IEA INTERNATIONAL ENERGY AGENCY

Task 1 Strategic PV Analysis and Outreach

PVPS

National Survey Report of PV Power Applications in Austria 2019

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PHOTOVOLTAIC POWER SYSTEMS
TECHNOLOGY COLLABORATION PROGRAMME

Cover picture:

PV Roofgarden at University of Natural Resources and Life Sciences (BOKU) Vienna, Austria; Engineered by ATB Becker, PV-Modules, by Ertex-Solar.

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 IEA carries out a comprehensive programme of energy cooperation among its 30 member countries and with the participation of the European Commission. The IEA Photovoltaic Power Systems Programme (IEA PVPS) is one of the collaborative research and development agreements (technology collaboration programmes) 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. This report has been prepared under Task 1, which deals with market and industry analysis, strategic research and facilitates the exchange and dissemination of information arising from the overall IEA PVPS Programme.

The IEA PVPS participating countries are Australia, Austria, Belgium, Canada, Chile, China, Denmark, Finland, France, Germany, Israel, Italy, Japan, Korea, Malaysia, Mexico, Morocco, the Netherlands, Norway, Portugal, South Africa, Spain, Sweden, Switzerland, Thailand, Turkey, and the United States of America. The European Commission, Solar Power Europe, the Smart Electric Power Alliance (SEPA), the Solar Energy Industries Association and the Copper Alliance are also members.

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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 country National Survey Report for the year 2019. Information from this document will be used as input to the annual Trends in photovoltaic applications report.

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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 2019 statistics if the PV modules were installed and connected to the grid between 1 January and 31 December 2019, although commissioning may have taken place at a later date.

1.1 Applications for Photovoltaics

After the already very high proportion of on-roof installation has risen continuously in recent years, it fell significantly in 2019 to 87.07% (2018: 95.87%) based on the newly installed PV output. In return, with a share of 7.26% (2018: 3.17%), the share of ground-mounted PV systems in the total newly installed capacity increased significantly (+130%). This is followed by facade (0.41%) and roof-integrated systems (2.99%). While the proportion of facade-integrated systems continued to decrease in 2019, the proportion of roof-integrated PV systems increased significantly, even though on a low absolute level (2018: 0.35%). One reason for the growth in self-sufficient systems is the ever more diverse applications for self-sufficient small and very small PV systems, such as B. balcony panels, individual PV modules in traffic engineering or small solar kits for well pumps and garden houses, which, however, are often not sold through the PV planners and installers. This means that a survey of this group is only possible to a limited extent, which means that the feedback from the PV planners and installers will be combined with an expert estimate for the first time this year.

1.2 Total photovoltaic power installed

Table 1: Annual PV power installed during calendar year 2019.

		Installed PV capacity in 2019 [MW]	AC or DC
PV capacity	Off-grid	0,5	DC
	Decentralized	228,3 (BIPV: 8,3)	DC
	Centralized	18,1	DC
	Total	246,9	DC

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)

Table 2: Data collection process.

Is the collection process done by an official body or a private company/Association?	By an academic consortium on behalf of the ministry of climate action
Link to official statistics (if this exists)	https://nachhaltigwirtschaften.at/de/iea/publikationen/schriftenreihe-2019-20-marktentwicklung-innovative-energietechnologien-2018.php#downloads

Table 3: The cumulative installed PV power in 4 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	338	**187**	n.a.	**525**
1993	423	**346**	n.a.	**769**
1994	590	**453**	n.a.	**1043**
1995	755	**586**	n.a.	**1341**
1996	888	**831**	n.a.	**1719**
1997	992	**1196**	n.a.	**2188**
1998	1193	**1648**	n.a.	**2841**
1999	1393	**2189**	n.a.	**3582**
2000	1649	**3219**	n.a.	**4868**
2001	1835	**4263**	n.a.	**6098**
2002	1962	**8357**	n.a.	**10319**
2003	2131	**14660**	n.a.	**16791**
2004	2645	**18415**	n.a.	**21060**
2005	2895	**21126**	n.a.	**24021**
2006	3169	**22416**	n.a.	**25585**
2007	3224	**24477**	n.a.	**27701**
2008	3357	**29030**	n.a.	**32387**
2009	3605	**48991**	n.a.	**52596**
2010	3812	**91686**	n.a.	**95498**
2011	4502	**182670**	n.a.	**187172**
2012	4722	**358163**	n.a.	**362885**
2013	5190	**620784**	n.a.	**625974**
2014	5489	**779757**	n.a.	**785246**
2015	5535	**931563**	n.a.	**937098**
2016	6487	**1089529**	n.a.	**1096016**
2017	6963	**1262008**	n.a.	**1268971**
2018	7197	**1447927**	8	**1455132**
2019	7697	**1694377,4**	18,6	**1702093**

Table 4: PV power and the broader national energy market.

	2018 numbers	2019 numbers
Total power generation capacities [GW]	21 GW	22 GW
Total renewable power generation capacities (including hydropower) [GW]	>14 GW	> 16 GW (Wind 3,1 GW Biomass 0,65 GW PV 1,7GW Hydro storage 3,1 GW Run of river 8,2 GW)
Total electricity demand [TWh]	71.902 TWh	72.621 TWh
Total energy demand [TWh]	1,424 PJ/395 TWh	1,453 PJ/404 TWh.
New power generation capacities installed in 2019 [GW]	1GW	0,3 GW
New renewable power generation capacities installed in 2019 (Wind, PV) [GW]	0,42 GW	2 GW
Estimated total PV electricity production (including self-consumed PV electricity) in [TWh]	1,47 TWh	1,79 TWh
Total PV electricity production as a % of total electricity consumption	2	2,5

1.3 Key enablers of PV development

Table 5: Information on key enablers.

	Description	Annual Volume	Total Volume	Source
Residential Heat Pumps [#]	-	39138	325000	Austrian market statistics, Innovative Energietechnologien in Österreich Marktentwicklung 2019
Electric cars [#]	Battery electric	8693	29.523	Bundesverband Elektromobilität Österreich
Electric buses and trucks [#]	-		<100	est.
Other	One battery driven Train			https://noe.orf.at/stories/3014768/

2 COMPETITIVENESS OF PV ELECTRICITY

2.1 Module prices

Table 6: Typical module prices for a number of years. (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
2011	1350	n.a.	1446
2012	810	n.a.	943
2013	650	n.a.	746
2014	600	n.a.	671
2015	570	n.a.	600
2016	510	n.a.	610
2017	480	n.a.	508
2018	440	n.a.	466
2019	420	n.a.	447

Highest prices are not given, since they occur at glass-glass modules for Building integration with costs depending sometimes on architectural requests and can be up to 5 times and more of the cost of a standard. The minimum price that has been achieved in 2019 was from an imported module

2.2 System prices

Table7: Turnkey PV system prices of different typical PV systems.

Category/Size	Typical applications and brief details	Current prices [€/W]
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.	2,036
Residential BAPV 5-10 kW	Grid-connected, roof-mounted, distributed PV systems installed to produce electricity to grid-connected households. Typically roof-mounted systems on villas and single-family homes.	1,56
Residential BIPV 5-10 kW	Grid-connected, building integrated, distributed PV systems installed to produce electricity to grid-connected households. Typically, on villas and single-family homes.	> 2
Small commercial BAPV 10-100 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.	1,19
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.	> 2
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.	0,8 (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.	0,75 (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.	0,7 (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.

The figures reported in the table above are an average price out of 13-24 samples for each category. Prices for larger systems are estimations.
Some smaller kits available in hardware stores at comparable prices (modules and inverter)
As far as ground-mounted installations are concerned, the regulatory framework under which the above-mentioned prices have been encountered is the feed in tariff, first larger systems without subsidies are reported.

Table 8: National trends in system prices for different applications

Year	Residential BAPV Grid-connected, roof-mounted, distributed PV system 5-10 kW **[€/W]**	Small commercial BAPV Grid-connected, roof-mounted, distributed PV systems 10-100 kW **[€/W]**	Large commercial BAPV Grid-connected, roof-mounted, distributed PV systems 100-250 kW **[€/W]**	Small centralized PV Grid-connected, ground-mounted, centralized PV systems 10-20 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	1,27	0,9 (est.)	n.a.
2019	1560	1,19	0,8 (est.)	n.a.

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 2019 is presented in Table 9 and 10, respectively.

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 29 and 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 2: Cost breakdown for a grid-connected roof-mounted, distributed residential PV system of 5-10 kW.

Cost category	Average [€/W]	Low [€/W]	High [€/W]
Hardware			
Module	0,594		
Inverter	0,28		
Mounting material	0,3		
Other electronics (cables, etc.)	0,1		
Subtotal Hardware	1,274		
Soft costs			

Planning	0,046		
Installation work	0,15		
Shipping and travel expenses to customer	0		
Permits and commissioning (i.e. cost for electrician, etc.)	0,05		
Project margin	0,05		
Subtotal Soft costs	0,296	0,9…2,0 (excl. VAT)	
Total (excluding VAT)	1,57		
Average VAT	0,2		
Total (including VAT)	1,884		

2.4 Financial Parameters and specific financing programs

Table 10: PV financing information in 2019.

Different market segments	Loan rate [%]
Average rate of loans – residential installations	1,5-2
Average rate of loans – commercial installations	1
Average cost of capital – industrial and ground-mounted installations	1

2.5 Specific investments programs

Table 11: Summary of existing investment schemes.

Investment Schemes	Introduced in Austria
Third party ownership (no investment)	Available
Renting	available
Leasing	available
Financing through utilities	citizen PV power plants
Investment in PV plants against free electricity	not available
Crowd funding (investment in PV plants)	available
Community solar	Not yet available
International organization financing	not available
Other (please specify)	-

2.6 Additional Country information

Table 12: Country information.

Retail electricity prices for a household [€/W]	18-24 €Cent/kWh			
Retail electricity prices for a commercial company [€/W]	10-19 €Cent/kWh			
Retail electricity prices for an industrial company [€/W]	10-13 €Cent/kWh			
Population at the end of 2019	8,8 Mio.			
Country size [km^2]	84.000			
Average PV yield in [kWh/kW]	1050			
Name of major electric utilities		Electricity production [%]	Share of grid Subscribers [%]	Number of retail customers [%]
	Verbund			
	Wienenergie			

	EVN			
	Energie AG			
	Kelag			
	TIWAG			
	VKW			
	BEWAG			
	Salzburg AG			
	Energie Steiermark			

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.

Table13: Summary of PV support measures.

	On-going measures in 2019 – Residential	Measures introduced in 2019– Residential	On-going measures in 2019 – Commercial + Industrial	Measures introduced in 2019 – Commercial + Industrial	On-going measures in 2019 – Centralized	Measures introduced in 2019 – Centralized
Feed-in tariffs	yes		yes		yes	
Feed-in premium (above market price)						
Capital subsidies	yes		yes		yes	
Green certificates						
Renewable portfolio standards (RPS) with/without PV requirements						
Income tax credits						
Self-consumption						
Net-metering						
Net-billing						
Collective self-consumption and virtual net-metering						
Commercial bank activities e.g. green mortgages promoting PV						
Activities of electricity utility businesses	yes		yes		yes	
Sustainable building requirements	yes		yes		yes	
BIPV incentives						
Other						

3.1 National targets for PV

The target for PV installation fixed in the green electricity act from 2012 was 1.200 MW in 2020. This number was reached already some years earlier. In 2020 the new energy law is under negotiations with an official target of +11TWh until 2030. This might correspond to an additional installation of about 11 GW between 2020 and 2030.

3.2 Direct support policies for PV installations

3.2.1 Description of support measures

In 2019, a wide variety of funding conditions continued to exist in the federal states and also at the federal level. Above all, the green electricity feed-in subsidy for PV systems with an output of more than 5 kWpeak, which is carried out by the office for green electricity (OeMAG), continues to be associated with discontinuity in terms of time and, due to the limited subsidies, with a high degree of uncertainty regarding a grant promise . The following funding options exist:

• Investment grants from the federal states

• Investment support from the Climate and Energy Fund (KLIEN)

Processing: Kommunalkredit Public Consulting (KPC)

• Investment support for PV systems and electricity storage (§ 27a ÖSG 2012)

Processing: Processing center for Ökostrom AG (OeMAG)

• Federal states and KLIEN co-financing

• Green electricity feed-in funding (ÖSG 2012) Processing center for Ökostrom AG (OeMAG)

In addition, PV systems were subsidized in Carinthia, Lower Austria, Upper Austria, Salzburg and Styria through housing subsidies. Since 2018, as an alternative to tariff funding, there has also been the option of applying for investment funding in accordance with Section 27a for photovoltaic systems and electricity storage. The annual funding volume is EUR 36 million, with EUR 24 million primarily earmarked for the construction or expansion of photovoltaic systems with a bottleneck capacity of up to 500 kWpeak.

Feed-in Tariff:

The green electricity tariff promotion applies to newly installed PV systems with an output greater than 5 kWpeak. Subsidized plants enter into a contractual relationship with the settlement agency for Ökostrom AG (OeMAG). According to the change in the Green Electricity Feed-In Tariff Ordinance 2018 (ÖSET-VO 2017), issued on December 22, 2017), the following feed-in tariffs were issued for plants that have been in a contractual relationship with OeMAG from 2019:

• € 7.67 cents / kWh for systems with a bottleneck capacity of over 5 kWpeak to 200 kWpeak, which are only attached to or on a building

In addition to the further reduced feed-in tariff, an additional investment grant for the construction of 30% of the construction costs, up to a maximum of EUR 250 / kWpeak, will be granted for photovoltaic systems with a bottleneck capacity of over 5 kWpeak to 200 kWpeak that are only attached to or on a building granted. As in previous years, freestanding systems were no longer subsidized in the course of tariff funding.

Investment support:

The submission process for the photovoltaic promotion campaign "Photovoltaic systems" of the Climate and Energy Fund was again based on the same principle in 2019 as in 2018. Construction-ready projects could be submitted from March to November 2019 on an ongoing basis. The completion and final billing of the PV system had to take place within 12 weeks from the time of the first registration. The funding volume was reduced from EUR 4.5 million in 2018 to EUR 4.3 million, but was subsequently increased several times. The amount of investment support was reduced slightly and in 2019 was EUR 250 per kWpeak and EUR 350 per kWpeak for building-integrated PV systems. There was no restriction on the size of the photovoltaic system, but funding was limited to a maximum of 5 kWpeak. In addition to individual systems, "community systems" up to 50 kWpeak could also be submitted for funding (funding EUR 250 per kWpeak or EUR 350 per kWpeak for building-integrated PV systems).

In addition, the climate and energy fund also established agricultural and forestry operations (funding campaign: photovoltaic systems in agriculture and forestry) and various facilities (e.g. public buildings) in climate and energy model regions (funding campaign: KEM - photovoltaic systems) supported in the construction of a PV system with a bottleneck capacity between 5 kWpeak and 50 kWpeak (agriculture and forestry) or 150 kWpeak (KEM). The amount of investment support for farmers was EUR 275 or EUR 375 (building integrated) per kWpeak. PV systems in the climate and energy model regions were supported with EUR 375, - or EUR 475, - for building-integrated solutions per kWpeak.

3.3 BIPV development measures

By promoting photovoltaic systems up to a maximum of 5 kWp, the climate and energy fund wants to create attractive incentives for environmentally and climate-friendly electricity supply. Community facilities continue to be funded.

As in the previous year, in addition to individual systems, this year's promotional campaign also includes community facilities that are used by at least two residential or business units. Natural and legal persons can submit. A maximum of 5 kW of a system is funded per application. The funding is paid in the form of a one-off investment grant. The subsidy for free-standing systems / rooftop systems is 250 euros / kW and for building-integrated systems 350 euros / kW.

3.4 Self-consumption measures

Table 3: Summary of self-consumption regulations for small private PV systems in 2019

PV self-consumption	1	Right to self-consume	Yes
	2	Revenues from self-consumed PV	Avoided electricity from the grid
	3	Charges to finance Transmission, Distribution grids & Renewable Levies	not for self-consumed electricity (tax was cancelled in 2019)
Excess PV electricity	4	Revenues from excess PV electricity injected into the grid	market price 3-4 €Cent/kwh
	5	Maximum timeframe for compensation of fluxes	n.a.
	6	Geographical compensation (virtual self-consumption or metering)	n.a.
Other characteristics	7	Regulatory scheme duration	
	8	Third party ownership accepted	yes
	9	Grid codes and/or additional taxes/fees impacting the revenues of the prosumer	cancelled in 2019
	10	Regulations on enablers of self-consumption (storage, DSM…)	no
	11	PV system size limitations	no

	12	Electricity system limitations	no
	13	Additional features	no

3.4.1 Description of support measures

No specific support measures for self-consumption; in contrary, the self-consumption benefits result in the fact that the roofs are not fully covered, but only to the extent that self-consumption is optimised.

3.5 Collective self-consumption, community solar and similar measures

"The community generating plant generates electrical energy to cover the consumption of the participating beneficiaries '. The 'participating beneficiary' is a legal or natural person or a registered partnership that is assigned to a community generating plant with its consumption system. Through the joint construction and operation of such a system, formerly pure electricity consumers can generate electricity together, use the generated electricity themselves and thus supply themselves to a certain extent. Insofar as the participating parties consume the electricity generated themselves, they save energy costs, network charges and taxes that would be incurred if the electricity were obtained from the network. The excess PV electricity can be stored as heat instead of being fed into the grid. Otherwise the self-consumption increases additionally. The joint construction and operation of such a system results in a higher self-consumption quota and thus faster amortization.

Collective self-consumption was introduced in Austria 2017 (§16a of the ELWOG-law) and mainly dedicated to PV on multifamily buildings; there are various effects why this model is not yet successful; smart meter installations and their data acquisition is mentioned frequently as well as the bureaucracy of the implementation. Moreover, it is frequently not seen as a sufficient financial benefit by the users.

3.6 Tenders, auctions & similar schemes

Not available in 2019 in Austria

3.7 Other utility-scale measures including floating and agricultural PV

A 22,5,kWp PV AGRO System with 60 vertical bifacial PV-Modules was opened in Oktober 2019 on a agricultural area close to Vienna. The project will be supervised by the University of agriculture BOKU in Vienna.

3.8 Social Policies

There are several PV for schools/kindergarden initiat***i***ves, however, they a***d***dress mainly the aspect of awareness raising. Example Upper Austria: State funding program for photovoltaic systems in Upper Austria's kindergartens. The funding program supported the construction of photovoltaic systems on Upper Austria. Kindergartens: In addition to the construction of photovoltaic systems, the topics of green electricity and saving electricity became a focus in kindergarten. As part of the funding program, 200 Upper Austrian Kindergartens become sun kindergartens! Grid-connected photovoltaic systems with a power of 0.5 to 3 kWpeak, based on upper Kindergartens were built with a maximum of 1,500 euros / kWp.

Example Lower Austria: PV for Schools and Kindergardens Short facts: Funding applicant: community & community association, school community; Delivery head: max. 25% of the eligible costs for investments up to € 100,000; Annuity grant, 7% for a fictitious loan over 15 years with an investment of over € 100,000; In addition to the insulation and construction of solar thermal systems, the State of Lower Austria supports communities from the Lower Austria School and

Kindergarten Fund with up to 25% of the costs, the construction of photovoltaic systems for new buildings and renovations of schools and kindergartens.

3.9 Indirect policy issues

3.9.1 Rural electrification measures

Nearly all regions are electrified, specific support schemes for alpine shelter, and isolated applications are available. For grid connected systems in the agriculture sector here is another support scheme:

Funding campaign 2018-2020: NEW: Extension of the program duration and extension to support electricity storage from 16.09.2019. As part of a limited-time promotional campaign, photovoltaic systems with or without electricity storage are supported by agricultural and forestry businesses with an output greater than 5 kWpeak and up to a maximum output of 50 kWpeak.

3.9.2 Support for electricity storage and demand response measures

There was a support for decentral private home storage systems in 2019: The generous capping of the maximum storage capacity (up to 10 kilowatt hours of storage capacity per kilowatt peak of photovoltaics is encouraged) makes it possible for a few very large storage facilities to make particularly heavy demands on the budget. The entire funding budget (6 million euros) was called up within 46 seconds. This is about twice as fast as in the first round of funding in 2018. The level of resentment in the industry is correspondingly great - after all, several thousand applicants tried to apply for financial support for an electricity storage system within a few minutes. According to the funding agency OeMAG, particularly large storage projects with several megawatts were applied for this year compared to the previous year, which skim off a large funding budget, which is a reason for emptying the funding pool in record time.

3.9.3 Support for electric vehicles (and VIPV)

The purchase of an electric car will be supported with 4,000 euros. It makes no difference whether the car is purely powered by batteries or equipped with a hydrogen fuel cell. Subsidized is only the purchase of electric cars for private use, which cost no more than 50,000 euros. For enterprises, municipalities and associations, the upper limit was set at 60,000 **€** acquisition value. Two regions (lower Austria and Styria) provide additional support up to 1.000 €. This support is only given, if the user can prove its electricity to be 100% renewable, either form own systems (PV) or by any electricity provider which is certified as 100% renewable only.

3.9.4 Other support measures

Since there was a change in politics in 2019 to a Conservative - Green Coalition Government, many promoting aspects are under discussion. Amongst them a CO_2 tax. The official target of having 100% renewable electricity (balance) in 2030 drives all decisions in energy politics. Moreover, there is a target to reach "climate neutrality" in 2040.

3.10 Financing and cost of support measures

FIT is financed by the electricity consumers by an additional rate to their bill. The so called green electricity subsidy (“Ökostromabgabe”) is the first financing component of the green electricity subsidy system. It is redefined annually by regulation.

The eco-electricity subsidy is a uniform percentage premium on the Network Use (NNE) and Network Loss Fee (NVE). Currently a typical consumer household pays about 80 € per year for this green electricity subsidy.

4 INDUSTRY

4.1 Production of photovoltaic modules

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 2019.

Module manufacturer	Technology	Total Production [MW]	
		Cell	Module
Wafer-based PV manufactures			
Ertex-Solar	sc-Si, Mc-Si		
Kioto	sc-Si, Mc-Si		
Energetica	sc-Si, Mc-Si		
DAS-Energy	sc-Si, Mc-Si		
MGT-Esys	sc-Si, Mc-Si		
TOTAL:			126

Detailed values for each company are not public. In Austria, in 2019 there was no production site for ingots, wafer and/or cells.

4.2 Manufacturers and suppliers of other components

Austria's capacity in PV inverter production is about 3,5 GW. Further expertise of Austrian companies lies in the development of high performance concepts for the production of solar glass, solar storages, switches and other electrical equipment.

Some of these companies are working together in the Austrian Technology Platform Photovoltaics, which is a joint initiative for Austrian manufacturing operations in the photovoltaics sector and all the relevant Austrian research institutes. The aim is to optimise innovation and research activities to benefit the domestic photovoltaics sector and to help increase the share of the market held by Austrian PV-related technology and service providers.

(www.tppv.at)

• Fronius – Solar Inverter Manufacturer since 1992,

• Ulbrich of Austria is a Burgenland-based technology company that produces high-quality cells and edge connectors for the interconnection of photovoltaic solar modules.

• Welser Profile is the leading manufacturer of special profiles, profile tubes and complete

profile systems made of steel, stainless steel and non-ferrous metals.

• Planseewerke: In the solar industry Plansee supplies sputtering targets for the following technologies: CIGS (copper, indium, gallium, sulfur / selenium), CdTe (cadmium telluride), CSP (Concentrated Solar Power);As coating materials, this materials are performance-critical components for thin-film photovoltaics and solar thermal energy.

Further PV related production:

• LEBAU Partnernetzwerk & Bau GmbH,

• Phoenix Contact,

• Lapp Cables

• Gebauer & Griller Kabelwerke Gesellschaft m.b.H.

• Startups: Crystalsol, Sunplugged

5 PV IN THE ECONOMY

This chapter aims to provide information on the benefits of PV for the economy.

5.1 Labour places

Table16: Estimated PV-related full-time labour places in 2019

Market category	Number of full-time labour places
Research and development (not including companies)	514
Manufacturing of products throughout the PV value chain from feedstock to systems, including company R&D	1008
Distributors of PV products	included in installation
System and installation companies	1227
Electricity utility businesses and government	n.a.
Other	n.a.
Total	2749

5.2 Business value

Value of PV business in 201*9 in Austria: 387 Mio.€*

6 INTEREST FROM ELECTRICITY STAKEHOLDERS

6.1 Structure of the electricity system

Since the full liberalization in 2001 the Austrian electricity market operates within a framework that consists of the relevant legislation at EU (Electricity Directive 2009/72/EC), Austrian (Electricity Act – ELWOG Elektrizitätswirtschafts- und organisationsgesetz) and provincial level (e.g. the Vienna Electricity Act - Wiener Elektrizitätswirtschaftsgesetz).

During the course of the liberalization, a number of great technical and organisational changes resulted for market participants. First of all, the operation of the grids was separated from competitive activities, such as generation, wholesale and retail, which means an unbundling of the vertically integrated electricity utilities in Austria. Furthermore so-called balance groups were introduced to enable consumers, generators, suppliers and wholesalers to trade or conclude deals with each other. Whoever takes electricity off the grid, feeds in or trades must be member of a balance group. The E-Control is the politically and financially independent regulator of the Austrian Electricity market. The main tasks are to strengthen competition and ensure that this does not compromise security of supply and sustainability.

At the end of 2014 about 140 distribution system operators (DSO) existed in Austria. These distribution system operators are responsible for secure grid operation, for metering and for handling and processing grid user.

6.2 Interest from electricity utility businesses

Many electricity utilities started public participation models for PV, others are selling PV systems or do both. The electric cars development might further push PV, since many utilities offer EV services, install charging stations; the direct link to the use of electricity out of renewables is visible. Nearly all larger utilities are meanwhile promoting PV for private houses, industries or multifamily solutions. Because of the ambitious governmental plans to add another 11 GW to the existing 1,7 GW until 2030, many electricity companies are currently planning very large PV Systems in the multi-MW range.

6.3 Interest from municipalities and local governments

Municipalities and local governments are mainly the most effective drivers for the PV development beside the federal support schemes. From 2014 almost all provinces offered support in form of investment subsidies in addition to the federal incentives. Salzburg, Styria, Tyrol and Vienna offer a separate support scheme for PV.

Other (Burgenland, Carinthia, Lower Austria, Upper Austria, Styria and Salzburg) offers additional funding by the subsidized housing scheme. Only in Vorarlberg and Lower Austria no regional support was available in 2015. Since 2014 decentralized electricity storages in combination with PV systems are supported in some provinces.

7 HIGHLIGHTS AND PROSPECTS

7.1 Highlights

Highlight in PV policy in 2019 was the concrete discussion on adding another 11 TWh PV to the electricity portfolio in Austria. Along with this fact, the way, how and which PV systems should be predominantly installed is still open. There are discussion to foster the building integration and integration on all further sealed areas - like parking slots, bridges, noise barriers etc... Competition with the food production and PV on green fields are discussed controversial, due to the limited space in Austria compared to other countries. Concerning production, a 1 GW factory for PV modules was announced (Energetica). A 2,7 MW PV system at the production site will care for an environmental friendly production.

7.2 Prospects

The goal of the Federal Government to generate 100% electricity from renewables by 2030 can only be achieved if the current expansion rates are at least quadrupled. In order for PV to cover around 15% of Austria's electricity consumption in 2030 (assuming an increase of 20% compared to 2016), annual expansion rates of around 600 rising to more than 1000 MWp annually from 2020 on, would be required.

The photovoltaic technology roadmaps of the Ministry from 2016 and 2018 outlines the fundamental development perspective of photovoltaics, which can be made possible if the framework conditions are adapted accordingly. It is no longer predominantly a question of cost that leaves the actual development behind the roadmap paths but framework conditions: The self-consumption levy or obviously reducible bureaucratic barriers such as plant permits, recalls, lack of targets for PV obligations in new construction and renovation. Another open point is the lack of opportunity to use neighbourhood solutions for own electricity optimizations. The energy community schemes starting in 2021 might ease this problem by creating larger areas for self-consume; Funding will continue to play an important role, but simple application and processing as well as long-term predictability are a necessary prerequisite, which unfortunately hardly represents the practice.

Other easy-to-manage models of support include suspending VAT until it reaches a certain amount of installation (eg, 10 GW) or other tax breaks.

Currently, the roadmap paths are only compatible with the now official expansion OBJECTIVES, but the reality far from the necessary factor 4 to 6. The annual addition has reached a new peak with about 250 MW in 2019, however, the required jump increase is currently visible and might be reachable only by very large PV Systems. The Renewable Energy-Expansion Act, which is foreseen to replace the Green Electricity Act in 2020, will enter into force in 2021.

The technological goals of the roadmap, such as a stronger focus in Austria on building integrated photovoltaics (BIPV) are currently only at a low level continued, new applications like AGRO PV, and PV in the mobility sector (carports/parking slots/noise barriers) are in its state of infancy.