IEA INTERNATIONAL ENERGY AGENCY

Task 1 Strategic PV Analysis and Outreach

PVPS

National Survey Report of PV Power Applications in Norway 2018

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PHOTOVOLTAIC POWER SYSTEMS
TECHNOLOGY COLLABORATION PROGRAMME

Cover picture:

Solenergi Fusen AS

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:

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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

PV systems are predominantly installed on residential and commercial buildings for self-consumption.

1.2 Total photovoltaic power installed

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

		Installed PV capacity in 2018 [MW]	AC or DC
PV capacity	Off-grid	(Partly included in Decentralized)	
	Decentralized	23,5 MW	DC
	Centralized		
	Total	23,5 MW	DC

It is not possible to obtain reliable numbers for small off-grid installations, but the capacity of such installations is minor compared to grid connected systems. The data are collected by Øystein Holm, Multiconsult for Solenergiklyngen, and they are estimates based on completed larger projects and import statistics for PV panels.

Table 2: PV power and the broader national energy market.

	2017 numbers	2018 numbers
Total power generation capacities [GW]	33,8	34,7
Total renewable power generation capacities (including hydropower) [GW]	33,1	34,0
Total electricity demand [TWh]	132,9	135,4
Total energy demand [TWh]		
New power generation capacities installed in 2018 [GW]		0,93*
New renewable power generation capacities installed in 2018 (including hydropower) [GW]		0,93*
Estimated total PV electricity production (including self-consumed PV electricity) in [GWh]	40	60
Total PV electricity production as a % of total electricity consumption	0,03%	0,04%

*PV not included.

The data are from The Norwegian Water Resources and Energy Directorate. It is important to note that the total electricity production was 145,7 TWh in 2018 (down from 148,2 TWh in

2017), where the surplus was exported. The year-to-year variation in electricity production is related to variations in precipitation and other hydrological factors.

2 COMPETITIVENESS OF PV ELECTRICITY

Due the limited size of the Norwegian PV market, the companies that act in the market do not disclose market data for competitive reasons.

A full view of electricity production and distribution in Norway is provided by The Norwegian Water Resources and Energy Directorate (https://www.nve.no/english/). Electricity production in Norway is predominantly hydropower, with very low variable production costs compared to any other energy source.

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 3: 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	-	-	-	-	-	-
Feed-in premium (above market price)	-	-	-	-	-	-
Capital subsidies	Yes	-	-	-	-	-
Green certificates	-	-	Yes	-	-	-
Renewable portfolio standards (RPS) with/without PV requirements	-	-	-	-	-	-
Income tax credits	-	-	-	-	-	-
Self-consumption	Yes	-	-	-	-	-
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	-	-	-	-	-	-
Sustainable building requirements	-	-	-	-	-	-

BIPV incentives	-	-	-	-	-	-

3.1 National targets for PV

Norway has no defined goals when it comes to implementation of PV technology. The electricity certificate market is technology neutral, and it is only relevant for hydropower, wind power, and PV installations on commercial rooftops.

3.2 Direct support policies for PV installations

The public agency Enova SF subsidizes up to 35% of the installation costs for grid connected residential PV systems at a rate of 10 000 NOK per installation and 1250 NOK per installed kW maximum capacity up to 15 kW. In 2018 the programme was extended to also incorporate leisure homes with grid connection. However, buildings with multiple residential units are in general excluded from using this support scheme.

3.3 Self-consumption measures

Table 4: 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	
	3	Charges to finance Transmission, Distribution grids & Renewable Levies	
Excess PV electricity	4	Revenues from excess PV electricity injected into the grid	Yes
	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	
	9	Grid codes and/or additional taxes/fees impacting the revenues of the prosumer	
	10	Regulations on enablers of self-consumption (storage, DSM…)	
	11	PV system size limitations	
	12	Electricity system limitations	Yes
	13	Additional features	

Excess PV electricity injected into the grid is normally compensated with the net retail rate for electricity. A system registered in this category is not allowed to exceed 100 kW injection into the grid. Owners of systems that exceed this limit need to register as electricity producers.

3.4 Indirect policy issues

3.4.1 Support for electric vehicles (and VIPV)

Norway has an extensive and very effective set of incentives for electric vehicles and charging facilities, but there are no links between these incentives and PV. The transition from fossil fuels to electric energy in the transportation sector increases the domestic demand for electricity. Long term this may indirectly stimulate PV investments.

4 INDUSTRY

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

Table 5: Silicon feedstock, ingot and wafer producer's production information for 2018.

Manufacturers	Process & technology	Total Production	Product destination	Price
REC Solar Norway	Silicon feedstock [Tonnes]	8000	Withheld	Withheld
Norsun Norwegian Crystals	sc-Si ingots. [Tonnes]	Withheld	Withheld	Withheld
REC Solar Norway	mc-Si ingots [Tonnes]	Withheld	Withheld	Withheld
Norsun	sc-Si wafers [MW]	400	Withheld	Withheld

REC Solar has production facilities in Singapore and Norway.

4.2 Manufacturers and suppliers of other components

There are companies in the electrotechnical sector that has significant production of battery systems, but these activities are not specifically aimed at storage of electricity generated by PV systems.

There are also companies that supply software for operations and maintenance planning of renewable energy production systems, including solar parks.

Finally, there is one company, Scatec Solar, that has large scale activities in worldwide development of solar parks.

5 PV IN THE ECONOMY

5.1 Employment

The manufacturing sector (feedstock and other materials, ingots and wafers) has approximately 800 employees. Due to varying business models the employment figures related to installation activities cannot be estimated accurately. E.g. some dedicated PV project development companies procure installation services from general electro-technical contractors, while some general electro-technical enterprises have PV installation work as a part of their offer to the market.

5.2 Business value

There are at present no accurate estimates for the PV installation sector in Norway but based on the turnover of the larger companies it can be estimated that it exceeded NOK 200 million in 2018. This estimate is also reasonable compared to the installation volume of 23 MW.

6 INTEREST FROM ELECTRICITY STAKEHOLDERS

6.1 Structure of the electricity system

The electricity sector is regulated by The Norwegian Water Resources and Energy Directorate.

Norway has a competitive electricity market with respect to producers and retailers, while grid operators are required to be neutral. Transmission fees are subject to regulations decided by The Norwegian Water Resources and Energy Directorate.

6.2 Interest from electricity utility businesses

Companies operating in the Norwegian electricity market need not be utilities in the historical sense. Many companies have origins in previous utilities, while others do not have such connections. Independently of this, companies may have residential PV as a major or supplementary offer to consumers/prosumers. Business models associated with this are continuously being developed.

With Norwegian climatic conditions and electricity generation costs, it is not foreseen that large-scale PV plants connected to the transmission grid can be economically feasible.

6.3 Interest from municipalities and local governments

There are already many examples of municipalities that have included PV as a part of the energy system in public buildings. Some municipalities, including the capital Oslo, are establishing policies for increasing PV installations in new and existing public buildings.

7 HIGHLIGHTS AND PROSPECTS

7.1 Highlights

2018 was a year with good organic growth in PV installations in Norway, but the total volume of installations is still low. PV continues to gain acceptance as an important part of energy efficient buildings.

7.2 Prospects

The Norwegian PV market is expected to continue its growth, but it is limited by the fact that use of PV in practice is limited to self-consumption. If the concept of self-consumption could be extended to consumption in neighbourhoods, the growth rate may increase. On the other side, future growth would be threatened by the introduction of possible new grid fees that are unfavourable for variable consumption and production.