IEA INTERNATIONAL ENERGY AGENCY

Forskningsrådet

National Survey Report of PV Power Applications in Norway 2013

PVPS

PHOTOVOLTAIC POWER SYSTEMS PROGRAMME

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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 23 member countries. The European Commission also participates in the work of the Agency.

The IEA Photovoltaic Power Systems 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 24 participating countries are Australia (AUS), Austria (AUT), Belgium (BEL), Canada (CAN), China (CHN), Denmark (DNK), France (FRA), Germany (DEU), Israel (ISR), Italy (ITA), Japan (JPN), Korea (KOR), Malaysia (MYS), Mexico (MEX), the Netherlands (NLD), Norway (NOR), Portugal (PRT), Spain (ESP), Sweden (SWE), Switzerland (CHE), Thailand (THA), Turkey (TUR), the United Kingdom (GBR) and the United States of America (USA). The European Commission (EC), the European Photovoltaic Industry Association (EPIA), the US Solar Electric Power Association (SEPA), the US Solar Energy Industries Association (SEIA) and the Copper Alliance are also members.

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 2013. 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 2013 statistics if the PV modules were installed and connected to the grid between 1 January and 31 December 2013, although commissioning may have taken place at a later date**.

1.1 Applications for Photovoltaics

The market for PV in Norway continues to be related to off-grid applications, primarily the leisure market (cabins, leisure boats) and to a more limited extent, the professional market (mostly lighthouses/lanterns along the coast and telecommunication systems).

1.2 Total photovoltaic power installed

Aside for the leisure market, few new PV installations of significant size were installed in 2013. The largest grid connected system in 2013 was a 70 kWp roof mounted system at Høgskolen i Hedmark, avdeling Evenstad.

Table 1: PV power installed during calendar year 2013

			MW installed in 2013 (mandatory)	MW installed in 2013 (optional)	AC or DC
Grid-connected	BAPV	Residential		0,03	DC
		Commercial		0,07	DC
		Industrial			
	BIPV (if a specific legislation exists)	Residential			
		Commercial			
		Industrial			
	Ground-mounted	cSi and TF			
		CPV			
Off-grid		Residential		0,5	DC
		Other		0,02	DC
		Hybrid systems			
		Total	0,62		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?	No

Link to official statistics (if this exists)	-
	-

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

MWW for capacities and GWh-TWh for energy	2013 numbers	2012 numbers
Total power generation capacities (all technologies)	Approx. 30 000	Approx. 30 000
Total power generation capacities (renewables including hydropower)	Approx. 30 000	Approx. 30 000
Total electricity demand (= consumption)	Not available	128
New power generation capacities installed during the year (all technologies)	379	606
New power generation capacities installed during the year (renewables including hydropower)	379	606
Total PV electricity production in GWh-TWh	8,5	8
Total PV electricity production as a % of total electricity consumption	0,006	0,006

Table 4: Other informations

	2013 Numbers (optional)
Number of PV systems in operation in your country (a split per market segment is interesting)	N.A.
Capacity of decommissioned PV systems during the year in MW	N.A.
Total capacity connected to the low voltage distribution grid in MW	N.A.
Total capacity connected to the medium voltage distribution grid in MW	N.A.
Total capacity connected to the high voltage transmission grid in MW	N.A.

Table 5: The cumulative installed PV power in 4 sub-markets.

Sub-market	1992-2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Stand-alone domestic	5966	6175	6440	6800	7150	7450	7780	8080	8400	8800	9250	9750
Stand-alone non-domestic	350	365	375	377	390	410	430	450	470	490	510	530
Grid-connected distributed	68	75	75	75	128	132	132	132	192	192	192	292
Grid-connected centralized												
TOTAL (MW)	6384	6615	6890	7252	7668	7992	8342	8662	9062	9482	9952	10572

2 COMPETITIVENESS OF PV ELECTRICITY

2.1 Module prices

Table 6: Typical module prices for a number of years

Year	1992						2013
Standard module price(s): Typical							
Best price							
PV module price for concentration (if relevant)							

2.2 System prices

System prices collected from system suppliers serving the Norwegian market reported in the report 'Kostnadsstudie - Solkraft I Norge 2013' published by Enova. The system prices show large variations, and the referred are average prices.

Table 7: **Turnkey Prices (ex. VAT) of Typical Applications**

Category/Size	Typical applications and brief details	Current prices NOK per Wp
OFF-GRID Up to 1 kW		
OFF-GRID >1 kW		
Grid-connected Rooftop up to 10 kW (residential)		21
Grid-connected Rooftop from 10 to 250 kW (commercial)		18
Grid-connected Rooftop above 250kW (industrial)		15
Grid-connected Ground-mounted above 1 MW		12
Other category existing in your country (hybrid diesel-PV, hybrid with battery…)		

Table 8: National trends in system prices (NOK ex.VAT) for different applications

Price/Wp	1992					2011	2012	2013
Residential PV systems < 10 KW						40-65	20-30	21
Commercial and industrial							15-20	15
Ground-mounted								12

2.3 Financial Parameters and programs (leasing…)

. N.A.

Table 9: PV financing scheme

Average Cost of capital	
Description of a specific PV financing scheme (leasing, renting…)	

2.4 Additional Country information

Table 10: Country information

Retail Electricity Prices for an household (range)	0,5 – 1,0 NOK/kWh (all taxes included)
Retail Electricity Prices for a commercial company (range)	0,5-0,8 NOK/kWh (all taxes included)
Retail Electricity Prices for an industrial company (range)	0,4-0,6 NOK/kWh (all taxes included)
Population at the end of 2013 (or latest known)	5,3 million
Country size (km^2)	323 787
Average PV yield (according to the current PV development in the country) in kWh/kWp	800
Name and market share of major electric utilities.	Statkraft Hafslund Eco Energi BKK Lyse Agder Energi Trondheim Energi Akershus Energi

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.

3.1 Direct support policies

Table 11: PV support measures (summary table)

	On-going measures	Measures that commenced during 2013
Feed-in tariffs (gross / net?)	N.A	N.A.
Capital subsidies for equipment or total cost	N.A.	N.A.
Green electricity schemes	Electricity certificates	N.A.
PV-specific green electricity schemes	N.A.	N.A.
Renewable portfolio standards (RPS)	N.A.	N.A.
PV requirement in RPS	N.A.	N.A.
Investment funds for PV	N.A.	N.A.
Income tax credits	N.A.	N.A.
Prosumers' incentives (self-consumption, net-metering, net-billing…)	N.A.	N.A.
Commercial bank activities e.g. green mortgages promoting PV	N.A.	N.A.
Activities of electricity utility businesses	N.A.	N.A.
Sustainable building requirements	Building Codes (TEK10)	N.A.

3.2 Direct Support measures

3.2.1 Support measures exiting in 2013

3.2.1.1 Description of support measures excluding prosumers, BIPV, and rural electrification

2013 was the second year of operation of the common Swedish-Norwegian electricity certificate market. The el-certificate market is a technology neutral, market-based support scheme for power generation from renewable energy sources. The market is designed to increase power generation from renewable energy sources in the two countries with a total of 26,4 TWh/year before 2020. The entrance fee for the participation in the el-certificate market is minimum NOK 15 000.-, and this amount is generally too high for owners of small PV-systems. Thus the Norwegian market remains without any particular public support schemes for PV systems. Thus, the main market for PV in Norway continues to be related to off-grid applications in addition to a few grid connected systems on buildings.

3.2.1.2 Prosumers' development measures

Enova SF, a public agency owned by the Ministry of Petroleum and Energy, was established in 2001 as an instrument to improve energy system efficiency and increase renewable energy production. Enova offers support schemes in the areas in which the greatest effect in the form of saved, converted, or generated clean energy can be achieved. Since the

introduction of the el-certificate market Enova only supports new power generation technologies, i.e. demonstration projects including immature technologies or technologies new to the Norwegian market. Renewable power generation from wind, hydro, PV, etc. will receive support from the el-certificate market.

3.2.1.3 BIPV development measures

Currently, Norway has no defined goals when it comes to implementation of PV technology. There are no incentive scheme supporting the installation of PV systems . However, Enova SF supported a few pilot projects which included PV as energy efficiency measure.

3.2.1.4 Rural electrification measures

N.A.

3.2.1.5 Other measures including decentralized storage and demand response measures

N.A.

3.2.2 Support measures phased out in 2013

In 2013 Enova stopped supporting “passive” energy standard for new buildings as these solutions now seem to be financially viable without support.

3.2.3 New support measures implemented in 2013

A new support for upgrading existing buildings was released by Enova.

3.2.4 Measures currently discussed but not implemented yet

Tax deduction for private investments in energy efficient technologies is discussed.

3.2.5 Financing and cost of support measures

N.A.

3.3 Indirect policy issues

N.A.

3.3.1 International policies affecting the use of PV Power Systems

3.3.2 The introduction of any favourable environmental regulations

3.3.3 Policies relating to externalities of conventional energy

3.3.4 Taxes on pollution (e.g. carbon tax)

4 HIGHLIGHTS OF R&D

4.1 Highlights of R&D

The Norwegian Research Council (NRC) funds industry oriented research, basic research and socio-economic research within the energy field, including renewable energy sources. Most of the R&D projects are focused on the silicon chain from feedstock to solar cells research, but also related fundamental material research and production processes. A growing supply business is also filling out the portfolio of projects.

The Norwegian Research Centre for Solar Cell Technology has completed it's fourth year of operation (www.solarunited.no). Leading national research groups and industrial partners in PV technology participate in the centre. The research activities are grouped into six work packages, five of which involve competence-building: mono- and multi-crystalline silicon, next-generation modeling tools for crystallizing silicon, solar-cell and solar panel technology, new materials for next-generation solar cells, and new characterization methods. The sixth is a value-chain project that will apply the findings of the other five work packages to produce working solar cell prototypes. The total Centre budget is 374 MNOK over the duration of the Centre (2009–2017).

This year the performance of the centre was subject to an evaluation performed by international experts. The evaluation showed that the most of the goals set at the startup of the centre has been achieved. The activities within crystallization and solidification of Si as well as the activities within detailed characterization were identified as the strongholds of the centre. As a consequence of the recommendations from the evaluation group these activities has been strengthened by adding a new work package on production of polysilicon by the chemical route. The new work package will give the researches better control of the value chain and strengthen the work on high performance materials.

There are six main R&D groups in the universities and institute sector of Norway:

- IFE (Institute for Energy Technology): Focus on polysilicon production, silicon solar cell design, production and characterization and investigations of the effect of material quality upon solar cell performance. A solar cell laboratory at IFE contains a dedicated line for producing silicon-based solar cells. Additionally, a characterization laboratory and a polysilicon production lab, featuring three different furnace technologies have been established.
- University of Oslo (UiO), Faculty of Mathematics and Natural Sciences: The Centre for Materials Science and Nanotechology (SMN) is coordinating the activities within materials science, micro- and nanotechnology.
- NTNU (Norwegian University of Science and Technology) Trondheim: Focuses on production and characterization of solar grade silicon.
- SINTEF Trondheim and Oslo: Focus on silicon feedstock, refining, crystallisation, sawing and material characterisation.
- Agder University (UiA): Research on silicon feedstock with Elkem. Renewable Energy demonstration facility with PV, solar heat collectors, heat pump, heat storage and electrolyser for research on hybrid systems.
- Norut (Northern Research Institute Narvik): Development of silicon based solar cells and includes the whole production chain from casting of silicon to solar cell modules. A lab for solar cell characterization was built in cooperation with Innotech Solar AS.

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

The national research programme for renewable energies 'Energix' of Forskningsrådet and development funding by the national incubator Innovasjon Norge was totally 75 mill.NOK in 2013. Demo and field tests of 'plus-energy building technologies' of the national instrument for energy efficiency implementation Enova totalled 25 mill.NOK. (However, this includes support of a range of energy-efficient technologies, not only PV.)

Table 12: Public budgets for R&D, demonstration/field test programmes and market incentives [mill.NOK]

	R & D	Demo/Field test
National/federal	75	25
State/regional		
Total	100	

5 INDUSTRY

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

a) Falling unit prices and over-capacity on the supply side has led to corresponding production reductions and shut downs for the major Norwegian PV actors.

Renewable Energy Corporation, is involved in the whole value chain of solar cells, from raw materials to complete modules. In 2012 REC shut down all its production facilities in Norway and only the head office remained in Oslo. In 2013 REC was split in two different companies. The production of silicon gases and polysilicon is located in the new company REC Silicon (USA), whereas the production of wafers, cells modules as well as the systems division is located in REC Solar (Singapore).

Elkem Solar is based on the so called metallurgical route; Elkem Solar has invested in a silicon production plant in Kristiansand in southern Norway. With a design capacity of 6 000 tons of solar grade silicon per year, the plant started to ramp up production during 2009. The production technology is now tested and verified, and according to Elkem, it enables the company to produce silicon with just 1/4 of the energy consumption compared with traditional technology.

During 2012 and 2013 Elkem Solars solar grade silicon was only been in production for 6 months. During the stand-still Elkem Solar has developed and tested an even lower cost and more environmental friendly production method for SoG-Si feedstock. In January 2014 Elkem announced that they would start production again.

NorSun manufactures high performance monocrystalline silicon ingots and wafers at its plant in Årdal on the Norwegian west coast. Annual production capacity at the company's facility in Norway exceeds 250 MWp. As for most other solar companies, 2013 was a tough year for Norsun and it was necessary with a financial restructuring. At the end of the year market conditions improved and the factory was running at full capacity with most of the temporarily laid off workers back at work.

Norwegian Crystals in September 2013 the newly established company Norwegian Crystals acquired the former REC Wafer production facility for mono crystals in Glomfjord. The capacity of the factory is approximately 200 MW/y and by the end of the year the factory had been able to ramp up to almost 50 % of the capacity. Norwegian Crystals produce mono crystalline silicon blocks for the international market.

Table 13: Production information for the year for silicon feedstock, ingot and wafer producers

Manufacturers (or total national production)	Process & technology	Total Production	Product destination (if known)	Price (if known)
Elkem Solar	Silicon feedstock	0		
Norsun Norwegian Crystals	sc-Si ingots.	250 MWp 200 MWp		
REC Silicon	mc-Si ingots	(USA)		
Norsun	sc-Si wafers	250 MWp		
REC Solar	mc-Si wafers and modules	(Singapore)		

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.

All previous PV cell and module manufacturing in Norway has been stopped.

Table 14: Production and production capacity information for 2013

Cell/Module manufacturer (or total national production)	**Technology** (sc-Si, mc-Si, a-Si, CdTe)	**Total Production (MW)**		**Maximum production capacity (MW/yr)**	
		Cell	Module	Cell	Module
Wafer-based PV manufactures					
1		a		b	
2		c	d	e	f
3 etc					
Total					
Thin film manufacturers					
1		x	*x*	y	*y*
2					
Cells for concentration					
1		g		h	
TOTALS		**a+c+x+g**	**d+x**	**b+e+y+h**	**f+y**

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. Eltek Valere is a producer of PV-inverters. Other BOS-components are imported.

6 PV IN THE ECONOMY

6.1 LABOUR PLACES

a) The Norwegian R&D Centre for solar Cell Technology includes 80 researchers, post doc's and PhD-students.

b) Companies with production facilities in Norway includes Norsun, Elkem, Norwegian Crystals, The Quartz Corporation, Dynatec Engineering, Mosaic Solutions, Vetro Solar,

c) Consultants Multiconsult and Asplan-Viak offers solar system consultancy, System entrepeneurs Fusen, Sønnico, Getek, Solenergisystemer, Solenergispesialisten, ASV Greenscan and Solbes offers system installation.

Table 15: Estimated PV-related labour places in 2013

Research and development (not including companies)	80
Manufacturing of products throughout the PV value chain from feedstock to systems, including company R&D	
Distributors of PV products	
System and installation companies	450
Electricity utility businesses and government	10
Other	10
Total	550

6.2 Business value

Table 16: Value of PV business

Sub-market	**Capacity installed *in 2013* (MW)**	**Price per W** *(from table 7)*	**Value [mill.NOK]**	**Totals**
Off-grid domestic	0.5	100	50	
Off-grid non-domestic	0.02	21	0,4	
Grid-connected distributed	0.1	18	*1,8*	
Grid-connected centralized			*d*	
				52,2
Export of PV products				*e*
Change in stocks held				*f*
Import of PV products				*g*
Value of PV business				***a+b+c+d+e+f-g***

7 INTEREST FROM ELECTRICITY STAKEHOLDERS

7.1 Structure of the electricity system

Short description of the electricity industry landscape	Liberalized market with separation between production, transmission and distribution companies. The ownership is both public and private. The electricity industry regulator is NVE, and the national transmission lines are operated by Statnett.

7.2 Interest from electricity utility businesses

N.A.

7.3 Interest from municipalities and local governments

N.A.

8 STANDARDS AND CODES

N.A.

9 HIGHLIGHTS AND PROSPECTS

N.A.

Definitions, Symbols and Abbreviations

For the purposes of this and all IEA PVPS National Survey Reports, the following definitions apply:

PV power system market: The market for all nationally installed (terrestrial) PV applications with a PV power capacity of 40 W or more.

Installed PV power: Power delivered by a PV module or a PV array under standard test conditions (STC) – irradiance of 1 000 W/m^2, cell junction temperature of 25^{o}C, AM 1,5 solar spectrum – (also see 'Rated power').

Rated power: Amount of power produced by a PV module or array under STC, written as W.

PV system: Set of interconnected elements such as PV modules, inverters that convert d.c. current of the modules into a.c. current, storage batteries and all installation and control components with a PV power capacity of 40 W or more.

CPV: Concentrating PV

Hybrid system: A system combining PV generation with another generation source, such as diesel, hydro, wind.

Module manufacturer: An organisation carrying out the encapsulation in the process of the production of PV modules.

Off-grid domestic PV power system: System installed to provide power mainly to a household or village not connected to the (main) utility grid(s). Often a means to store electricity is used (most commonly lead-acid batteries). Also referred to as 'stand-alone PV power system'. Can also provide power to domestic and community users (plus some other applications) via a 'mini-grid', often as a hybrid with another source of power.

Off-grid non-domestic PV power system: System used for a variety of industrial and agricultural applications such as water pumping, remote communications, telecommunication relays, safety and protection devices, etc. that are not connected to the utility grid. Usually a means to store electricity is used. Also referred to as 'stand-alone PV power system'.

Grid-connected distributed PV power system: System installed to provide power to a grid-connected customer or directly to the electricity grid (specifically where that part of the electricity grid is configured to supply power to a number of customers rather than to provide a bulk transport function). Such systems may be on or integrated into the customer's premises often on the demand side of the electricity meter, on public and commercial buildings, or simply in the built environment on motorway sound barriers etc. They may be specifically designed for support of the utility distribution grid. Size is not a determining feature – while a 1 MW PV system on a rooftop may be large by PV standards, this is not the case for other forms of distributed generation.

Grid-connected centralized PV power system: Power production system performing the function of a centralized power station. The power supplied by such a system is not associated with a particular electricity customer, and the system is not located to specifically perform functions on the electricity grid other than the supply of bulk power. Typically ground mounted and functioning independently of any nearby development.

Turnkey price: Price of an installed PV system excluding VAT/TVA/sales taxes, operation and maintenance costs but including installation costs. For an off-grid PV system, the prices associated with storage battery maintenance/replacement are excluded. If additional costs are incurred for

reasons not directly related to the PV system, these should be excluded. (E.g. If extra costs are incurred fitting PV modules to a factory roof because special precautions are required to avoid disrupting production, these extra costs should not be included. Equally the additional transport costs of installing a telecommunication system in a remote area are excluded).

Field Test Programme: A programme to test the performance of PV systems/components in real conditions.

Demonstration Programme: A programme to demonstrate the operation of PV systems and their application to potential users/owners.

Market deployment initiative: Initiatives to encourage the market deployment of PV through the use of market instruments such as green pricing, rate based incentives etc. These may be implemented by government, the finance industry, electricity utility businesses etc.

Final annual yield: Total PV energy delivered to the load during the year per kW of power installed.

Performance ratio: Ratio of the final annual (monthly, daily) yield to the reference annual (monthly, daily) yield, where the reference annual (monthly, daily) yield is the theoretical annual (monthly, daily) available energy per kW of installed PV power.

Currency: The currency unit used throughout this report is NOK

PV support measures:

Feed-in tariff	an explicit monetary reward is provided for producing PV electricity; paid (usually by the electricity utility business) at a rate per kWh that may be higher or lower than the retail electricity rates being paid by the customer
Capital subsidies	direct financial subsidies aimed at tackling the up-front cost barrier, either for specific equipment or total installed PV system cost
Green electricity schemes	allows customers to purchase green electricity based on renewable energy from the electricity utility business, usually at a premium price
PV-specific green electricity schemes	allows customers to purchase green electricity based on PV electricity from the electricity utility business, usually at a premium price
Renewable portfolio standards (RPS)	a mandated requirement that the electricity utility business (often the electricity retailer) source a portion of their electricity supplies from renewable energies
PV requirement in RPS	a mandated requirement that a portion of the RPS be met by PV electricity supplies (often called a set-aside)
Investment funds for PV	share offerings in private PV investment funds plus other schemes that focus on wealth creation and business success using PV as a vehicle to achieve these ends
Income tax credits	allows some or all expenses associated with PV installation to be deducted from taxable income streams

Compensation schemes (self-consumption, net-metering, net-billing…)	These schemes allow consumers to reduce their electricity bill thanks to PV production valuation. The schemes must be detailed in order to better understand if we are facing self-consumption schemes (electricity consumed in real-time is not accounted and not invoiced) or net-billing schemes (the electricity taken from the grid and the electricity fed into the grid are tracked separately, and the electricity account is reconciled over a billing cycle). The compensation for both the electricity self-consumed and injected into the grid should be detailed. Net-metering schemes are specific since they allows PV customers to incur a zero charge when their electricity consumption is exactly balanced by their PV generation, while being charged the applicable retail tariff when their consumption exceeds generation and receiving some remuneration for excess electricity exported to the grid
Commercial bank activities	includes activities such as preferential home mortgage terms for houses including PV systems and preferential green loans for the installation of PV systems
Activities of electricity utility businesses	includes 'green power' schemes allowing customers to purchase green electricity, operation of large-scale (utility-scale) PV plants, various PV ownership and financing options with select customers and PV electricity power purchase models
Sustainable building requirements	includes requirements on new building developments (residential and commercial) and also in some cases on properties for sale, where the PV may be included as one option for reducing the building's energy foot print or may be specifically mandated as an inclusion in the building development