CANADA

PHOTOVOLTAIC TECHNOLOGY STATUS AND PROSPECTS 2012

Patrick Bateman, Canadian Solar Industries Association (CanSIA) (http://www.cansia.ca)
Lisa Dignard-Bailey and Yves Poissant, CanmetENERGY, Natural Resources Canada

GENERAL FRAMEWORK

Canada's Department of Natural Resources (NRCan) supports priorities to promote the sustainable and economic development of the country's natural resources, while improving the quality of life of Canadians. CanmetENERGY [1], reporting to the Innovation and Energy Technology Sector of NRCan, is the largest federal energy science and technology organization working on clean energy research, development, demonstration and deployment. Its goal is to ensure that Canada is at the leading edge of clean energy technologies to reduce air and greenhouse gas emissions and improve the health of Canadians.

The Province of Ontario, Canada's most populous and second largest province, leads the country in photovoltaic (PV) investment. In 2012 an additional 267 MW was installed, for a cumulative capacity of 645 MW_{AC} in operation. This is a 70% increase over the 2011 installed capacity.

Figure 1: A 260 kilowatt solar PV rooftop system installed at the Okanogan College in British Columbia to meet ambitious target for the living challenge and help train students in green construction practices (Photo: Skyfire Energy)

The next most notable developing market is that of the province of Alberta (Canada's fourth largest and third most populous) due to its Micro-Generation Regulation [2] and programs such as ENMAX's Generate Choice [3]. In the province of British Columbia several large demonstration projects significantly increased the installed capacity. Figure 1 highlights the most recent 260 kilowatt PV installation at the Okanogan College targeting net-zero energy consumption. In the Northwest Territories a large 61 kW_p PV system was installed (Figure 2) to assess the cost and benefits of PV for diesel-powered remote community microgrids.

NATIONAL PROGRAMME

Research and Demonstration

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. Most research projects are carried out, on a cost-sharing basis, with industry, universities, research groups, quasi-public agencies, and other departments and governments.

The PV Innovation Research Network, funded by the Natural Sciences and Engineering Research Council (NSERC), brings together a core group of 32 academic researchers in Canada, as well as CanmetENERGY, the National Research Council, the Ontario Center of Excellence and 15 industrial partners. The network submitted its midterm report and held its third national scientific conference and first Canadian PV graduate school event. The network focuses its efforts on organic, nanostructure and other innovative PV device approaches that have the potential to leapfrog existing and established technologies.

The NSERC Smart Net-Zero Energy Buildings Strategic Network (SNEBSN) performs research that will facilitate widespread adoption in key regions of Canada of optimized net zero energy buildings design and operation concepts by 2030. CanmetENERGY is contributing to this research effort and is leveraging its activities through its leadership of a large international collaboration for the IEA-SHC/ECBS Task 40/Annex 52, entitled "Towards Net Zero Energy Solar Buildings". To achieve this objective, Task/Annex experts from 18 countries, including Canada, will document research results and promote practical demonstration projects that can be replicated worldwide.

Figure 2: Fort Simpson is Northwest Territories Power Corporation largest diesel-powered community. This 61 kilowatt system (the largest North of 60 degrees in Canada) will help displace 15 000 litres of fuel annually and provide up to 8.5% of the villages' minimum power requirements during the summer. (Photo: Skyfire Energy)`

IMPLEMENTATION

Ontario's Feed-In Tariff Program

Ontario's Feed-In-Tariff (FIT) and microFIT programs, managed by the Ontario Power Authority (OPA), are North America's first comprehensive guaranteed pricing structure for electricity production from renewable fuel sources including solar-PV, bio-energy, waterpower and wind. In 2012 the program pricing schedule for PV systems was revised to reflect decreasing equipment costs and other market factors [4].

As of December 2012, the OPA received, under the FIT program, 10 299 applications representing about 21 292 MW_{AC} of PV generating capacity. Of these applications, more than 1 700 projects currently have contracts for roughly 4 500 MW_{AC} of capacity. Under the microFIT program, the OPA has received approximately 56 000 applications representing 514 MW_{AC} of generating capacity, 99% of which was for solar PV. Roughly 14 800 microFIT projects have been contracted so far, representing 130 MW connected to the grid.

The OPA recently opened an application period for small FIT projects (>10 kW_{AC} up to 500 kW_{AC}), from which it expects to award up to 200 MW_{AC} worth of contracts. Because of delays, some suppliers under the precursor program to FIT, the RESOP program, have been given extensions to complete their projects. The OPA reported that approximately 395 MW_{AC} of solar PV is operational and 80 MW_{AC} is still under development from the RESOP program.

Alberta micro-generation program

A new renewable energy micro-generation program from ENMAX Energy Corporation was introduced in the province of Alberta in 2010 [3]. ENMAX Energy is a subsidiary of ENMAX Corporation which is owned by The City of Calgary. As part of the new program partly funded by the Alberta Climate Change and Emissions Management (CCMEC) Corporation, ENMAX will deliver turnkey home generation solutions (including wind and solar) to residential consumers across Alberta. To date ENMAX has installed more than 500 kW_p of micro-generation in Alberta under the program. The not-for profit CCMEC Corporation was established in the province of Alberta to "achieve actual and sustainable reductions in greenhouse gas emissions and facilitate climate change adaptation by stimulating transformative change through investments in climate change knowledge, clean technology development and operational deployment."

Industry Status

Canada's solar sector has experienced continued significant investment over the last 4 years. Employment in PV-related areas in Canada has grown with a 2012 labour force estimated at over 5 500 compared to 2 700 jobs in 2009.

In 2012, a Sector Profile for Solar Photovoltaics in Canada was published. It reported on the state of the PV market including various incentives in place, describing the PV supply chain, key manufacturers, economic impacts, workforce capability and the state of R&D initiatives in Canada. [5]

Market

PV power capacity in Canada grew at an annual rate of 25% between 1994 and 2008. In recent years this growth was 202% in 2010 and 49% in 2011 due to the Ontario incentive programs. Provincial and Territorial government policies are now all supporting "net-metering" of PV power and have encouraged a number of building integrated PV applications. The market uptake has been low for net-metering applications as shown in Figure 3 due to the low price of electricity in most regions of Canada.

A sustainable market for remote and off-grid applications has developed over the last 18 years in Canada and accounted for 84% of the cumulative PV installed capacity in Canada in 2008. However the off-grid market represented less than 1 % of PV systems installed in Canada in 2011 due to the large growth of grid-connected applications. The national survey completed for 2011 showed a significant decrease in PV module prices (weighted average) to 1,52 CAD per watt, compared to 9,41 CAD in 2001. This represents an average annual price reduction of 20 % over a 10-year period.

Future Outlook

The Feed-In Tariff (FIT) Program in the province of Ontario is viewed by the Canadian PV industry as a major step towards developing a competitive, strong Canadian solar industry. Other Canadian provincial and territorial governments continue to evaluate the potential for accelerating the deployment of solar PV in their energy mixes with significant progress expected in Alberta in 2013. The Canadian Solar Industry Association in their strategic planning process has identified innovation in the solar electricity sector as a key strategic opportunity for Canada. A committee will support an in-depth analysis of opportunities for innovation in solar electricity generation and prepare a Solar Electricity Innovation Roadmap for Canada in 2013.

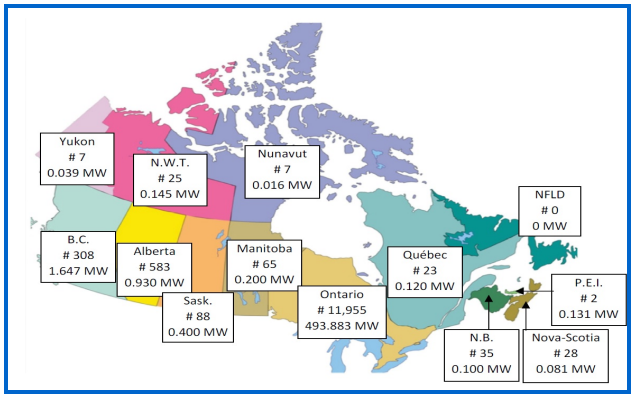

Figure 3: Map showing the Canadian provinces, the capacity (megawatt) and the number of utility interconnected PV Systems in 2011

References

[1] CanmetENERGY: http://canmetenergy-canmetenergie.nrcan-rncan.gc.ca/eng/

[2] Alberta Utilities Commission. Micro-Generation Regulation (Rule 024).

[3] Enmax Generate Choice: http://www.generatechoice.ca/

[4] OPA Feed-in Tariff Program: http://fit.powerauthority.on.ca/

[5] Sector Profile for Solar PV in Canada: http://canmetenergy.nrcan.gc.ca/renewables/solar-photovoltaic/publications/3092