IEA INTERNATIONAL ENERGY AGENCY

Task 1 Strategic PV Analysis and Outreach

National Survey Report of PV Power Applications in Austria 2018

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PVPS

PHOTOVOLTAIC POWER SYSTEMS
TECHNOLOGY COLLABORATION PROGRAMME

Cover picture:

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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 2018. Information from this document will be used as input to the annual Trends in photovoltaic applications report.

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DISCLAIMER:

Data for non-IEA PVPS countries are provided by official contacts or experts in the relevant countries.
Data are valid at the date of publication and should be considered as estimates in several countries due to the publication date.

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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 2018 statistics if the PV modules were installed and connected to the grid between 1 January and 31 December 2018, although commissioning may have taken place at a later date.

1.1 Applications for Photovoltaics

The main market segments in Austria are on-grid residential PV as well as commercial PV systems on industrial halls and properties.

Rooftop installation are dominating by far with 95.9% of all installations related to the installed power capacity; With a share of 3.2% (2017: 3.4%) the proportion of ground-mounted PV systems fell again in 2018. Behind follow with great distance facade (0.6%) and roof integrated systems (0.3%). Projects and prototypes for Floating and Agricultural PV are under development; however, no significant installations existed in 2018.

1.2 Total photovoltaic power installed

The market development of photovoltaics (PV) for the year 2018 in Austria was analysed and documented on the basis of data from investment subsidies of the federal states and the Austrian climate and energy fund (handled by Kommunalkredit Public Consulting GesmbH) as well as the feed-in subsidies handled by the OeMAG settlement office for Ökostrom AG. In addition, data reports from Austrian companies in the field of photovoltaics, which contributed to the PV market in Austria in 2018 were collected and analysed. Moreover, producers of PV modules, plant designers and installers and manufacturers of inverters and additional PV components were consulted.

Due to the inclusion of photovoltaics in the Austrian Electricity Statistics Regulation 2016 of the BMWFW (Federal Law Gazette II No. 17/2016), since 2016 all Austrian Network operator are obliged to report the installed PV power in their networks to the Austrian Regulator, E-Control.

Results are however each available only in the 3rd or 4th quarter of the following year, making a comparison only available for the respective previous year.

Table 1: Annual PV power installed during calendar year 2018.

		Installed PV capacity in 2018 [MW]	AC or DC
PV capacity	Off-grid	0,212	DC
	Decentralized	168,3	-
	Centralized (> 2MW)	-	-
	Total	168,5	DC

Table 2: PV power installed during calendar year 2018.

			Installed PV capacity in 2018 [MW]	Installed PV capacity in 2018 [MW]	AC or DC
Grid-connected	BAPV	Residential	161,5	-	DC
		Commercial		-	DC
		Industrial		-	DC
	BIPV	Residential	1,5	-	DC
		Commercial		-	DC
		Industrial		-	DC
	Utility-scale	Ground-mounted	5,3	5,3	DC
		Floating		-	-
		Agricultural		-	-
Off-grid		Residential	0,2	-	-
		Other		-	-
		Hybrid systems		-	-
Total			168,5		DC

Table 3: Data collection process.

If data are reported in AC, please mention a conversion coefficient to estimate DC installations.	-
Is the collection process done by an official body or a private company/Association?	Data Collection is done by the University AS Technikum Vienna on behalf of the Austrian ministry of Transport Innovation and Technology
Link to official statistics (if this exists)	https://nachhaltigwirtschaften.at/resources/iea_pdf/schriftenreihe-2019-20-marktstatistik-2018-bf.pdf
	Since there is a check with the data from the regulator, which gets data from the grid operators, the accuracy seems to be within a +/- 5% range.

Table 4: 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	-	**525**
1993	423	346	-	**769**
1994	610	453	-	**1.063**
1995	722	569	70	**1.361**
1996	908	761	70	**1.739**
1997	960	1.178	70	**2.208**
1998	1.213	1.648	70	**2.861**
1999	1.413	2.119	140	**3.672**
2000	1.671	3.063	140	**4.874**
2001	1.857	4.440	241	**6.120**
2002	1.984	7.857	476	**10.341**
2003	2.173	13.507	1.153	**16.833**
2004	2.645	17.262	1.153	**21.060**
2005	2.895	19.973	1.153	**24.021**
2006	3.169	21.263	1.153	**25.585**
2007	3.224	23.721	1.756	**27.701**
2008	3.357	27.274	1.756	**32.387**
2009	3.605	48.991	N/A	**52.596**
2010	3.812	91.686	N/A	**95.498**
2011	4.502	182.670	N/A	**187.172**
2012	4.722	258.163	N/A	**362.885**
2013	5.190	620.784	N/A	**625.974**
2014	5.498	779.757	N/A	**785.250**
2015	5.535	931.563	N/A	**937.098**
2016	6.487	1.089.529	N/A	**1.096.016**
2017	6.954	1.262.046	N/A	**1.269.000**
2018	7.175	1.430.466	N/A	**1.437.641**

Table 5: Other PV market information.

	2018 Numbers
Number of PV systems in operation in your country	115.397 (data from Dec 31 2017)
Capacity of decommissioned PV systems during the year [MW]	No decommissioned systems reported
Capacity of repowered PV systems during the year [MW]	-
Total capacity connected to the low voltage distribution grid [MW]	-
Total capacity connected to the medium voltage distribution grid [MW]	-
Total capacity connected to the high voltage transmission grid [MW]	0 MW

Table 6: PV power and the broader national energy market.

	2017 numbers	2018 numbers
Total power generation capacities [GW]	~ 21 GW	~ 21 GW
Total renewable power generation capacities (including hydropower) [GW]	>10 GW	>10 GW Wind 3 GW Biomass 0,5 GW PV 1,4 GW Hydro storage 2,4 GW Run of river 5,6 GW Source: https://www.apg.at/de/markt/Markttransparenz/erzeugung/installierte-leistung
Total electricity demand [TWh]	65 TWh (2016)	66 TWh (estd.)
Total energy demand [TWh]	1.456 PJ	n.a.
New power generation capacities installed in 2018 [GW]	< 1 GW	< 1 GW
New renewable power generation capacities installed in 2018 (including hydropower) [GW]	196 MW Wind 173 MW PV	230 MW Wind 168 MW PV
Estimated total PV electricity production (including self-consumed PV electricity)	1,27 TWh	1,44 TWh
Total PV electricity production as a % of total electricity consumption	2,1	2,4

1.3 Key enablers of PV development

Table 7: Information on key enablers.

	Description	Annual Volume	Total Volume	Source
Decentralized storage systems [#]	Federal support for PV – storage systems		6.000	
Residential Heat Pumps [#]		39.181	320.000	https://nachhaltigwirtschaften.at/resources/iea_pdf/reports/marktstatistik-2018-endbericht.pdf
Electric cars [#]	Federal support for Electric cars	~7.000	25.000	
Electric buses and trucks [#]		Single projects		
Other	-	-	-	

2 COMPETITIVENESS OF PV ELECTRICITY

2.1 Module prices

Table 8: Typical module prices for a number of years. (Excluding 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			1.45 1.40
2012			0,94 0,85
2013			0,75 0,64
2014			0,67 0,60
2015			0,60 0,56
2016			0,61 0,59
2017			0,51 0,48
2018			0,47

2.2 System prices

Table 9: Turnkey PV system prices of different typical PV systems.(excluding VAT)

Category/Size	Typical applications and brief details	Current prices [€/W]
Residential BAPV 5-10 kW	For a 5 kWp System per kWp	1.567
Small commercial BAPV 10-100 kW	For a system > 10 kWp per kWp	1.267
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.	~ 1.000 (estimation)
Industrial BAPV >250 kW	No data available since support scheme is limited to 200kWp systems	n.a.
Small centralized PV 1-20 MW	No data available	n.a.
Large centralized PV >20 MW	No systems > 20 MW installed	n.a.

Table 10: 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	3.680	N/A	N/A	N/A
2011	2.970	N/A	N/A	N/A
2012	2.216	N/A	N/A	N/A
2013	1.934	N/A	N/A	N/A
2014	1.752	N/A	N/A	N/A
2015	1.658	N/A	N/A	N/A
2016	1.645	N/A	N/A	N/A
2017	1.621	N/A	N/A	N/A
2018	1.567	1.267	1.000*	N/A

*Expert Estimation

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 2018 is presented in Table 11 and **Erreur ! Source du renvoi introuvable.**, 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 11 and **Erreur ! Source du renvoi introuvable.** 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 11: 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	614		
Inverter	283		
Mounting material andOther electronics (cables, etc.)	333		
Subtotal Hardware			
Soft costs			
Planning, Installation, Shipping and travel expenses to customer Installation work, Permits and commissioning (i.e. cost for electrician, etc.) Project margin	338		
Total (excluding VAT)	**1.568**	**1.170……2.000**	
Average VAT	20%		
Total (including VAT)	**1.882**		

2.4 Financial Parameters and specific financing programs

Table 12: PV financing information in 2018.

Different market segments	Loan rate [%]
Average rate of loans – residential installations	4
Average rate of loans – commercial installations	3
Average cost of capital – industrial and ground-mounted installations	

2.5 Specific investments programs

Table 13: Summary of existing investment schemes.

Investment Schemes	Introduced in Austria
Third party ownership (no investment)	Y
Renting	Y
Leasing	Y
Financing through utilities	Y
Investment in PV plants against free electricity	No
Crowd funding (investment in PV plants)	Y
Community solar	Y
International organization financing	No
Other (please specify)	-

2.6 Additional Country information

Table 14: Country information.

Retail electricity prices for a household [€/W]	16-24 €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 2018	8.8 Mio.			
Country size [km²]	84.000 km²			
Average PV yield in [kWh/kW]	1.000 – 1.050			
Name and market share of major electric utilities		Electricity production [%]	Share of grid Subscribers [%]	Number of retail customers [%]
	Wienenergie	~ 10 %	25 %	>2 Mio.
	Verbund	8,2 GW		
	…			
	…			

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 15: Summary of PV support measures.

	On-going measures in 2018 – Residential	Measures introduced in 2018 – Residential	On-going measures in 2018 – Commercial + Industrial	Measures introduced in 2018 – Commercial + Industrial	On-going measures in 2018 – Centralized	Measures introduced in 2018 – Centralized
Feed-in tariffs	Yes (>5kWp)	-	Yes	-	< 200kWp	-
Feed-in premium (above market price)	-	-	-	-	-	-
Capital subsidies	Yes (additional to FIT for >5kWp and exclusively for <5kWp)	-	Yes		-	-
Green certificates	-	-	-	-	-	-
Renewable portfolio standards (RPS) with/without PV requirements	-	-	-	-	-	-
Income tax credits	-	-	-	-	-	-
Self-consumption	Tax > 25.000kWh/ a	-	- Tax > 25.000kWh/ a	-	Tax > 25.000kWh/ a -	-
Net-metering	-	-	-	-	-	-
Net-billing	-	-	-	-	-	-
Collective self-consumption and virtual net-metering	First demos-	-	-	-	-	-
Commercial bank activities e.g. green mortgages promoting PV	-	-	-	-	-	-
Activities of electricity utility businesses	Yes, various-	-	-	-	-	-
Sustainable building requirements	Yes	Yes	Yes	Yes	Yes	Yes
BIPV incentives	Yes. 100 € Bonus-	-	-	-	-	-
Other (specify)	-	-	-	-	-	-

3.1 National targets for PV

Since 2018 there exists for the first time an official government target of 100% green electricity by 2030. Out of that, PV targets were derived leading to additional 12-15 GW PV (from currently 1.4 GW) until 2030.

3.2 Direct support policies for PV installations

- The feed-in-tariff system is designed only for systems larger than 5 kWp; Feed-in Tariff is provided via the national green-electricity act; The "new *RES"* are supported by this act mainly via up to 13 years guaranteed feed-in tariffs; the annual cap, which started with 50 Mio. € in 2012 is reduced every year by one million; Photovoltaic gets 8 Mio. € out of that. The feed-in-tariffs are stated by the federal Ministry for Economics and financed by a supplementary charge on the net-price and a fixed price purchase obligation for electricity traders. For 2018 the tariff was set with 7,91 €Cent/kWh for PV at buildings and no incentive for PV on open landscape; an additional 250 € subsidy per kWp (or 30% of total invest cost) was offered.
- About 4,6 MEUR were dedicated to PV investment support for small systems up to 5 kWp in 2018 by the Austrian "Climate and Energy Fund". This additional support scheme has existed since 2008 and is well-co-ordinated with the feed-in scheme. With 275 EUR per kWp for roof-top systems and 375 EUR per kWp for building integrated systems, the support per kWp was the same as in 2017. This support has led to about 3 600 new PV systems with a total capacity of 20,2 MWp in 2018.
- For the fourth time, there was an additional offer for the agricultural sector – systems from 5 kWp to 50 kWp, owned by farmers, obtained the same incentive per kWp (275/375 EUR) as other private owners, which might have led to approx. 4,3 MWp installed in 2018. Regions that participate in the Programme "Climate and Energy Pilot Regions" are eligible to receive funding for PV installations that are in special "public interest". In 2018, 50 PV installations were funded with 0,53 MEUR. In total, 1,4 MW were submitted.
- Besides that, some provinces provide PV support budgets as well, amongst them very specific support e.g. only for municipal buildings or for tracked PV systems.
- In 2018 there was an invest support for systems up to 500kWp available. 9 Mio € were provided. For systems up to 100kWp the support was 250 €/kWp, for larger systems up to 500 kWp 200 €/kWp.

Feed-in tariffs from 2009 to 2017 according to the Feed-in Decree

(€C/kWh)	2010	2011	2012	2013	2014	2015	2016	2017	2018
up to 5 kWpeak	-	-	-	-					
above 5 kWpeak up to 10 (20) kWpeak	35 – 38	35 – 38	23 – 27.6						
above 10 (20) kWpeak	25 – 33	25 – 33	19 – 25						
above 5 kWpeak up to 500 kWpeak				16.59 – 18.12					
above 5 kWpeak up to 350 kWpeak					10.00 (open landscape)- 12.50 (PV on buildings)				
above 5 kWpeak up to 200 kWpeak						11.50 18.00 No suppNo support for PV on open landscape	8.24 No support for PV on open landscape	8.24 No support for PV on open landscape	7.91 + 250 € per kWp No support for PV on open landscape

3.2.1 BIPV development measures

Only for residential systems < 5kWp there is a 100 € bonus for BIPV systems.

3.3 Self-consumption measures

Table 16: Summary of self-consumption regulations for small private PV systems in 2018.

PV self-consumption	1	Right to self-consume	Yes
	2	Revenues from self-consumed PV	No
	3	Charges to finance Transmission, Distribution grids & Renewable Levies	Tax of 1,5 €Cent for self consumed PV in systems producing more than 25.000 kWh/a
Excess PV electricity	4	Revenues from excess PV electricity injected into the grid	If systems under the FIT 7,91€Cent/kwh – if not: energy market price
	5	Maximum timeframe for compensation of fluxes	-
	6	Geographical compensation (virtual self-consumption or metering)	-
Other characteristics	7	Regulatory scheme duration	-
	8	Third party ownership accepted	Y
	9	Grid codes and/or additional taxes/fees impacting the revenues of the prosumer	Tax of 1,5 €Cent for self consumed PV in systems producing more than 25.000 kWh/a
	10	Regulations on enablers of self-consumption (storage, DSM…)	-
	11	PV system size limitations	For subsidies: 200 kWp
	12	Electricity system limitations	-
	13	Additional features	-

3.4 Collective self-consumption, community solar and similar measures

In 2017, the national regulation concerning interconnection to the low voltage was changed in order to enable the distribution of PV electricity in multifamily houses. (ELWOG-Law). Since then, a lot of models were discussed and first sites are realised.
In several apartment blocks in "Viertel Zwei" in Vienna, more than 100 consumers generate their own photovoltaic energy (100kWp PV plant) and share the solar energy with their neighbours. Storage and e-charging points will be added by the end of the year 2019. Not even consumed kilowatt hours should be sold in the distant future on the power exchange. However, the legal framework is still missing, because the EU Clean Energy Package ("winter package") has not yet been transposed into national law.

At Wien Energie, it is assumed that the participants - as in the classic model "PV in multi-family dwellings" - can cover about one third of their annual electricity requirement from their own generation and cover up to another third from the Energy Community, depending on the availability of one Quartier memory. The aim of the research project at the Krieau is to determine whether these assumptions actually apply.

3.5 Tenders, auctions & similar schemes

The Austrian eco electricity law, introduced 2002 will be replaced in 2020 by a “renewable extension law” (Erneuerbaren Ausbaugesetz); political discussions since mid 2018 clearly indicate, that a tendering system for PV plants > 500kWp will be introduced.

3.6 Other utility-scale measures including floating and agricultural PV

No demos so far, some internal discussions to prepare first demos.

3.7 Social Policies

No PV policy with social aspects.

3.8 Retrospective measures applied to PV

No retrospective measures.

3.9 Indirect policy issues

3.9.1 Rural electrification measures

The Austrian Federal Ministry of Agriculture, Forestry, Environment and Water Management supports renewable energy systems (e.g. PV, wind power, storages, etc.) in areas not connected to the grid with an investment subsidy up to a maximum of 35 % of the eligible costs.

3.9.2 Support for electricity storage and demand response measures

After some years of support mechanism by provinces since 2014, in 2018 for the first time a storage support was introduced for PV homestorage systems. 6 Mio. € were available, only 11% of the applications could be granted due to the big interest of consumers. Support rate was up to 500€/kWh.

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 euro 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 Curtailment policies

No curtailment policy in Austria

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 80 € per year for this green electricity subsidy.

4 INDUSTRY

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

N/A – no 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 17: PV cell and module production and production capacity information for 2018.

Cell/Module manufacturer	Technology (sc-Si, mc-Si, a-Si, CdTe, CIGS)	Total Production [MW]		Maximum production capacity [MW/yr]	
		Cell	Module	Cell	Module
Wafer-based PV manufactures					
1 Ertex-Solar	sc-Si, mc-Si	-	X	-	-
2 Kioto/PVP	sc-Si, mc-Si	-	X	-	-
3 DAS Energy	sc-Si, mc-Si	-	X	-	-
4 MGT-esys	sc-Si, mc-Si	-	X	-	-
5 Energetica	sc-Si, mc-Si	-	X	-	-
Total			*132 MW*	-	
Thin film manufacturers					
No Manufactory		x	x	y	y
Cells for concentration					
No Manufactory		g		h	
Totals		**-**	**132**	**-**	**-**

4.3 Manufacturers and suppliers of other components

Austria's capacity in PV inverter production is about 2 GW. The export rate is about 93%. 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 supplys 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,
- Gebauer & Griller Kabelwerke Gesellschaft m.b.H.
- Levion
- 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

Table 18: Estimated PV-related full-time labour places in 2018

Market category	Number of full-time labour places
Research and development (not including companies)	549
Manufacturing of products throughout the PV value chain from feedstock to systems, including company R&D	138
System and installation companies, Distributors	865
Electricity utility businesses and government	N/A
Other - Inverterproducers	927
Total	**2.478**

5.2 Business value

Table 19: Rough estimation of the value of the PV business in 2018 (VAT is excluded).

Sub-market	Capacity installed in 2018 [MW]	Average price [€/W]	Value	Sub-market
Off-grid	0,2	1.567€/kWp	0,31	
Grid-connected distributed/centralized	168	1.567 €/MWp	263 Mio.€	
Value of PV business in 2018 (installation)				263,3 Mio.€

Not regarded: PV production, which was exported.

6 INTEREST FROM ELECTRICITY STAKEHOLDERS

6.1 Structure of the electricity system

Since the fully 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

Already in 2014 and 2015 some Austrian DSOs announced that PV has reached a critical penetration in some network segments, mainly rural weak grids. This question of PV grid integration becomes an important national enabler for Smart Grids Technologies and systems in Austria.
As already mentioned, some electricity utilities started public participation models for PV, others are selling PV systems. 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.

6.3 Interest from municipalities and local governments

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

The highlight in 2018 was the formal announcement of the 100% renewable electricity target by the federal government. Further capacities in renewable electricity production are mainly in the field of wind (currently 11%) and photovoltaics, since the main pillar of renewable generation in Austria, hydropower is close to its limits. Bioenergy (currently about 6% of the Austrian electricity demand) has some potential as well, however all relevant scenarios see PV as the main source of additional electricity generation. 12-15 TWh of additional generation needs to be installed until 2030, which means 4-6 times the installation rated of the previous years.

A concept for achieving this challenging target was immediately prepared jointly by the federal PV Association PV Austria together with the Austrian PV technology platform.

In terms of industry, highlight in 2018 was the announcement of the Carinthian company Energetica to establish a GW factory within the next two years. This would be an important step to develop again a significant PV module production to Europe.

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 MWp from 2017 would be required.

The photovoltaic technology roadmap of the BMVIT 2016 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. 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. The annual addition has settled in recent years, well below 200 MWpeak, the required jump increase is currently not expected. The Renewable Energy-Expansion Act, which is to replace the Green Electricity Act in 2020, cannot be expected to approximate such a development according to the current state of design.

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, reduced research funding for technological developments in photovoltaics, but currently speak against a successful international positioning in this promising niche.