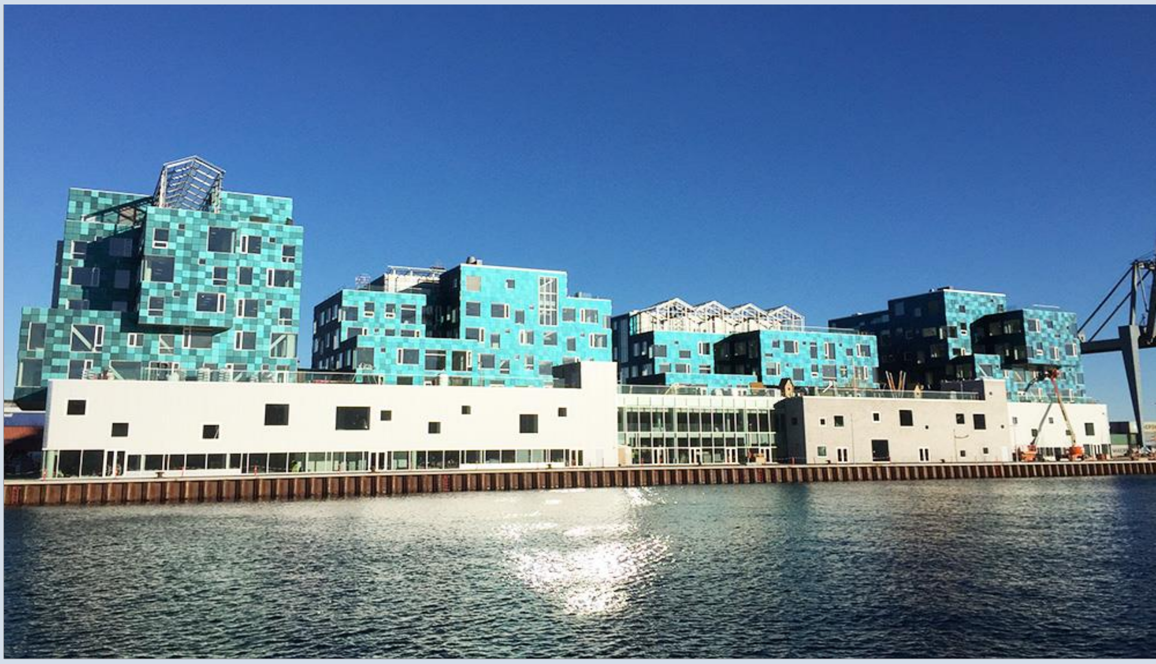
IEA INTERNATIONAL ENERGY AGENCY

National Survey Report of PV Power Applications in Denmark

2016



PHOTOVOLTAIC
POWER SYSTEMS
PROGRAMME

PVPS

Prepared by

Peter Ahm, PA Energy Ltd., Denmark

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Foreword

The International Energy Agency (IEA), founded in November 1974, is an autonomous body within the framework of the Organisation for Economic Co-operation and Development (OECD) which carries out a comprehensive programme of energy co-operation among its member countries

The IEA Photovoltaic Power Systems Technology Collaboration Programme (IEA-PVPS) is one of the collaborative R & D agreements established within the IEA and, since 1993, its participants have been conducting a variety of joint projects in the applications of photovoltaic conversion of solar energy into electricity.

The participating countries and organisations can be found on the www.iea-pvps.org website.

The overall programme is headed by an Executive Committee composed of one representative from each participating country or organization, while the management of individual Tasks (research projects / activity areas) is the responsibility of Operating Agents. Information about the active and completed tasks can be found on the IEA-PVPS website www.iea-pvps.org

Introduction

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 2015. Information from this document will be used as input to the annual Trends in photovoltaic applications report.

The PVPS website www.iea-pvps.org also plays an important role in disseminating information arising from the programme, including national information.

1 INSTALLATION DATA

The PV power system 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 2016 statistics if the PV modules were <u>installed and connected to the grid</u> between 1 January and 31 December 2016, although commissioning may have taken place at a later date**.

1.1 Applications for Photovoltaics

The main PV market in Denmark is BAPV and BIPV. Effective since late 2011 the Danish state owned TSO Energinet.dk (www.energinet.dk) registers all grid-connected PV systems, as it is mandatory for the installer responsible for the grid hook-up to report a number of technical details of each PV system including the time of grid hook-up or start of operation. The basic data in this database (in Danish) is as of early 2014 freely available at the above website although it is only periodically updated.

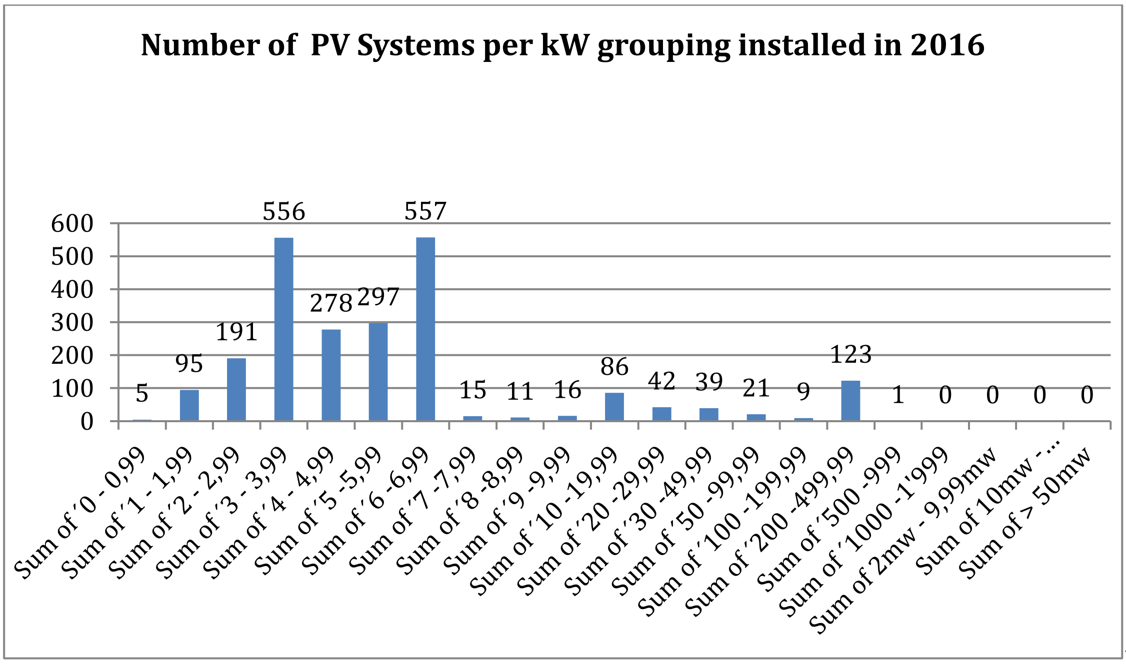
Using this database as source it can be stated with a quite high degree of accuracy, that in 2012, the Danish PV boom year, 70.221 PV systems corresponding to 406,661 MW were put in operation. The similar figures for 2013 are 29.370 PV systems corresponding to 155,439 MW, and for 2014 only about 1.860 PV systems corresponding to 42,019 MW. In 2015 about 3.500 PV systems were installed corresponding to about 181 MW and in 2016 about 2.340 PV systems corresponding to 71,4 MW – a steadily declining market since 2012.

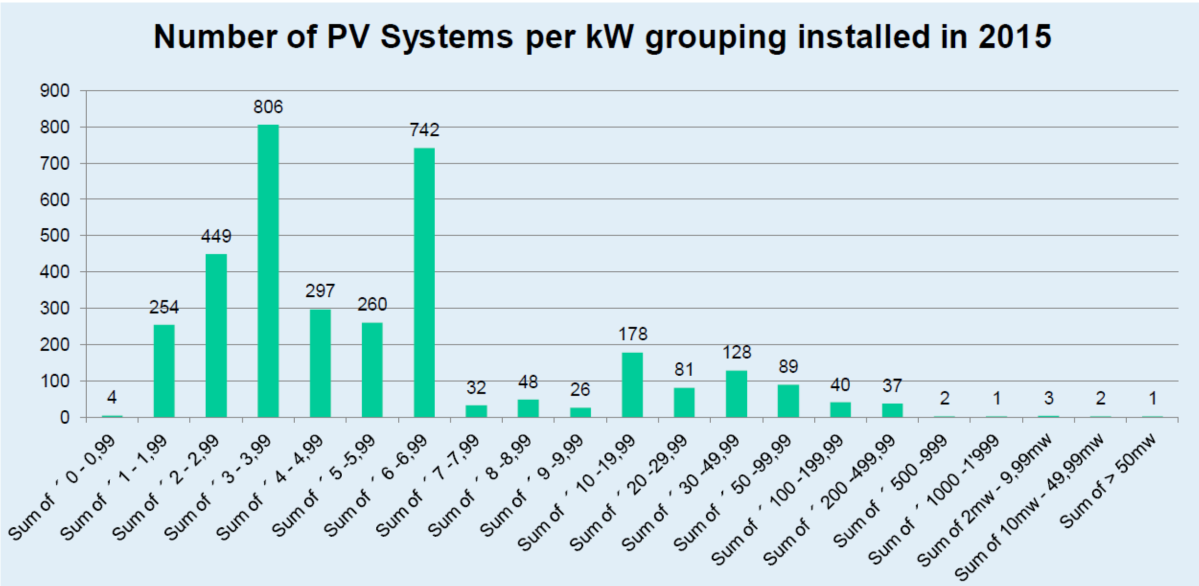
The main reason for this declining market trend is a series of abrupt political initiatives since 2013 to hinder the PV market development otherwise driven by falling prices and customer interest. The background for the political wish to curb the PV market development is the fact, that about 2/3 of the retail price of electricity in Denmark is various taxes, and with PV systems encouraging own consumption, that is the PV system owner uses as much PV electricity as possible, the state loses taxes, i.e. income, which has been found unacceptable. Thus a more and more competitive source of green and popular electricity as PV has stumbled in the energy taxation scheme in a country with a clear target of being independent of fossil fuels by 2050.

However, with a new long term political energy agreement under preparation it is the hope, that PV will be allowed to find its position in the future energy mix of the country based on market conditions and not be determined by taxation schemes.

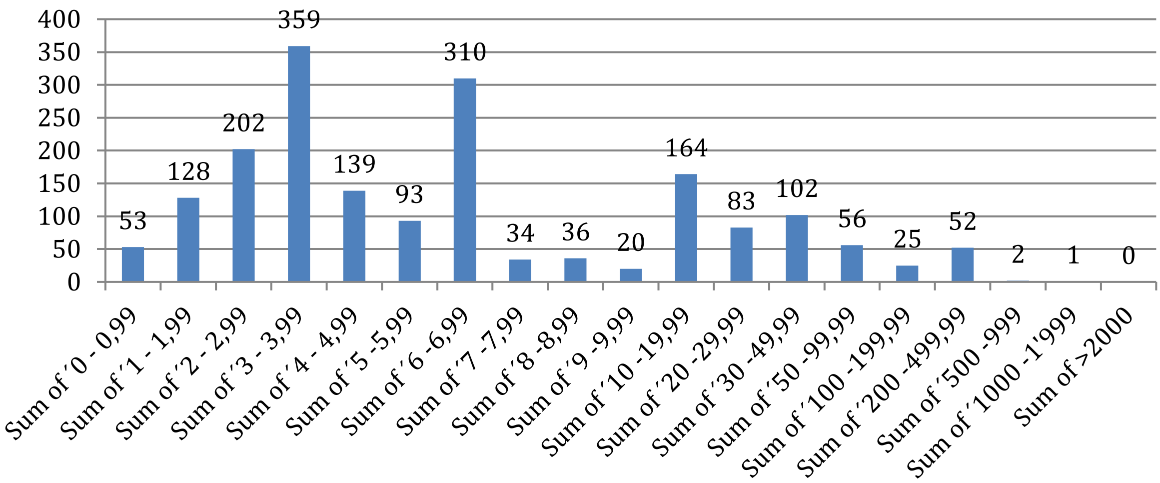
Although BAPV and BIPV are the main areas of application in the country a small number of utility scale systems in the range of 10 to 75 MW have been implemented inside the last few years, and both the Danish and the German-Danish PV auction rounds around end of 2016 revealed PV electricity to be cheaper than off-shore wind and on the level of on-shore wind highlighting PV electricity as a more and more competitive solution. Private sector developers have indicated, that the need of support measures for utility scale PV is quickly coming to an end and that market price of electricity as given by the Nordpool power exchange will be sufficient for new PV installations.

In order to try to analyze the market development in more detail the data for 2013 to 2016 have been sorted in number of PV systems per size, e.g. 0-1 kW, 1-2 kW, 2-3 kW etc. The results are shown in the following 5 charts.

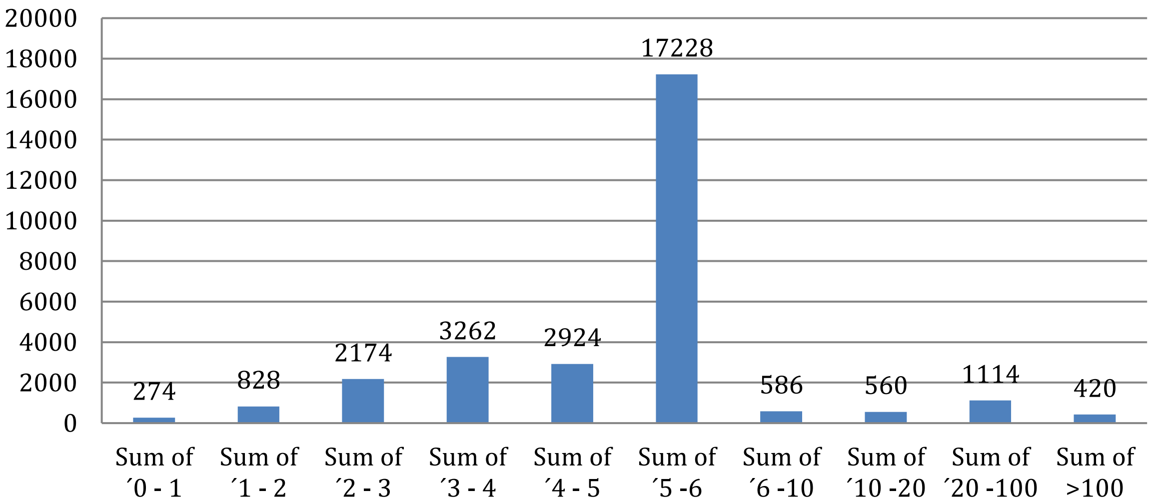

Number of PV Systems per kW grouping installed in 2016
600
500
400
300
200
100
0
5
95
191
556
278
297
557
15
11
16
86
42
39
21
9
123
1
0
0
0
0
Sum of ’0 - 0,99
Sum of ’1 - 1,99
Sum of ’2 - 2,99
Sum of ’3 - 3,99
Sum of ’4 - 4,99
Sum of ’5 -5,99
Sum of ’6 -6,99
Sum of ’7 -7,99
Sum of ’8 -8,99
Sum of ’9 -9,99
Sum of ’10 -19,99
Sum of ’20 -29,99
Sum of ’30 -49,99
Sum of ’50 -99,99
Sum of ’100 -199,99
Sum of ’200 -499,99
Sum of ’500 -999
Sum of ’1000 -1’999
Sum of 2mw - 9,99mw
Sum of 10mw - ...
Sum of > 50mw

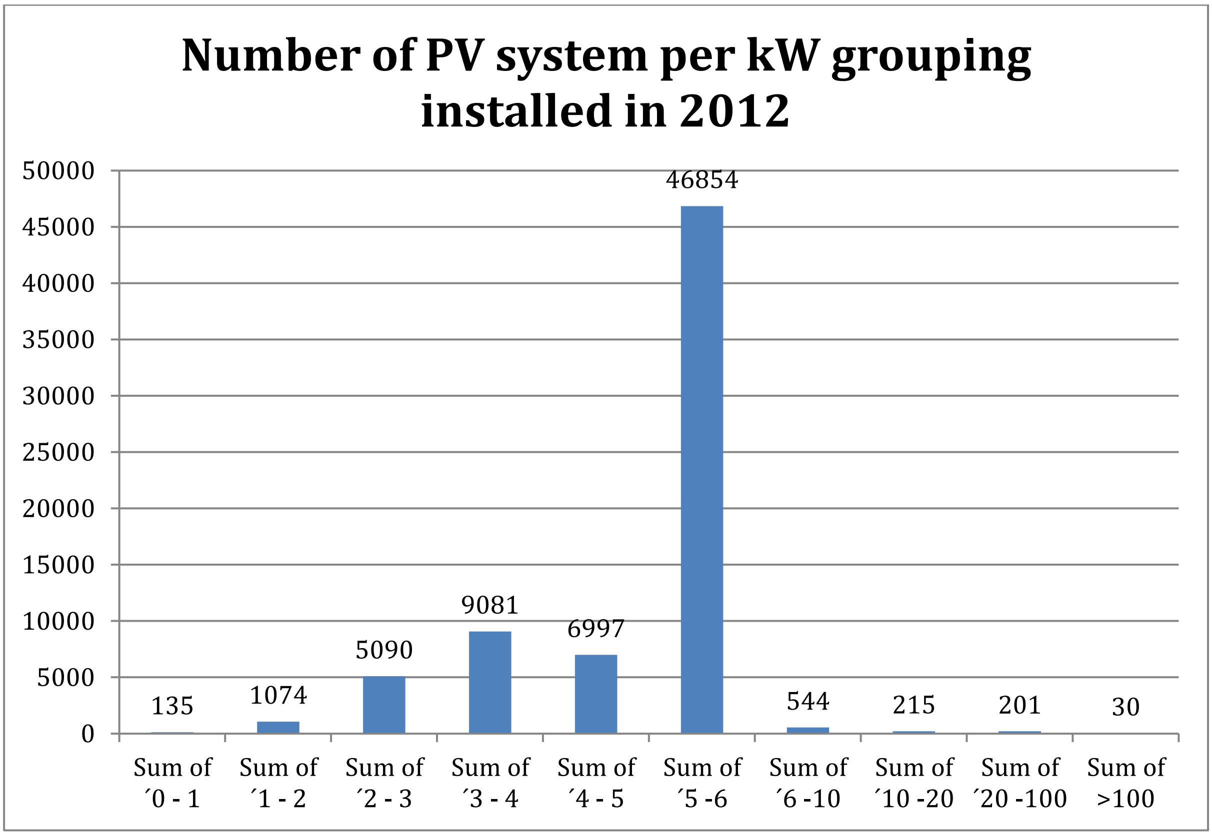

Number of PV Systems per kW grouping installed in 2015
900
800
700
600
500
400
300
200
100
0
4
254
449
806
297
260
742
32
48
26
178
81
128
89
40
37
2
1
3
2
1
Sum of ’ 0 - 0,99
Sum of ’ 1 - 1,99
Sum of ’ 2 - 2,99
Sum of ’ 3 - 3,99
Sum of ’ 4 - 4,99
Sum of ’ 5 -5,99
Sum of ’ 6 -6,99
Sum of ’ 7 -7,99
Sum of ’ 8 -8,99
Sum of ’ 9 -9,99
Sum of ’ 10 -19,99
Sum of ’ 20 -29,99
Sum of ’ 30 -49,99
Sum of ’ 50 -99,99
Sum of ’ 100 -199,99
Sum of ’ 200 -499,99
Sum of ’ 500 -999
Sum of ’ 1000 -1’999
Sum of 2mw - 9,99mw
Sum of 10mw - 49,99mw
Sum of > 50mw

Number of PV systems per kW grouping installed in 2014



Number of PV systems per kW grouping installed in 2013





Looking at five years interpretation of trends will be somewhat uncertain, but the writer believes the following observations to be pertinent:

- The Danish PV market has been disrupted in 2013 - 2016 by abrupt political initiatives to curb the PV market development as indicated above and by the uncertainties of the actual feed-in-tariffs due to the dispute between Denmark and the European Commission (EC) on the current Public Obligation Service (PSO) system, which is base for most Danish support to electricity producing renewable energy technologies. This problem has now been solved by phasing out the PSO system and providing alternative funding via the state budget.[1]
- The number of PV systems grouped by system size is grouped according to the PV panel maximum output (DC). The systems at 6-7 kW and below are typically BAPV installations on residential housing (roof-tops) with a concentration of systems at 6-7kW, and includes for 2012 almost 70.000 systems and for 2103 almost 27.000 systems. For 2014 and 2015 this trend has almost disappeared to be replaced by small (3 kW) systems indicating an increased focus on self-consumption for residential roof-tops.
  Self-consumption appears also to have driven the PV systems from >7 to 100 kW typically being BAPV and BIPV installations on commercial buildings; systems >100 kW are mostly BAPV installations again on large commercial buildings and as mentioned above in 2015 and 2016 utility scale PV systems (ground mounted) ranging from 9 to 75 MW as a new trend quickly getting more competitive than wind.

[1] However, new market uncertainties are introduced this way, as the state budget each year has to go through complex political negotiations.

- The dramatic reduction in number of systems from 2013 to 2014, in particular concerning residential roof-tops, and the emergence in 2015-2016 of large scale PV farms are a clear consequence of a very political influenced market – both by domestic policies and the above mentioned dispute with the EC. Utility scale PV systems do not involve own consumption and this way taxation issues.
- Uncertainties as to feed-in tariffs have promoted PV system designed for a high degree of self-consumption both for the residential and the commercial market sectors. For the residential sector a self-consumption ratio of 20-30 % appears possible, for the commercial sector a ratio of up to 40 % seems realistic. There is an increased interest in "behind-the-meter" storage to increase the self consumption rate. The increasing focus on self-consumption, and thus loss of revenue for the government (green taxes) and loss of revenue for the DSO's have lead to considerations of both a tax on the self-consumed electricity and a fee for the grid access of PV system owners, but no final decisions on these issues have yet been taken.
- All in all the rapid reduction in PV cost has caught the Danish political/administrative system by surprise again and again resulting in abrupt reactions driven by concerns of loss of electricity taxes this way effectively putting up barriers for a market driven development of the PV sector.

1.2 Total photovoltaic power installed

Table 1: PV power installed during calendar year 2016

AC			MW installed in 2016 (mandatory)	MW installed in 2016 (optional but HIGHLY NEEDED)	AC or DC
Grid-connected	BAPV & BIPV	Residential	20		
		Commercial			DC
		Industrial			
	Ground-mounted	cSi and TF	51		DC
		CPV			
Off-grid		Residential	0,1		DC
		Other	0,3		DC
		Hybrid systems			
		Total	71,4		DC

Table 2: 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?	Grid connected PV according to the state owned TSO Energinet.dk.

	Off-grid PV author's research/estimate
Link to official statistics (if this exists)	www.energinet.dk

Table 3: PV power and the broader national energy market.

MW-GW for capacities and GWh-TWh for energy	2016 numbers	2015 numbers
Total power generation capacities (all technologies)	11,5 GW (est.)	11 GW
Total power generation capacities (renewables including hydropower)	6,5 GW (est.)	6,2 GW
Total electricity demand (= consumption)	30,5 TWh (est.)	31 TWh
New power generation capacities installed during the year (all technologies)	0,4 GW (est.)	0,5 GW
New power generation capacities installed during the year (renewables including hydropower)	0,1 GW (est.)	0,4 GW
Total PV electricity production in GWh-TWh	858 GWh	788 GWh
Total PV electricity production as a % of total electricity consumption	2,8	2,5

Table 4: Other informations

	2016 Numbers
Number of PV systems in operation in your country (a split per market segment is interesting)	**107.400**
Capacity of decommissioned PV systems during the year in MW	**< 0,2**
Total capacity connected to the low voltage distribution grid in MW	**620**
Total capacity connected to the medium voltage distribution grid in MW	**80**
Total capacity connected to the high voltage transmission grid in MW	**150**

Table 5: The cumulative installed PV power in 4 sub-markets [MW_{DC}].

Sub-market	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Stand-alone domestic	0,1	0,1	0,1	0,1	0,2	0,2	0,3	0,5	0,6	0,7	0,8	0,9
Stand-alone non-domestic	0,2	0,2	0,3	0,3	0,4	0,5	0,5	0,5	0,9	1,1	1,4	1,7
Grid-connected distributed	2,4	2,6	2,7	2,8	4	6,4	15,9	406,7	556,8	595,8	645,8	665,8
Grid-connected centralized	0	0	0	0	0	0	0	0	5	8	131	181
TOTAL (MW)	2,6	2,9	3,1	3,2	4,6	7,1	16,7	407,8	563,3	605,6	786,6	850

2 COMPETITIVENESS OF PV ELECTRICITY

2.1 Module prices

Table 6: Typical module prices for a number of years [DKK/W]

Year	2010	2011	2012	2013	2014	2015	2016
Standard module crystalline silicon price(s): Typical	10-15	8-12	6-10	5-10	4-9	3-7	2-6

2.2 System prices

Table 7: **Turnkey Prices of Typical Applications [DKK/W]**

Category/Size	Typical applications and brief details	Current prices per W
OFF-GRID Up to 1 kW	Telemetry, navigational aids, information displays, etc.	10-25
OFF-GRID >1 kW	Professional remote, telecommunication, etc.	20-35
Grid-connected Rooftop up to 10 kW (residential)	Residential roof-tops	8-15
Grid-connected Rooftop from 10 to 250 kW (commercial)	BAPV/BIPV	6-13
Grid-connected Rooftop above 250kW (industrial)	BAPV/BIPV	6-14
Grid-connected Ground-mounted above 1 MW	Relative few systems (est. – price commercial secret)	4-7
Other category (hybrid diesel-PV, hybrid with battery…)	None	-

Table 8: National trend in system prices (current) for residential PV systems [DKK/W]

Price/Wp	2010	2011	2012	2013	2014	2015	2016
Residential PV systems < 10 KW	20-30	18-25	15-25	12-20	11-19	10-18	7-12

2.3 Cost breakdown of PV installations

Reliable information/data is not possible to obtain. The private sector is reluctant to provide sufficient data to form a decent "average" cost picture.

2.3.1 Residential PV System < 10 kW

It is not possible to obtain reliable and systematic information/data on these issues. Companies are reluctant to provide such a break down.

2.3.2 Utility-scale PV systems > 5 MW

No reliable data.

2.4 Financial Parameters and specific financing programs

Table 11: PV financing scheme [% p.a.]

Average rate of loans – residential installations	0,5-3 (mortgage)
Average rate of loans – commercial installations	1-4
Average cost of capital – industrial and ground-mounted installations	No data

2.5 Specific investments programs

There is no specific acquisition or leasing programmes.

2.6 Additional Country information

Table 12: Country information

Retail Electricity Prices for an household (range)	2,25 – 2,45 DKK/kWh
Retail Electricity Prices for a commercial company (range)	1,65 – 1,85 DKK/kWh
Retail Electricity Prices for an industrial company (range) depends on type of comp.	0,75 – 1,20 DKK/kWh
Population at the end of 2014 (or latest known)	5,6 mio
Country size (km^2)	44.000
Average PV yield (according to the current PV development in the country) in kWh/kWp	900-1.000 kWh/kW

Name and market share of major electric utilities.	http://www.danishenergyassociation.com

3 POLICY FRAMEWORK

The Danish government launched in November 2011 its energy plan called Our Energy with the vision of a fossil free energy supply by 2050 and interim targets for energy efficiency and renewable energy by 2020 and 2035, e.g. by 2020 50 % of the electricity shall come from wind turbines. The plan, which reaches up to 2020, was further detailed in the government's periodical energy statements. With regard to renewable energy (RE) the plan sets target for the overall contribution from RE by 2050, but the previous in-between targets leading up to 2050 are no longer in the plan.

A new energy plan coming into play from 2020 and onwards have been under preparation for some time, e.g. by a national energy committee that has recommended inter alia that:

- Effective international energy markets to be promoted
- Renewable energy to be deployed based on market conditions
- An integrated and flexible energy system including all technologies to be developed

The political discussions on the new energy plan has already started, and the current minister of energy, supply and climate announced recently, that RE deployment in the country in the future is expected to be based on technology neutral auction schemes, e.g. no more politically set technology specific targets. Pilot auction schemes have already been launched nationally and in collaboration with Germany, and the government has announced preliminary and limited funding for RE auctions in 2018 and 2019.

Renewable energy has at present and for quite some time been a considerable element in the energy supply: by end of 2016 more than 47 % of the national electricity consumption was generated by renewable energy sources including incineration of waste. Ongoing research, development and demonstration of new energy solutions including renewable energy sources have in principle high priority by the government, however the amount of R&D funding allocated to RE has been reduced over the last couple of years. Renewable energy technologies, in particular wind, has and in the future will play an important role and PV getting more and more competitive is expected to play an increasingly important role in the future Danish energy system facilitated by the coming new energy plan.

For a historic overview of the changing political and regulatory framework influencing the Danish PV scene please refer to previous PV National Survey Reports to be found on the website www.iea-pvps.org.

3.1 Direct support policies for PV installations

3.1.1 New, existing or phased out measures in 2016

3.1.1.1 Description of support measures excluding BIPV, and rural electrification

A number of existing support schemes for grid connected PV can still be found (please refer to previous Danish National Survey Reports), but same support schemes are expected to be completely phased out before end of 2017. The underutilized support schemes now constitute an accumulated amount of + 60 MW, and by end of 2017 the underutilized funding will be cancelled. Underutilization is found primarily to be due to administrative barriers and uncertainties as to the future conditions for operating grid connected PV systems.

As described above no future RE technology specific support schemes are expected.

3.1.1.2 BIPV development measures

A few small scale BIPV specific development schemes has been found as an integral part of the so called EUDP programme. However same programmes have been completed (ref. previous Danish National Survey Reports), and no new such programmes are expected.

3.1.1.3 Rural electrification measures

No rural electrification support measures exist – the country has been 100 % electrified for years.

3.1.1.4 Support for electricity storage and demand response measures

There is no public support schemes for electricity storage or demand response; however these technologies can be found at a small scale in previous and ongoing R&D&D projects.

3.2 Self-consumption measures

PV self-consumption	1	Right to self-consume	Yes, based on a hourly scale
	2	Revenues from self-consumed PV	Retail price of electricity
	3	Charges to finance Transmission & Distribution grids	Under consideration for distribution grids
Excess PV electricity	4	Revenues from excess PV electricity injected into the grid	Under out-phasing
	5	Maximum timeframe for compensation of fluxes	1 hour
	6	Geographical compensation	None
Other characteristics	7	Regulatory scheme duration	None
	8	Third party ownership accepted	No
	9	Grid codes and/or additional taxes/fees impacting the revenues of the prosumer	Under consideration
	10	Regulations on enablers of self-consumption (storage, DSM…)	None
	11	PV system size limitations	No
	12	Electricity system limitations	No
	13	Additional features	-

3.3 Collective self-consumption, community solar and similar measures

Collective self-consumption can only be accepted based on an application and the eventual consequent dispensation. Virtual netmetering and community solar schemes are not allowed.

3.4 Tenders, auctions & similar schemes

As described above technological neutral RE auction schemes are already in the pilot phase and pilots are expected to be continued op to 2020. The new energy plan under development and effective from 2020 and onwards is expected for RE only to focus on technological neutral RE auction schemes.

3.5 Financing and cost of support measures

Support measures for PV (and other RE's) have so far mainly been financed by the so called Public Service Obligation (PSO) administered by the state owned TSO. The money involved was collected as a small levy on every kWh sold. Following discussions with the European Commission on the compliance of the PSO scheme with EU state aid regulations it was in 2016 decided to phase out the PSO scheme over some years and in the future use the state budget to provide the financing of eventual RE support measures.

3.6 Indirect policy issues

There is an ongoing and more and more understood conflict between climate and energy policy and regulations and the various green taxes on energy, as reduced income from taxes is loss of revenue for the state. The above mentioned energy commission in preparation of the new energy plan has recommended to strongly reduce or best cancel same energy taxes in order to defuse this conflict, and ongoing political discussions appear to be in favour of this.

4 HIGHLIGHTS OF R&D

4.1 Highlights of R&D

During 2016 R&D small scale efforts in the fields of organic dye sentizised PV cells (PEC), polymer cells and "PV cells-architecture-lights" continued. R&D efforts into nano-structured PV cells were continued as well.

4.2 Public budgets for market stimulation, demonstration / field test programmes and R&D

Table 14: Public budgets for R&D, demonstration/field test programmes and market incentives.

	R & D	**Demo/Field test**
National/federal	Approx. DKK 20 mio.	Approx. DKK 15 mio.
State/regional	-	-
Total	Approx. DKK 35 mio.	

5 INDUSTRY

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

There is no commercial crystalline Si manufacturing industry in Denmark, and there is no known Danish direct interests in international Si manufacturing industry.

5.2 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 below.

Company Gaia Solar, a module manufacturer, was declared financially broken during 2016.

There is no information available on the company Racell producing Si cells and modules incl. PV-T modules on a small scale and specializing in BIPV products.

The company Photonics Energy acts as a holding company for inter alia PV manufacturing facilities in China (Jumao). No further details available.

Polymer modules are produced on a pilot scale using print screen technology.

Other businesses have voiced interest in eventual manufacturing of PV cells and modules, but throughput is considered so far as commercially negligible.

5.3 Manufacturers and suppliers of other components

Balance of system component manufacture and supply is an important part of the PV system value chain. For 2016 the situation in Denmark is briefly described below.

The company Danfoss is still producing inverters and is in collaboration with German SMA for commercial market oriented efforts.

The company Grundfos produces its special variable frequency inverter for its RE powered range of water pumping systems and markets same systems worldwide. For up to date information on technology, performance and prices please consult the company website.

No battery producers in Denmark with PV related products.

3-5 companies are reported to produce – on a small scale – charge controllers and PV related electronics.

6 PV IN THE ECONOMY

6.1 Labour places

a) Public research and development (not including private companies):
about 20

b) Manufacturing of products throughout the PV value chain from feedstock to systems, including company R&D:
about 150

c) All other, including within electricity companies, installation companies etc.:
about 200

NB! Information on labour places is based on the authors best estimate – no official statistics available.

6.2 Business value

Total business value for the PV sector in 2016 is estimated by the author to DKK 350 mio; no solid data are available.

7 INTEREST FROM ELECTRICITY STAKEHOLDERS

7.1 Structure of the electricity system

The transmission systems for power and gas are operated by the state owned TSO, Energinet.dk, see http://www.energinet.dk/EN/Sider/default.aspx .

The DSO's are mostly owned by the consumers as cooperatives, but a few commercial DSO's can also be found. The DSO's are organized in an association, see http://www.danishenergyassociation.com/.

The government regulator controls the pricing of electricity and the margins and accumulated wealth of the DSO's. The DSO's are by law obliged to contribute to energy conservation and has at present a target of 3 % energy conservation per year; if the target is not met the DSO's are fined. The DSO's have full (commercial) freedom how to implement the conservation targets.

7.2 Interest from electricity utility businesses

The Danish TSO Energinet.dk has for several years expressed interest in PV as a potential contributor to the electricity supply and in support of the electric grid. This interest has also been minted out via support channelled through the various relevant PSO (now being out phased as mentioned above) support programmes. One example is the EU EcoGrid project encompassing many smart grid activities including up to 7 MW of PV providing a local PV penetration of around 17 % in the grid of the island of Bornholm. Energinet.dk has published reports on PV in the Grid System and PV & Batteries, both with forecast up to 2040. The main message is, that from the point of view of a TSO there should be no major problem in accommodating 6-8 GW of PV in the Danish grid system. A further message is, that PV and wind complement each other.

The distribution utilities, notably Eniig (formerly EnergiMidt), have also promoted the use of PV and has included the technology in its business portfolio, and in particular since 2009 several distribution utilities have included PV technology in their portfolio of products. The utility made for a couple of years use of a capital incentive to customers inside its service area, but is now marketing PV technology without any special support. Most distribution utilities simply regard PV as a relevant standard product and some offer finance packets and payment via the electricity bill.

Through its national federation Dansk Energi the Danish utilities in 2010 announced, that they will not charge PV system owners for access to the grid (related to the use of the net-metering scheme), and several distribution utilities will not charge for the metering system needed to benefit from the net-metering scheme. However, these free services of the utilities are now in the process of changing to a fee-for-service scheme as the Danish regulator has found this free service in principle illegal; Dansk Energi is now reported to be working on recommendations to its members on such a fee and issued a first proposal early 2015; this proposal was however quickly withdrawn following a lot of criticism from a wide range of stakeholders and a revised proposal is expected in 2017.

7.3 Interest from municipalities and local governments

Municipalities and regions in Denmark have demonstrated a fast growing interest in PV technology. The main driver here is the climate plans and targets formulated by most municipalities, e.g. to aim for a CO_2 neutral community by a certain year. Municipalities then follow up with lighthouse demonstration of the PV technology by installing PV on the many municipal buildings such as schools, hospitals, kindergartens, homes for the elderly, etc. Many municipalities combine the PV demonstration systems with information campaigns both targeting the citizens using the municipal buildings and the general public. PV on municipal buildings are faced with significant constraints as to ownership, size and application. These constraints are seen as serious barriers for PV deployment by several municipalities, and proposals to lift same barriers have been submitted to the government – so far without any result leaving the municipal PV sector in standby as outlined below.

The deployment of PV in a municipal context has been capped at an additional 20 MW up to 2020, if the involved municipalities want to benefit from the special regulations and higher FIT in force for municipal PV systems. If not municipalities are forced to created one administrative operational unit per PV system making municipal PV systems an administrative nightmare, and many municipalities have had to cancel otherwise planed PV installations on schools, kindergartens and administrative facilities.

8 HIGHLIGHTS AND PROSPECTS

As discussed above several times a new energy plan effectively from 2020 and onwards is now being prepared and discussed on the political level.

The coming energy plan is expected to provide a better framework for the PV technology in replacement of the situation in Denmark since 2013, where haphazard and short term measures effectively have put the Danish PV market on hold, please refer to previous Danish National Survey Reports (www.iea-pvps.org).

In relation to PV and other RE's the new energy plan is expected to focus on inter alia:

- Technology neutral tender/auction schemes
- Strong focus on using the market to control deployment of energy technologies
- Promotion of an EU scale energy market
- Development of a Danish integrated and flexible energy system

The new energy plan is thus expected to provide a more level playing field for PV in the future Danish energy system.

However, as the energy plan only will be effective by 2020 the above positive development for the PV sector in Denmark is so far an expectation.