GW]	25,075	31.12.2023
Total electricity demand [TWh]	73,25 including own consumption and grid losses (without pump storage electricity needs) 62,81 (Electricity end consume)	31.12.2023
New power generation capacities installed [GW]	3,069	2023

New renewable power generation capacities (including hydropower) [GW]	3,069	2023
Estimated total PV electricity production (including self-consumed PV electricity)	5 TWh (est.)	31.12.2023
Total PV electricity production as a % of total electricity consumption	8 % of final end consume 6,8 % of total electricity use	31.12.2023
Average yield of PV installations (in kWh/kWp)	1.050	-

Datasource: Stromstatistik Österreichs Energie, https://oesterreichsenergie.at/stromstatistik-1

1.3 Key enablers of PV development

Important factors that have driven market development in 2023 to an unprecedented extent are the development of electricity prices and uncertainty in the development of international electricity prices, the desire for increased independence from these, discussions about dependence on Russian natural gas and the desire to make a (personal of institutional) contribution to mitigating global warming. The significantly lower purchase costs compared to previous years have been a major enabler of this development.

PV needs also to be seen as significant part in the energy transition process which has many links to other important technology developments:

- Decentralized PV-Storage systems – approx. every 3rd decentralized PV-system installed with a storage (typical capacity in 2023: 14 kWh)
- Residential Heat Pumps/all heat pumps (residential and industrial for heating and hot water preparation) – 57.000 (2023 in numbers) - total: 498.000 (Survey on behalf of the Ministry of Climate Action, Environment, Energy, Mobility, Innovation and Technology)
- Electric cars (number); battery only cars (no hybrid): 160.000 Source: Statistic Austria, end 2023

2 COMPETITIVENESS OF PV ELECTRICITY

2.1 Module prices in Austria

Table 7: Typical module prices (in € per kWp excl. VAT)

Year	Lowest price of a standard module crystalline silicon	Highest price of a standard module crystalline silicon	Typical price of a standard module crystalline silicon
2023	- -	3400 (specific module for Building integration) -	457 (mean price of Austrian products) 232 (mean price of global modules for PV retailers)

2.2 System prices in Austria

Table 8: Turnkey PV system prices of different typical PV systems

Category/Size	Typical applications and brief details	Current prices [€/kWp]
Off-grid 1-5 kW	A stand-alone PV system is a system that is installed to generate electricity to a device or a household that is not connected to the public grid.	n.a.
Residential BAPV 5 kW 10 kW	Grid-connected, roof-mounted, distributed PV systems installed to produce electricity to grid-connected households. Typically roof-mounted systems on single-family homes.	1669 1347
Residential BIPV 10 kW	Grid-connected, building integrated, distributed PV systems installed to produce electricity to grid-connected households. Typically, on villas and single-family homes.	>2000 (est.)
Small commercial BAPV 100 kW	Grid-connected, roof-mounted, distributed PV systems installed to produce electricity to grid-connected commercial buildings, such as public buildings, multi-family houses, agriculture barns, grocery stores etc.	1000 (est.)
Small commercial BIPV 10-100 kW	Grid-connected, building integrated, distributed PV systems installed to produce electricity to grid-connected commercial buildings, such as public buildings, multi-family houses, agriculture barns, grocery stores etc.	>1500 (est.)
Large commercial BAPV 100-250 kW	Grid-connected, roof-mounted, distributed PV systems installed to produce electricity to grid-connected large commercial buildings, such as public buildings, multi-family houses, agriculture barns, grocery stores etc.	900 (est.)

Large commercial BIPV 100-250 kW	Grid-connected, building integrated, distributed PV systems installed to produce electricity to grid-connected commercial buildings, such as public buildings, multi-family houses, agriculture barns, grocery stores etc.	n.a.
Industrial BAPV >250 kW	Grid-connected, roof-mounted, distributed PV systems installed to produce electricity to grid-connected industrial buildings, warehouses, etc.	800 (est.)
Small centralized PV 1-20 MW	Grid-connected, ground-mounted, centralized PV systems that work as central power station. The electricity generated in this type of facility is not tied to a specific customer and the purpose is to produce electricity for sale.	650 (est.)
Large centralized PV >20 MW	Grid-connected, ground-mounted, centralized PV systems that work as central power station. The electricity generated in this type of facility is not tied to a specific customer and the purpose is to produce electricity for sale.	n.a.
Other categories existing in Austria. Examples could be: **Hybrid diesel-PV** **Floating Centralized PV** **Agricultural PV** **Industrial BIPV**	-	n.a.

Table 9: National trends in system prices for different applications

Year	Residential BAPV Grid-connected, roof-mounted, distributed PV system 5kW **[€/W]**	Small commercial BAPV Grid-connected, roof-mounted, distributed PV systems 10kW **[€/W]**	Large commercial BAPV Grid-connected, roof-mounted, distributed PV systems >100 kW **[€/W]**	Centralized PV Grid-connected, ground-mounted, centralized PV systems > 10 MW **[€/W]**
2010	3680	n.a.	n.a.	n.a.
2011	2970	n.a.	n.a.	n.a.
2012	2216	n.a.	n.a.	n.a.
2013	1943	n.a.	n.a.	n.a.
2014	1752	n.a.	n.a.	n.a.
2015	1658	n.a.	n.a.	n.a.

2016	1645	n.a.	n.a.	n.a.
2017	1621	n.a.	n.a.	n.a.
2018	1567	1270	900	n.a.
2019	1560	1190	800	n.a.
2020	1507	1190	700-1000	n.a.
2021	1543	1297	900 (est.)	n.a.
2022	1669	1300	1000	n.a.
2023	1669	1300	900	< 650 (est.)

2.3 Cost breakdown of PV installations

The cost breakdown of a typical 5-10 kW roof-mounted, grid-connect, distributed PV system on a residential single-family house and a typical >10 MW Grid-connected, ground-mounted, centralized PV systems at the end of 2023 is presented in the tables below.

The cost structure presented is from the customer's point of view. I.e. it does not reflect the installer companies' overall costs and revenues. The “average” category in Table 10 represents the average cost for each cost category and is the average of the typical cost structure. The average cost is taking the whole system into account and summarizes the average end price to customer. The “low” and “high” categories are the lowest and highest cost that has been reported within each segment. These costs are individual posts, i.e. summarizing these costs do not give an accurate system price.

Table 10: Cost breakdown for a grid-connected roof-mounted, distributed residential PV system of 5-10 kW

Cost category	Average [€/kW]	Low [€/W]	High [€/W]
Hardware			
Module	525,1	n.a.	n.a.
Inverter	309,3	n.a.	n.a.
Mounting material and other electronics (cables, etc.)	449,4	n.a.	n.a.
Subtotal Hardware	**1283,8**		
Soft costs			
Planning	100 (est.)	n.a.	n.a.
Installation work	285,3 (est.)	n.a.	n.a.

Shipping and travel expenses to customer	Included	n.a.	n.a.
Permits and commissioning (i.e. cost for electrician, etc.)	included	n.a.	n.a.
Project margin	included	n.a.	n.a.
Subtotal Soft costs	**333,82**		
Total (excluding VAT)	**1669,1**		
Average VAT	20%		
Total (including VAT)	**2002,92**		

2.4 Financial Parameters and specific financing programs

Table 11: PV financing information in 2023

Remark: The Austrian National Bank conducts a survey of lending rates, broken down into new and existing customers

Different market segments		Loan rate [%]
Average rate of loans – residential installations (corresponds to the loan > 5 years for non-commercial sector)		2,99…4,26 (Jan…Dec)
Average rate of loans – commercial installations		n.a.
Average cost of capital – industrial and ground-mounted installations		n.a.

Source: https://www.oenb.at/isawebstat/createChart?chart=2.10.1&lang=DE&newChart=true

2.5 Specific investments programs

See 6.1.

2.6 Additional Country information

Since the year 2022 the energy process are facing a dynamic development: 2022 was characterized by significantly rising electricity prices up to more than 50 €Cent/kWh in specific cases (e.g. new contracts),

later on, rebates were offered as well as reduced prices. By the end of 2022, the prices in general went down, but remaining at a level of at least 30% higher than in 2021. In any case, there now exists a wide range of electricity prices, rebates etc. However in 2023 the energy price trend stabilised somewhat, but the pre-crisis level was generally significantly exceeded.

Table 12: Country information

Retail electricity prices for a household [€/W] (typical household with 2.500 … 5.000 kWh/a) – Source: E-Control, Austrian regulator, "Strompreisentwicklung 2023", www.e-control.at	33,275…36,466 €Cent Remark: Du to the rise in electricity price, in December 2022 an "electricity price brake" was introduced nationwide (until End of 2024): For an annual consumption of up to 2,900 kilowatt hours (kWh), only a 10 cents/kWh payment for energy per household metering point is charged. Network charges, taxes and levies are added, as usual
Retail electricity prices for a commercial company [€/W] 20…500 MWh/a "Strompreisentwicklung 2023", www.e-control.at	32,201…32,311 €Cent
Retail electricity prices for an industrial company [€/W] >150.000 MWh/a "Strompreisentwicklung 2023", www.e-control.at	>23,391…20,672 (End of year)…. €Cent
Liberalization of the electricity sector	Austria has a fully liberalized electricity market with free choice of supplier for all customers. Currently about 31 companies are listed at the regulatory homepage offering electricity nationwide. (source: E-control.at - https://www.e-control.at/konsumenten/anbieter-uebersicht)

3 POLICY FRAMEWORK

This chapter describes the support policies aiming directly or indirectly to drive the development of PV. Direct support policies have a direct influence on PV development by incentivizing or simplifying or defining adequate policies. Indirect support policies change the regulatory environment in a way that can push PV development.

Table 13: Summary of PV support measures

Category	Residential		Commercial + Industrial		Centralized	
Measures in 2023	**On-going**	**New**	**On-going**	**New**	**On-going**	**New**
Feed-in tariffs	YES		YES		YES	
Feed-in premium (above market price)	YES (>10 kWp)		YES		YES	
Capital subsidies	YES		YES		YES	
Green certificates	-	-	-	-	-	-
Renewable portfolio standards with/without PV requirements	-	-	-	-	-	-
Income tax credits	-	-	-	-	-	-
Self-consumption	YES	-	YES	-	YES	-
Net-metering	-	-	-	-	-	-
Net-billing	-	-	-	-	-	-
Collective self-consumption and delocalized net-metering	YES	-	YES	-	-	-
Sustainable building requirements	YES (Vienna, Styria, Burgenland, Lower Austria)	-	YES (Vienna, Styria, Burgenland, Lower Austria)	-	-	-
BIPV incentives	YES (according federal RES Expansion law)	-	- YES (according federal RES Expansion law)	-	-	-

3.1 National targets for PV

In 2020 a new law (Renewable Energy Sources Expansion Act) was designed, which entered into force finally in July 2021. It sees a PV target of additional 11 TWh coming from PV until 2030. A “Transition-Scenario” developed mainly by the environment Agency Austria (Umweltbundesamt) on behalf of the ministry of climate action, shows 41 TWh as a target for PV, and 21 TWh until 2030 which is needed to reach climate neutrality by 2040. An Austrian national “integrated grid infrastructure plan” was published in April 2024.

The new targets means that an average annual installation rate of around 2 GW must be ensured until 2040. After 2023, the first year with just over two GW, developments to date in 2024 indicate that this 2 GW threshold could be achieved in 2024 as well.

3.2 Direct support policies for PV installations

The energy policy goal in Austria is set with 100% electricity from renewable energy sources by 2030 and climate neutrality by 2040. Currently - depending on the water, solar and wind situation - around 85-90% is covered by renewable generation due to the high proportion of hydropower and the contributions from wind and biomass as well as about 11% from photovoltaics; in the first 6 month of the year 2024 about 98% of the Austrian electricity was renewable, due to a record in wind and PV as well as a 2% reduction of the demand.

Historically, with the Renewable Energy Sources Expansion Act passed in summer 2021, the funding landscape in photovoltaics and electricity storage was significantly changed.

From 2022, either a market premium or the investment subsidy can be used to support a PV system. The market premium is the new subsidy for PV electricity fed into the grid and thus replaces the previously available feed-in tariff subsidy (current feed-in tariff contracts remain untouched).

The market premium is a premium on the reference market value (roughly comparable to the average electricity price traded on the market).

When submitting the application, the applicant must state the amount of the economically necessary electricity price of the PV system (this is done by means of a bid in the course of the general tendering round).

Funding applications are ranked according to the bid (registered electricity price in cent per kWh). The EAG subsidy processing centre must rank the admissible bids in ascending order according to the bid value, starting with the lowest bid value. If the bid value is the same, preference shall be given to the bid with the lower bid amount. If the bid value and the bid quantity are equal, the decision is made by lot, unless the order is not decisive for the award of the contract.

A monetary security (€5/kWp) must be deposited as part of the application process; a second security (€45/kWp) is also due upon acceptance of the contract. This security deposit can be made for several systems and for several bids together. If the PV system is not installed or not installed on time, the applicant loses the security (for systems < 100 kWp, a penalty of €50/kWp must be paid retroactively if the system is not installed or not installed on time).

The maximum value for the registered electricity price is specified by the legislator (determined by ordinance). Registered bids with a higher electricity price are invalid.

The market premium is paid out per month over a period of 20 years.

At least 2 tendering rounds with a total annual tendering volume of at least 700 MW take place annually.

Repayment of the additional revenue from electricity marketing is required for PV systems from 5 MWp.

The PV system must be connected to the Austrian public electricity grid, be remotely controllable in accordance with the technical and organisational rules pursuant to § 22 of the Energy Control Act and be equipped with a load profile meter or intelligent metering device.

The Investment-support is applicable to new PV systems/extensions up to 1,000 kWp as well as electricity storage up to 50 kWh (at least 0.5 kWh/kWp); The amount of the investment subsidy for PV systems varies with the size of the system. The amount of the investment subsidy for electricity storage is fixed. The minimum size of the electricity storage is linked to the performance of the PV system. Fixed subsidy amount only for PV systems up to 10 kWp. For PV systems from 10 kWp there is a maximum subsidy amount, which can be undercut by the applicant in order to be ranked higher in the ranking of the listed subsidy projects and thus the chance of to increase a grant.

In addition to further funding in the nine Austrian federal states, promotion of the climate and energy fund, which has existed for many years primarily for small systems and has supplemented the earlier feed-in tariff promotion; this was only available for systems > 5kWp, and continued in 2023. In total about 150.000 systems were supported by the energy and climate fund in 2023.

An investment subsidy for innovative photovoltaic systems from the Climate and Energy Fund (“PV-lighthouse projects”) was set up for the first time in 2021 and is intended to build bridges between research and the market and to initiate exemplary and model projects. A high degree of system integration and system usefulness and multiplicability are the goals of the funding. Through monitoring and reports, the knowledge gained should create a knowledge base for further innovative photovoltaic systems. Standard systems are not supported with this grant. A jury of experts selects projects with a high degree of innovation and reproducibility. A call was placed in late 2023 which finally led to ore than 30 projects with a high degree on innovation like alpine PV, PV-Parking and sound barriers, innovative system solutions including sector coupling solutions with the heating and cooling system.

3.2.1 BIPV development measures

There is just a 100 € bonus for BIPV in the investment support scheme of the climate and energyfund scheme. Other measures to support BIPV can be found in the research sector with some projects on BIPV as well as some activities of the Austrian PV technology platform (www.tppv.at) to support the development of BIPV.

With the new energy law (EAG) a 30% bonus on the support was introduced for “innovative PV applications” amongst them BIPV, Agro-PV and Floating PV.

With the lighthouse projects of innovative PV Systems mentioned above, the ministry of Climate Action, Environment, Energy, Mobility, Innovation and Technology supported innovative projects (BIPV and others) which are close to the market but still have significant finance needs.

The report: “Analysis of the Technological Innovation System for BIPV in Austria” was published recently: https://iea-pvps.org/wp-content/uploads/2024/09/IEA-PVPS-T15-21-2024-REPORT-Austria-TIS-BIPV.pdf

Self-consumption measures

Table 14: Summary of self-consumption regulations for small private PV systems in 2023

PV self-consumption	1	Right to self-consume	YES
	2	Revenues from self-consumed PV	Electricity bill savings
	3	Charges to finance Transmission, Distribution grids & Renewable Levies	NO, as long as beyond the meter; (Up to an amount of 25,000 kWh per year, the generation of electrical energy from renewable primary energy sources (e.g. photovoltaic systems) has already been exempt from the electricity tax, provided that this is not fed into the grid but is consumed by the user.) The 25.000 kWh threshold was removed completely in 2021, means no more electricity tax to be paid.
Excess PV electricity	4	Revenues from excess PV electricity injected into the grid	Yes, typically 3-13 €Cent depending on the offer of the utility/Energy service provider. However, this rate has decreased towards lower values, from 2024 on, most energy providers offer maximum 5-6 €Cent/kWh
	5	Maximum timeframe for compensation of fluxes	No
	6	Geographical compensation (virtual self-consumption or metering)	No
Other characteristics	7	Regulatory scheme duration	ongoing
	8	Third party ownership accepted	YES
	9	Grid codes and/or additional taxes/fees impacting the revenues of the prosumer	See above.
	10	Regulations on enablers of self-consumption (storage, DSM…)	None

	11	PV system size limitations	Not for PV, support for storage only up to 50kWh - for Balcony-PV systems there is a 800 W limit
	12	Electricity system limitations	Many, mainly due to overvoltage concerns and overheating of lines.
	13	Additional features	-

3.3 Collective self-consumption, community solar and similar measures

The collective use of PV electricity in a multifamily house within the individual apartments was enabled in 2018 by a new §16a at the Austrian ELWOG (Elektrizitätswirtschafts- und Organisationsgesetz); without using the public grid (and therefore no grid costs and taxes) collective-self consumption of PV electricity has been possible since 2018. With the Renewable Energy Sources Expansion Act, passed in summer 2021, collective self consumption by using the public grid is possible.

With the EAG regulations in 2021, energy communities, according to the European renewable energy directive and the electricity market directive was introduced in Austria.

With the new legal framework, it is possible for the first time for people to join forces and energy across property boundaries to produce, to store, consume and sell.

The new laws define two energy community models: the locally restricted “renewable energy community” (EEG) and the “citizen energy community” (BEG) which is geographically unrestricted within Austria. An EEG may generate, store, consume and sell energy (electricity, heat or gas) from renewable sources. EEGs use the grid operator's facilities (like the electricity grid), but they must always be located within the concession area of a single grid operator.

Renewable energy communities are limited to the “close area” defined by grid levels in the power grid. The participants in a local EEG are connected to each other within network levels 6 and 7 (low-voltage network). If network levels 4 (only the medium-voltage busbar in the substation) and 5 are also included, this is referred to as regional EEG.

Members or shareholders of EEGs can be private or legal persons, municipalities, local authorities or even SMEs. They must be located in the vicinity of the generating plant(s).

A lot is possible as an organizational form for EEGs, from associations to corporations, but the focus is on non-profit status. The main purpose of renewable energy communities is not financial gain, this must be enshrined in the statutes or result from the organizational form of the energy community.

Similar regulations apply to citizens energy communities (BEG). In contrast to the EEG, the BEG may only generate, store, consume and sell electrical energy. It is not limited to renewable sources and can extend over the concession areas of several network operators throughout Austria.

A National coordination office (“Österreichische Koordinationsstellefür Energiegemeinschaften” – www.energiegemeinschaften.gv.at) exclusively for energy communities, was introduced in May 2021 by the federal ministry of Climate Action,

Environment, Energy, Mobility, Innovation and Technology in order to reduce the barriers for the implementation of energy communities. In close partnership with all 9 public regional energy consulting services, this federal coordination office developed a lot of guidelines, information materials, videos as well as sample contracts; it also acts very successfully as a moderator between network operators, authorities, service providers and all other stakeholders of the energy community process. By mid of 2024 more than 2.000 energy communities are operational, many more are still under development, most of them are driven by municipalities, some between private persons or at small and medium industrial estates. About 500 of them are listed on a map, with contact data and description.

(https://energiegemeinschaften.gv.at/landkarte/)

3.4 Other utility-scale measures including floating and agricultural PV

Within the framework of the federal support programme on “lighthouse projects of innovative PV” several Agro PV and a few floating PV systems were financed. The largest floating PV system (24,5 MWp) was installed in 2022 in Grafenwörth, Lower Austria, with a production start in early 2023. A further Floating system was designed and built in 2022 in Styria and put into operation in summer 2023, producing about 700-800 MWh/a

3.5 Social Policies

No PV specific social policy in Austria, however some energy communities are specifically addressing social issues.

3.6 Indirect policy issues

3.6.1 Support for electricity storage and demand response measures

The support for electricity storage systems is described in 3.2, there is no support for demand response measures so far.

3.6.2 Other support measures

CO_2 pricing (“CO_2 tax”) is a key part of the eco-social tax reform that the Austrian government presented in October 2021. From October 1, 2022, CO_2 emissions will cost 30 euros per tonne. The introduction of the CO_2 price was originally planned for July 2022, but was postponed as part of a relief package to October 2022. The CO_2 price is to be increased year by year (2023: 35 euros, 2024: 45 euros) and gradually rise to 55 euros per ton by 2025. In the event of sharp changes in the price of energy, however, a so-called price stability mechanism can also lead to a slower or faster increase in the price of CO_2. to compensate for the additional burdens mentioned and to avoid social hardship a climate bonus payment was introduced in 2022. For the entire calendar year 2022 and 2023, the climate bonus was paid out in the form of vouchers or direct transfer to an account known to the tax authorities. The high inflation was the reason for the one-off payment of 500 euros in 2022, which was made up of the increased climate bonus (250 euros) and the anti-inflation bonus (250 euros). In 2023, the regional climate bonus

was paid out in its originally planned version with regional differentiation and differentiated according to place of residence. All natural persons who have registered their main residence in Austria for at least 6 months (183 days) in 2023 received the climate bonus. The basic amount for all people in Austria is 110 euros. The regional equalisation takes regional differences into account and varies between €40, €75 or €110 depending on where you live.

Financing and cost of support measures

The Renewable Energy Sources Act provides for a collection mechanism which, in addition to the flat rate for the promotion of renewables (formerly the green electricity flat rate – “Erneuerbaren Förderpauschale”), consists of a percentage surcharge on the grid utilisation fee and the grid loss fee as well as costs for the guarantees of origin (Herkunftsnachweise).

The “Erneuerbaren Förderpauschale” was set to zero (for 2022 and 2023), since the income from the marketing of the subsidised green electricity exceeds the exceed the subsidy requirement. The burden on a typical household for financing green electricity in Austria, which amounted to around €100 per year in the years up to 2021, was thus reduced to zero in 2022 (and 2023). (E-Control-Monitoring report 2023)

4 INDUSTRY

4.1 Production of feedstocks, ingots and wafers (crystalline silicon industry)

Silicon feedstock, ingot and wafer producer's production information for 2023

There is no Silicon, ingot and wafer production in Austria.

4.2 Production of photovoltaic cells and modules (including TF and CPV)

Module manufacturing is defined as the industry where the process of the production of PV modules (the encapsulation) is done. A company may also be involved in the production of ingots, wafers or the processing of cells, in addition to fabricating the modules with frames, junction boxes etc. The manufacturing of modules may only be counted to a country if the encapsulation takes place in that country.

Total PV cell and module manufacture together with production capacity information is summarised in Table below.

Table 15: PV cell and module production and production capacity information for 2023

PV-Module manufacturer (total national production)	Technology	Total Production [MW]		Maximum production capacity [MW/yr]	
		Cell	Module	Cell	Module
Wafer-based PV manufactures					
Total	Si-Modules	**0**	**152 MW**	**0**	**n.a.**

In 2023, in Austria photovoltaic modules with a total of 152 MW_{peak} were produced. Of this, 89,9 MW_{peak} were exported, which is one export rate of about 60%. The share of domestic production in the domestic market fell mainly due to the total increase of PV power installations in 2023 compared to the previous year to 2,4 % (2021: 14 %, 2022: 9,5%).

In 2023, a few manufacturers of PV Modules are operational in Austria: Sonnenkraft/Kioto Photovoltaics GmbH, Energetica-Photovoltaic industries (closed down in 2023), DAS Energy Ltd. as well as Ertex-Solartechnik GmbH and MGT Esys; Sunplugged, as a start-up, develops flexible photovoltaic modules for integration into building envelopes, devices and vehicles. Sunplugged's core product is a solar film that can be individually cut to size and is based on CIGS (copper indium gallium selenide) semiconductors.

4.3 Manufacturers and suppliers of other components

Most of the relevant manufacturers are partner of the Austrian PV-Technology Platform. (www.tppv.at)

Amongst them are:

- Fronius: There is significant PV inverter production in Austria, 5,397 GW of production was reported for 2023. Beside inverters, Fronius offers a wide spectrum of PV-Energy management solutions.
- Aerocompact is a manufacturer of smart mounting solutions
- SolOcean GmbH is a technology company and deals with the development and marketing of an innovative system for generating electrical energy using photovoltaics on water surfaces.
- Ulbrich of Austria Ulbrich is a world leader in PV Ribbon products that interconnect and transmit current for crystalline solar cells and thin film.
- Welser Profile is a leading manufacturer of special profiles, profile tubes and complete profile systems made of steel, stainless steel and non-ferrous metals. On average, up to 5 new solutions leave the Welser works per day and are used reliably in the PV and solar industries, in agricultural and environmental technology, as well as in the construction industry.
- Lenzing Plastics GmbH & Co KG is the world's leading manufacturer of products based on polyolefins and fluoropolymers. Lenzing Plastics has presented a Coloured photovoltaic encapsulation film in late 2022.
- Eder-Blechbau is a specialist for Solar Facade systems as well as for PV carports
- CALMA-TEC Lärmschutzsysteme GmbH produces and supplies PV-powered noise protection wall modules for roads, railways and industrial plants.
- ATB-Becker e.U. stands for the development of PV application technologies since 1987.
- Neoom provides innovative electricity systems from photovoltaic systems to electricity storage and charging stations as well as various platforms for intelligent energy management, including energy communities.
- Prefa provides integrated solar roof solutions

Above mentioned companies are working together in the Austrian PV Technology platform.

Some more manufacturers and supplies of PV related equipment and technology exist in Austria, Levion for energy management solutions, STO for PV Façade system, HEI Technology International GmbH, MY-PV Solar electronic, etc…

Recently a publication by the federal ministry of Climate Action, Environment, Energy, Mobility, Technology and Innovation highlighted the Austrian PV industry and research.

https://nachhaltigwirtschaften.at/resources/nw_pdf/photovoltaic-industry-and-research-in-austria.pdf

5 PV IN THE ECONOMY

5.1 Labour places

Table 16: Estimated PV-related full-time labour places in 2023

Market category	Number of full-time labour places
Research and development (not including companies)	525
Manufacturing of products throughout the PV value chain from feedstock to systems, including company R&D	1527
Distributors of PV products and installations	10931
Other	-
Total	**12.983**

Source: Innovative Energietechnologien in Österreich – Marktentwicklung 2023, Biermayr et al., Austrian ministry of Climate Action, Environment, Energy, Mobility, Innovation and Technology 2024

5.2 Business value

To calculate the total revenue generated by the installation of complete PV systems in Austria, the average system price for fully installed 5 kW_{peak} PV systems in 2023 was used, it can be assumed that almost 100 % of newly installed PV systems in Austria in 2023 were installed by domestic PV planners and installers. The calculated total turnover of Austrian PV planners and installers thus amounts to approx. 4,344.8 million euros for 2023.

Revenues from the sale of PV electricity in Austria in 2023:

Revenues from the sale of electricity by PV system operators totalled over EUR 1,300.95 million in 2023. For this estimate, the PV systems installed in Austria were divided into three categories:

- (1) Category 1 includes all systems that receive a feed-in tariff under the Green Electricity Act. These systems have a total capacity of 574.8 MW_{peak}.

- (2) Category 2 includes all stand-alone PV systems with a total capacity of 9.7 MW_{peak} at the end of 2023.

- (3) Category 3 includes all grid-connected systems that do not receive a feed-in tariff under the Green Electricity Act. At the end of 2023, their installed capacity totalled 5,810.3 MW_{peak}; these so-called surplus feeders consume part of the PV electricity generated themselves, while electricity that is not consumed is fed into the public grid and remunerated accordingly.

Table 17: Rough estimation of the value of the PV business in 2023 (VAT is excluded)

Sub-market	Capacity installed	Average price [€/kWh]	Value
Off-grid	9,7 MW	0,3	2,9 Mio. €/a
Grid-connected distributed and centralized	6,4 GW 6,4 TWh	0,05….0,1	320 Mio. €….640 Mio. €

6 INTEREST FROM ELECTRICITY STAKEHOLDERS

6.1 Structure of the electricity system

Austria has one Transmission system operator (Austrian Power Grid-APG) and more than 120 Distribution network operators. The balancing energy market in Austria is mainly determined by pumped storage power plants and gas-fired power plants. There are currently 16 natural gas power plants in Austria and 3,4 GW power made by pump hydro storages powerplants. E-Control is the regulatory authority in Austria responsible for the electricity and gas industry. The TSO and the larger DSO's are mainly owned by the federal od regional governments. Many smaller are private companies owned by industry or private persons. Unbundling is by law foreseen, however, several interdependencies between network operator and their former joint energy provider and generator-company still exist; this situation is strictly controlled by the regulatory authority in order not to influence the market competition.

Interest from electricity utility businesses

There are a lot of activities by utilities in the PV sector. Many of them have founded own daughter companies for their renewable energy projects and services. From planning and installing of private and commercial PV systems up to citizens participation in PV powerplant projects. Many larger utilities own and operate smaller to medium PV power plants up to the 10 MW range. Some larger ones are in the installation phase. (e.g. a 160 MW system in the east of the country).

Most larger energy suppliers offer the planning and installation of PV systems for private and business customers, usually in conjunction with feed-in tariffs and current or new power purchase agreements.

Interest from municipalities and local governments

In Austria, the most important decisions regarding the commissioning of PV systems are the responsibility of the federal states. Even if the national targets are now ambitious - 21 TWh by 2030 and 41 TWh by 2040 - these must now be realised at state level. However, most of the official state targets are still significantly lower than the PV targets for Austria, which have been allocated to the federal states.

With its solar power offensive (Wiener Sonnenstrom-Offensive), the City of Vienna has taken an important step towards optimal use of the potential in its urban areas.

In general, priority is given to utilisation on already built-up areas (buildings and other infrastructure), but it is clear that the targets can only be achieved through expansion on open spaces as well. Ground mounted PV-Power plants should generally contribute to increased biodiversity and/or be operated in combination with agriculture.

A showcase example for strategic planning is the district of Freistadt in Upper Austria (67,000 inhabitants, 1,000 km²), where a “PV on open space strategy” was developed in two years of work in consensus with all relevant stakeholders, which should lead to more electricity being generated locally together with wind power in 2040 than is needed, as the neighbouring urban area of the provincial capital Linz is also to be supplied partially out of this region. A regional energy co-operative is to ensure that most of the plants are built and operated cooperatively.

The PV Association Austria solar has initiated a website showing the targets and the achieved systems in all of the nine provinces of Austria. This is valuable since most of the laws and regulations for PV systems, (Building codes, Environmental laws, electricity laws, spatial planning, etc…) are regional legislation. https://pvaustria.at/bundeslaender/

7 HIGHLIGHTS AND PROSPECTS

7.1 Highlights

In any case, the highlight in 2023 was the 2,6 GW installation which is with 289 W/capita one of the highest or even the highest value any (European) country has seen so far.

This was associated with an enormous boost in orders for the local industry, most of them originating from 2022, but built in 2023. The geo-political crises of the years 2022 and 2023 leading to extreme energy prices were responsible for the increased awareness of energy and the fact that many people and entrepreneurs decided to purchase a PV system. It seems that the 2023 might be recorded at a one times high for quite a long time.

The fact that the fall in energy prices has in turn significantly slowed down this development shows that this price shock has by no means triggered a sustainable development. Special efforts need to be made to build a sustainable national 2 GW market, which is needed in order to fulfil the national 41 TWh target for 2040.

7.2 Prospects

PV Grid integration

One of the main hurdles to further expansion is the question of PV's capacity to be absorbed by the electricity grids and/or efficiently used by the energy system. More and more times of negative electricity prices at PV peak times show the need to come up with new solutions.

It is increasingly becoming standard practice for electricity grid operators to set limits on the maximum feed-in, which are justified by the fact that violations of the voltage band could occur at times of maximum feed-in. Regarding the timeline of PV, it is clear that these times are only extremely short (frequently some hours or even minutes per year) and that the grid is not utilised at many times according to its potential due to this fixed curtailment. Real-time knowledge of the conditions in the electricity distribution grids is the basis for better utilisation of the electricity grids, as is already being implemented in Australia, for example, with the “flexible PV export” model.

A boost for local energy management

Further grid expansion is necessary in any case, not only for PV but also for E-mobility, heat pumps and other industrial electricity applications, but local load management should be promoted on a large scale, especially as the absorption of all electricity peaks from PV leads to economic disproportionality. Due to low or negative prices on the electricity exchange at times of high PV irradiation, it is clear that the value of the electricity traded at these times is becoming less and less, especially as the times of high PV generation in Austria are synchronised with the times of high generation in neighbouring countries, which are expanding PV to the same extent. Local load management (storage, utilisation of flexibilities of all kinds) should therefore be given absolute priority and should go hand in hand with the grid extension efforts.

The role of PV in the context of the overall energy transition and the interplay with wind and other RE, storage technologies and other flexibilities

PV is more and more seen as the key for the energy transition. Even in Austria with its quite high share of hydropower, PV might finally contribute by more than a third to the national electricity production (>30% of electricity and > 20% of total energy demand according to the Austrian integrated grid infrastructure plan). The collaboration of PV with all other RES-generation, specifically wind power plants, with storage and other flexibilities might become crucial for the energy transition. The use of flexibilities even on the household level (E-charging, heat-Pumps, home-storages) as well as on the industrial area due to electrification of processes should become a priority. Flexible energy process and flexible grid prices are amongst the solutions which should be considered carefully.

The question of social acceptance and the commitment of citizens:

Even if the political goals have now been set (in Austria: climate neutrality by 2040), implementation is taking place on a broad scale in the regions. This requires the corresponding knowledge of local stakeholders and the broad acceptance of the population.
Local targets and removal of barriers in the commissioning processes are crucial.
The BMK's "Reallabore" programmes and a lot of other research initiatives are working on the local implementation throughout Austria, other initiatives like the “Freistadt- PV-Strategy” (see chapter 6) are also paving the way towards a local energy transition.

PV Industry and research

Austria would like to play an active role in this ongoing strategy to rebuild a continuous and strong European PV value chain. To this end, the connection to EU initiatives to rebuild strong European production must be strengthened. Research and innovation are seen as the key aspects that are required to increase the production of photovoltaic components in Europe and Austria. Modules and systems for special applications (building integration, alpine PV, etc.) as well as PV components with increased sustainability and recyclability should be developed in international cooperation. The Austrian research community in the PV sector is well positioned internationally. Following on from these developments, support systems should be set up to make these new PV applications quickly marketable.
Austria has discussed the introduction of an EU-Bonus for PV Components predominantly produced in Europa, which was finally endorsed by the Austrian parliament in July 2024.