IEA INTERNATIONAL ENERGY AGENCY

National Survey Report of PV Power Applications in CANADA – 2016

PVPS

PHOTOVOLTAIC POWER SYSTEMS PROGRAMME

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Cover Picture:

The Canadian government's clean technology research and development centre, CanmetENERGY, has a 40 kW rooftop photovoltaic array which was installed in 2016. Modules were manufactured by Canadian Solar and have a nameplate power of approximately 250 W. Additional rooftop facilities consist of a weather monitoring station and a single axis sun tracking solar thermal system. (photo credit: Josée Ottavi).

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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 www.iea-pvps.org website.

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 2016. 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 (in some cases) 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 installation statistics referring to 2016 refer to modules that were installed and connected to the grid between 1 January and 31 December 2016, although commissioning may have taken place at a later date.

1.1 Applications for photovoltaics

The grid-connected photovoltaic applications was the main market in 2016. Growth in this sector is spurred by Ontario's Feed-in-Tariff (FIT) program established in 2009 for projects greater than 10 kW as well as additional incentive programs such as microFIT (projects under 10 kW) and the Large Renewable Procurement (LRP) competitive procurement for projects above 500 kW. Approximately 30% of the grid-connected capacity is composed of small ground mounted or rooftop mounted systems (< 0,25 MW) and the remaining 70% capacity is composed of centralized utility-scale arrays.

Off-grid applications consist of stand-alone applications comprising a PV array as the sole generator or as a hybrid system combined with a small wind turbine or diesel generator. These systems are usually sited remotely with or without battery storage, but are increasingly installed in less remote areas as costs change and design professionals and the public become more aware of opportunities. The residential off-grid market consists primarily of remote homes and cottages, and communications (radios). The off-grid non-residential market consists of water pumping, road signals, navigational buoys, telecommunication repeaters, and industrial sensing, monitoring, and controlling.

1.2 Total photovoltaic power installed

The national cumulative installed PV capacity at the end of 2016 was 2 662 MW. This represents a growth of approximately 6% (143 MW) over the previous year. Ontario represents more than 99% of total installed capacity. Approximately 90% of the capacity growth was in Ontario. Photovoltaic installation in Alberta, British Columbia, and Saskatchewan also contributed 5%, 2%, and 1% respectively to capacity increase.

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	Residential	Part of 143,45		
		Commercial			
		Industrial			
	BIPV (if a specific legislation exists)	Residential			
		Commercial			
		Industrial			
	Ground-mounted	cSi and TF	Part of 143,45		DC
		CPV			
Off-grid		Residential			
		Other			
		Hybrid systems			
		Total	143,45		DC

Table 2: Data collection process

If data are reported in AC, please mention a conversion coefficient to estimate DC installations.	0.85
Is the collection process done by an official body or a private company/Association?	Natural Resources Canada
Link to official statistics (if this exists)	NA
	Estimated accuracy of data: ±3 %

Table 3: PV power and the broader national energy market (AC power)

MW-GW for capacities and GWh-TWh for energy	2016	2015
Total power generation capacities (all technologies)	NA	137 GW
Total power generation capacities (renewables including hydropower)	NA	89 GW
Total electricity demand (consumption)	561,3 TWh (estimated)	557,4 TWh (estimated)[1]
New power generation capacities installed during the year (all technologies)	NA	2,6 GW

[1] Assuming end-use energy demand grows at a rate of 0,7% in Canada between 2014 to 2040 according to [2].

New power generation capacities installed during the year (renewables including hydropower)	NA	1,7 GW
Total PV electricity production in GWh-TWh	2,979 TWh	2,508 TWh
Total PV electricity production as a % of total electricity consumption	0,53%	0,44%

Table 4: Other information

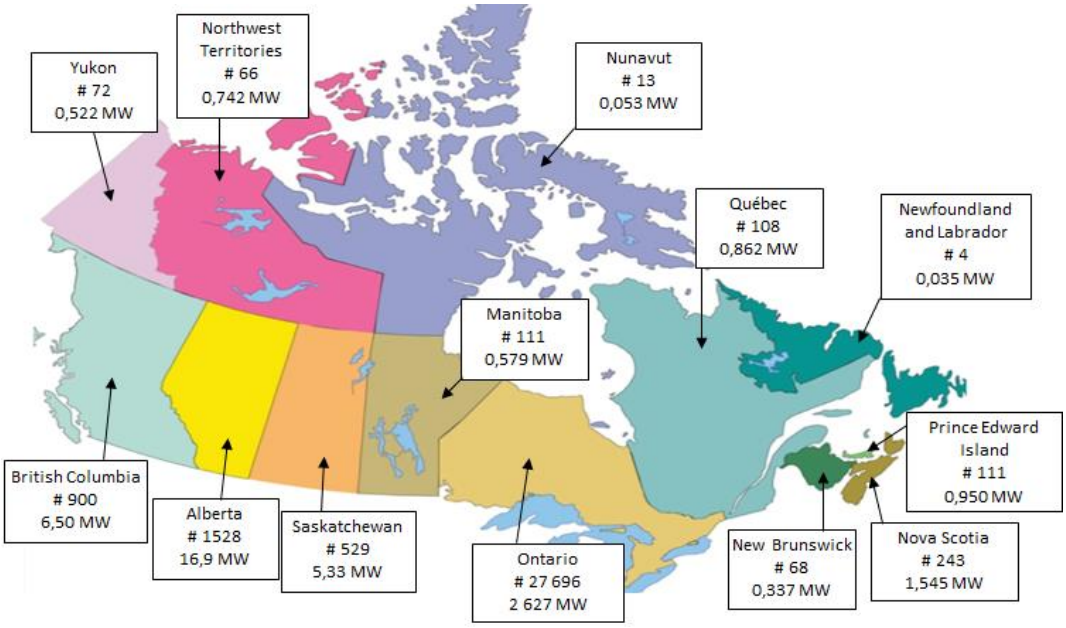
Calendar Year	2016
Number of PV systems in operation in your country (a split per market segment is interesting)	Centralized: 161 (est.) Distributed: 27 535 (est.)
Capacity of decommissioned PV systems during the year in MW	0
Total capacity connected to the low voltage distribution grid in MW	2 323 MW
Total capacity connected to the medium voltage distribution grid in MW	NA
Total capacity connected to the high voltage transmission grid in MW	329 MW

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

Sub-market	Stand-alone domestic (MW)	Stand-alone non-domestic (MW)	Grid-connected distributed (MW)	Grid-connected centralized (MW)	Total (MW)
1992	0,10	0,69	0,17	0	0,96
1993	0,19	0,84	0,19	0,01	1,23
1994	0,31	0,99	0,20	0,01	1,51
1995	0,45	1,19	0,21	0,01	1,86
1996	0,61	1,70	0,24	0,01	2,56
1997	0,86	2,26	0,25	0,01	3,38
1998	1,38	2,82	0,26	0,01	4,47
1999	2,15	3,38	0,29	0,01	5,83
2000	2,54	4,30	0,30	0,01	7,15
2001	3,32	5,16	0,34	0,01	8,83
2002	3,85	5,78	0,37	0,00	10,00
2003	4,54	6,89	0,40	0,00	11,83
2004	5,29	8,08	0,47	0,04	13,88
2005	5,90	9,72	1,07	0,06	16,75
2006	6,68	12,30	1,44	0,06	20,48
2007	8,09	14,77	2,85	0,06	25,77
2008	10,60	16,88	5,17	0,06	32,72
2009	15,19	20,01	12,25	47,12	94,57
2010	22,85	37,25	27,74	193,29	281,13
2011	23,31	37,74	131,16	366,11	558,29
2012	NA	NA	218,68	547,29	765,97

2013	NA	NA	273,19	937,29	1 210,48
2014	NA	NA	540,85	1 302,23	1 843,08
2015	NA	NA	735,81	1782,50	2 518,31
2016	NA	NA	790,11	1871,65	2 661,76

Figure 1: Cumulative utility interconnected PV (MW) systems as of December 31st, 2016 (including the total number of systems for each province).



2 COMPETITIVENESS OF PV ELECTRICITY

2.1 Module prices

As shown in table 6, over the past decade (2006 - 2016), relative module prices have declined by 85%.

Table 6: Typical module prices for a number of years (CAD/W)

Year	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**
Standard module crystalline silicon price(s): Typical	NA	NA	NA	11,09	10,70	9,41	7,14
Lowest prices							
Highest prices							
Year	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**
Standard module crystalline silicon price(s): Typical	6,18	5,53	4,31	5,36	4,47	3,91	3,31
Lowest prices							
Highest prices							
Year	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**
Standard module crystalline silicon price(s): Typical	2,27	1,52	1,15	0,95	0,85	0,80	0,78
Lowest prices			0,85	0,80	0,82	0,75	0,66
Highest prices							0,90

2.2 System prices

The industry reported system prices for grid-connected systems. The average installed turnkey price for grid connected applications was 2,00 - 3,50 CAD, but this price varies regionally and according to system size. A summary of typical system prices is provided in tables 7 and 8. From 2015 to 2016, the range of system prices for applications decreased up to 12,5%.

Table 7: **Turnkey Prices of Typical Applications – local currency (CAD)**

Category/Size	Typical applications and brief details	Current prices CAD / W
Off-grid Up to 1 kW		NA
Off-grid > 1 kW		NA
Grid-connected Rooftop up to 10 kW (residential)	Building applied PV system on a house	3,00 - 3,50
Grid-connected Rooftop from 10 to 250 kW (commercial)	Building applied PV system on a commercial rooftop	2,50 - 3,00
Grid-connected Rooftop above 250kW (industrial)	Large building applied PV system on a commercial rooftop	2,00 - 2,50
Grid-connected Ground-mounted above 1 MW	Ground-mounted utility scale PV system (1 - 10 MW)	< 2,00
Other category (hybrid diesel-PV, hybrid with battery)		NA

Table 8: National trends in system prices for different applications – local currency (CAD)

CAD/W	2001	2002	2003	2004	2005	2006	2007	2008
Residential PV systems < 10 KW	NA	NA	14,50	10,00	10,00	8,50	8,50	6,50
Commercial and industrial	NA	NA	NA	12,60	10,00	12,60	10,00	NA
Ground-mounted	NA	NA	NA	NA	NA	NA	NA	NA
CAD/W	2009	2010	2011	2012	2013	2014	2015	2016
Residential PV systems < 10 KW	8,50	6,50 - 8,00	6,79	3,00 - 5,00	3,44	3,00 - 4,00	2,80 - 6,00	3,00 - 3,50
Commercial and industrial	6,00 - 8,00	6,00	5,27	4,00	3,27	2,20 - 2,90	2,20 - 2,90	2,00 - 3,00
Ground-mounted	NA	4,00	3,50	2,80	2,88	2,00 - 2,60	2,00 - 2,60	< 2,00

2.3 Cost breakdown of PV installations

Table 9 lists the cost breakdown for a typical residential PV system under ten kilowatts in 2016.

2.3.1 Residential PV systems < 10 kW

Table 9: Cost breakdown for a residential PV system

Cost category	Average (CAD/W)	Low (CAD/W)	High (CAD/W)
Hardware			
Module	0,78	0,66	0,90
Inverter	0,45	0,30	0,60
Other (racking, wiring)	0,33	0,18	0,48
Soft costs			
Installation	1,80	1,20	2,40
Customer Acquisition			
Other (permitting, contracting, financing)			
Subtotal hardware	1,56	1,14	1,98
Subtotal soft costs	1,80	1,20	2,40
Total	**3,36**	**2,34**	**4,38**

2.4 Financial parameters and specific financing programs

With more than 99% of Canada's total installed capacity contracted with long-term power purchase agreements with the Independent Electricity System Operator in the province of Ontario, financing from institutional lenders has been available for projects, or portfolios of projects, that meet certain financial thresholds. Residential and small commercial projects have been less well served but the number of new options for low cost capital is growing.

The intent to create a new infrastructure bank "Canada Infrastructure Bank" was announced by Canada's federal government in 2016. The Bank will invest $35 billion from the federal government into transformative infrastructure projects including $5 billion for green infrastructure projects, including those that reduce greenhouse gas emissions and promote renewable power. Further details on how the bank will support solar projects is expected in 2017.

Table 10: PV financing scheme

Average rate of loans – residential installations	N/A
Average rate of loans – commercial installations	N/A
Average cost of capital – industrial and ground-mounted installations	N/A

2.5 Specific investments programs

Table 11: Summary of investment programs

Third Party Ownership (no investment)	Several companies offer third party ownership and leasing services. The residential market in Ontario has been dominated by this approach to date.
Renting	
Leasing	

Financing through utilities	Several utilities offer loans to their customers for energy efficiency upgrades. In most cases, solar has been excluded to date.
Investment in PV plants against free electricity	There are several approaches to "Community Solar" being trialled and tested throughout Canada.
Crowdfunding (investment in PV plants)	
Other (please specify)	Under Ontario's FIT program, many companies install and own systems on residential and commercial/industrial rooftops that are leased by a third party whereby the building owner receives monthly payments for the space on the roof with little or no initial investment.

2.6 Additional country information

Canada's electricity sector is regulated provincially and is comprised primarily of a mixture of wholesale open markets and vertically integrated crown corporations. Electricity generation in Canada was estimated to be 561,3 TWh in 2016 with the largest producers of electricity being the provinces of Quebec, Ontario, British Columbia, and Alberta. The population of Canada was estimated to be 36,29 million inhabitants at the end of 2016.

Table 12: Country information

Retail electricity prices for a household (range)	72,3 - 178,1 CAD / MWh [1]
Retail electricity prices for a commercial company (range)	51,9 - 176,6 CAD / MWh [1]
Retail electricity prices for an industrial company (range)	41,8 - 130,4 CAD / MWh [1]
Population at the end of 2016	36 285 400
Country size (km^2)	9 985 000
Average PV yield (according to the current PV development in the country) in kWh/kW	1 150
Name and market share of major electric utilities.	Hydro-Québec, BC Hydro and Power, Alectra

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 for PV installations

A number of direct support policy measures have been put in place in Canada. Table 13 summarizes the different PV support measures. The most significant PV-specific support measures have been in Ontario through a feed-in tariff policy.

3.1.1 New, existing or phased out measures in 2016

Ontario: The province of Ontario continued its procurements at the residential and commercial scales. Residential-scale solar (≤ 10 kW) was procured through the microFIT program which has an annual procurement target of 50 MW. Commercial-scale solar (>10 ≤ 500kW) was procured through the FIT program. Phase II of the Large Renewable Procurement (LRP) program which was expected

to competitively contract 140 MW in 2016 was postponed indefinitely due to a near-term electricity over-supply situation.

Saskatchewan: The province of Saskatchewan continued its net-metering rebate program which offers a one-time rebate, equivalent to 20% of eligible costs to a maximum payment of $20 000 for an approved and grid interconnected net metering project. This program is offered through the province's largest utility SaskPower but is available to all electricity customers in the province.

Manitoba: In 2016, Manitoba Hydro introduced a program available to residential, commercial and industrial customers that offered $1 per watt installed (as per the DC rating of the solar PV system) for systems from 1 kW to 200 kW.

Rebates are offered in several other provinces, territories and municipalities including Yukon, Northwest Territories, and Medicine Hat.

3.1.1.1 BIPV development measures

At present, there are no targeted BIPV development requirements across Canada however several voluntary green building programs have given rise to demonstration projects.

3.1.1.2 Rural electrification measures

In Canada, there are nearly 300 off-grid communities with a total population of approximately 200 000 people. These communities include Aboriginal and non-Aboriginal settlements, villages or cities as well as long-term commercial outposts and camps for mining, fishing and forestry activities. Of these sites, approximately 175 are indigenous communities (First Nations, Innu, Inuit or Métis) of which 16 of 29 have approximately 130 000 residents. There are several initiatives in partnership across all levels of Government to assist with the transition of these communities from diesel fuel to cleaner sources of energy including solar.

3.1.1.3 Support for electricity storage and demand response measures

Table 13: PV support measures summary

	On-going measures (residential)	Measures that commenced during 2016 (residential)	On-going measures (commercial and industrial)	Measures that commenced during 2016 (commercial and industrial)	On-going measures (ground-mounted)	Measures that commenced during 2016 (ground-mounted)
Feed-in tariffs	Yes (Province of Ontario) 50 MW microFIT (≤ 10 kW)		123,5 MW and 100 MW of FIT 3 and FIT 3 extension (> 10 ≤ 500 kW)			
Feed-in premium (above market price)						
Capital subsidies	Yes (Provinces					

	including Saskatchewan and municipalities including Medicine Hat, Alberta and territories including Northwest Territories).					
Green certificates	Yes (voluntary)					
Renewable portfolio standards (RPS) with/without PV requirements	No					
Income tax credits	No					
Self-consumption	Many utilities are active in several ways including residential lease-to-own programs					
Net-metering						
Net-billing						
Collective self-consumption and virtual net-metering	Several provinces and regulators explored a variety of approaches to “Community Solar” in 2016.					
Commercial bank activities e.g. green mortgages promoting PV						
Activities of electricity utility businesses						
Sustainable building requirements			Yes (voluntary)			
BIPV incentives						
Other (specify)						

3.2 Self-consumption measures

Table 14: Self-consumption measures summary

PV self-consumption	1	Right to self-consume	Throughout Canada
	2	Revenues from self-consumed PV	Applied as credits or monetarily depending on the jurisdiction
	3	Charges to finance Transmission & Distribution grids	Offset in some instances, paid on others depending on the jurisdiction
Excess PV electricity	4	Revenues from excess PV electricity injected into the grid	Applied as credits or monetarily depending on the jurisdiction
	5	Maximum timeframe for compensation of fluxes	Most typically one year
	6	Geographical compensation	Typically uniform within a jurisdiction
Other characteristics	7	Regulatory scheme duration	Various, depending on jurisdiction
	8	Third party ownership accepted	Various, depending on jurisdiction
	9	Grid codes and/or additional taxes/fees impacting the revenues of the prosumer	Various, depending on jurisdiction
	10	Regulations on enablers of self-consumption (storage, DSM)	Various, depending on jurisdiction
	11	PV system size limitations	Various, depending on jurisdiction
	12	Electricity system limitations	Various, depending on jurisdiction
	13	Additional features	None

3.3 Collective self-consumption, community solar and similar measures

Measures for collective self-consumption (e.g. PV systems for several apartments in the same building), virtual net-metering (allowing consumption and production in different places), and community solar (investment by several private or public persons) have begun in several Canadian jurisdictions with the potential for implementation in 2018 or later.

3.4 Financing and cost of support measures

The ways in which incentives are paid in Canada varies from region to region. Ontario's feed-in tariff is funded by electricity consumers. Means by which other programs are funded include provincial and municipal taxes.

3.5 Indirect policy issues

In 2016, Canada's Federal Government announced that there would be a price on carbon throughout Canada starting at a minimum of $10 per tonne in 2018, and rising by $10 per year to $50 per tonne in 2022. This measure will level the economic playing field between emitting and

non-emitting resources and create new revenue streams for re-investment in technologies that displace greenhouse gas emissions such as solar PV.

In 2016, the Federal Government also launched the Pan-Canadian Framework on Clean Growth and Climate Change. This document presents a strategy for Canada to meet its national obligations under the Paris Agreement. The strategy includes numerous policy and regulatory measures that could and will directly and indirectly support solar once implemented.

4 HIGHLIGHTS OF R&D

4.1 Highlights of R&D

NRCan's CanmetENERGY is responsible for conducting PV R&D activities in Canada that facilitate the deployment of PV energy technologies throughout the country. The PV program coordinates national research projects, contributes to international committees on the establishment of PV standards, produces information that will support domestic capacity-building and organizes technical meetings and workshops to provide stakeholders with the necessary information to make informed decisions. In 2016, research on the performance, cost and durability of PV systems in the arctic was identified as a priority to support the clean electricity program in Canadian northern territories. In addition, research also studies the integration of solar PV in remote grids.

A Business-led Network of Centres of Excellence was established in 2014. The Refined Manufacturing Acceleration Process (ReMAP), headquartered at Toronto-based Celestica, is developing an ecosystem for commercialization that links academics, companies and customers. With access to 38 labs and manufacturing lines across the country, the ReMAP network will work with participating companies from the information and communications technologies, healthcare, aerospace, defence and renewable energy sectors to quickly identify innovations that are most likely to succeed, and then accelerate the product commercialization and global product launch.

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

As shown in table 15, provincial, territorial and federal budgets allocated to solar photovoltaic research and development amounted to 8,75 M CAD, demonstration allocations amounted to 6,25 M CAD, for a total budget of 15 M CAD in 2016.

Table 15: Public budgets for R&D, demonstration/field test programmes and market incentives in 2016 (millions CAD).

	R & D	Demo/Field test
National/federal State/regional	8,75 M CAD	6,25 M CAD
Total	15,00 M CAD	

5 INDUSTRY

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

Canada continues to produce feedstock for the global solar industry through 5N Plus (Table 16). 5N Plus is a Canadian company, with 14 manufacturing facilities in Canada, US, Malaysia, England, China, Belgium and Laos. They have 18 sales offices in Asia, Europe, North America and South

America. First Solar (US) is their primary customer and is the largest thin film PV module producer worldwide.

Table 16: 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)
5N Plus	CdTe & CIGS high purity compounds	350 tonnes (2010 est.)		

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.

Table 17 presents data from three companies in Canada producing PV modules, all of which have their facilities located in the province of Ontario and are involved in contract manufacturing of modules for other multi-national companies. Together, these three companies produced an estimated 252 MW/year, largely for the domestic market in Canada. Total PV cell and module manufacture together with production capacity information is summarised in Table 17.

Table 17: Manufacturing and production capacity information for 2016

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					
Silfab	sc-Si, mc-Si				144
Heliene	mc-Si				58
Canadian Solar Inc	sc-Si, mc-Si				50
Total					**252**
Thin film manufacturers					
Cells for concentration					
TOTALS					**252**

5.3 Manufacturers and suppliers of other components

A comprehensive sector profile report was published in March 2012 which explores the whole PV supply chain in Canada, including balance of system technologies. The *Sector Profile for Solar Photovoltaics in Canada* can be found online from the CanmetENERGY [2] website.
The balance of system technology market in Canada is mainly served by foreign companies with operations in Canada, or production through contract manufacturing. The companies that have development and manufacturing facilities in Canada include Schneider-Electric (Xantrex), Eaton and Sungrow Canada.

6 PV IN THE ECONOMY

6.1 Business value

The value of PV business in Canada as it relates to the solar PV capacity installations in 2016 is estimated at 341 M CAD as detailed in table 18 below.

Table 18: Value of PV business

Sub-market	**Capacity installed *in 2016* (MW)**	**Price CAD / W** *(from table 7)*	**Value (M CAD)**	**Totals**
Off-grid domestic	*NA*	*NA*	*NA*	*NA*
Off-grid non-domestic	*NA*	*NA*	NA	*NA*
Grid-connected distributed	54,30	3,00	*162,9*	*162,9*
Grid-connected centralized	89,15	2,00	*178,3*	*178,3*
				341,2
Export of PV products				*NA*
Change in stocks held				*NA*
Import of PV products				*NA*
Value of PV business				***341,2 M CAD***

7 INTEREST FROM ELECTRICITY STAKEHOLDERS

7.1 Structure of the electricity system

Each Canadian province and territory has jurisdiction over its electricity sector and as a result the market structure and regulations of each is unique (although several inter-ties do join the systems). For example, Quebec, British Columbia, Manitoba and Newfoundland and Labrador are hydropower-dominated provinces characterized by low production costs, a dynamic export orientation and public ownership. Alberta and New Brunswick moved away from the centrally managed model through the creation of an independent system operator (ISO) and more competitive wholesale markets. Saskatchewan, Nova Scotia, and Prince Edward Island (PEI) are structured along vertically integrated utilities and highly dependent on fossil fuels, leading to high prices as in restructured provinces.

7.2 Interest from electricity utility businesses

Given the diversity in market structures across Canada, the interest from electricity utility businesses is equally variable. In Ontario, several utilities have established unregulated subsidiaries to act as generators and participate in Ontario's Feed-In Tariff program while others simply interconnect projects and handle the settlement of payments. In other jurisdictions, utilities offer rebates, manage net-metering or offer solar financing products such as lease-to-own. Given the renewed focus on climate policy and the rapidly declining costs in solar electricity, many utilities begun to explore solar seriously in 2016.

7.3 Interest from municipalities and local governments

There are over 3,500 urban and rural municipalities in Canada. All are driven to be economically and environmentally sustainable. Several municipalities continued to explore solar throughout 2016 including the Town of Banff who introduced Canada's first municipal feed-in tariff (approved in February 2015).

8 HIGHLIGHTS AND PROSPECTS

The Canadian market for Solar PV will continue to advance in 2017. While in the past, most market activity was driven by Ontario's microFIT, FIT and LRP programs, development activity will begin to diversify throughout the country as those programs end and as new opportunities arise.

Inter-provincial collaboration on climate change policies are expected to be a driver for new solar policy. As the installed price of solar PV systems comes down, the levelized cost of electricity (LCOE) for solar PV is set to reach parity with the higher electricity tier rates in the various Canadian markets between 2017 and 2020. Reaching this milestone for grid-connected PV in Canada will encourage Canadian households to both produce and import electricity to meet their needs.

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