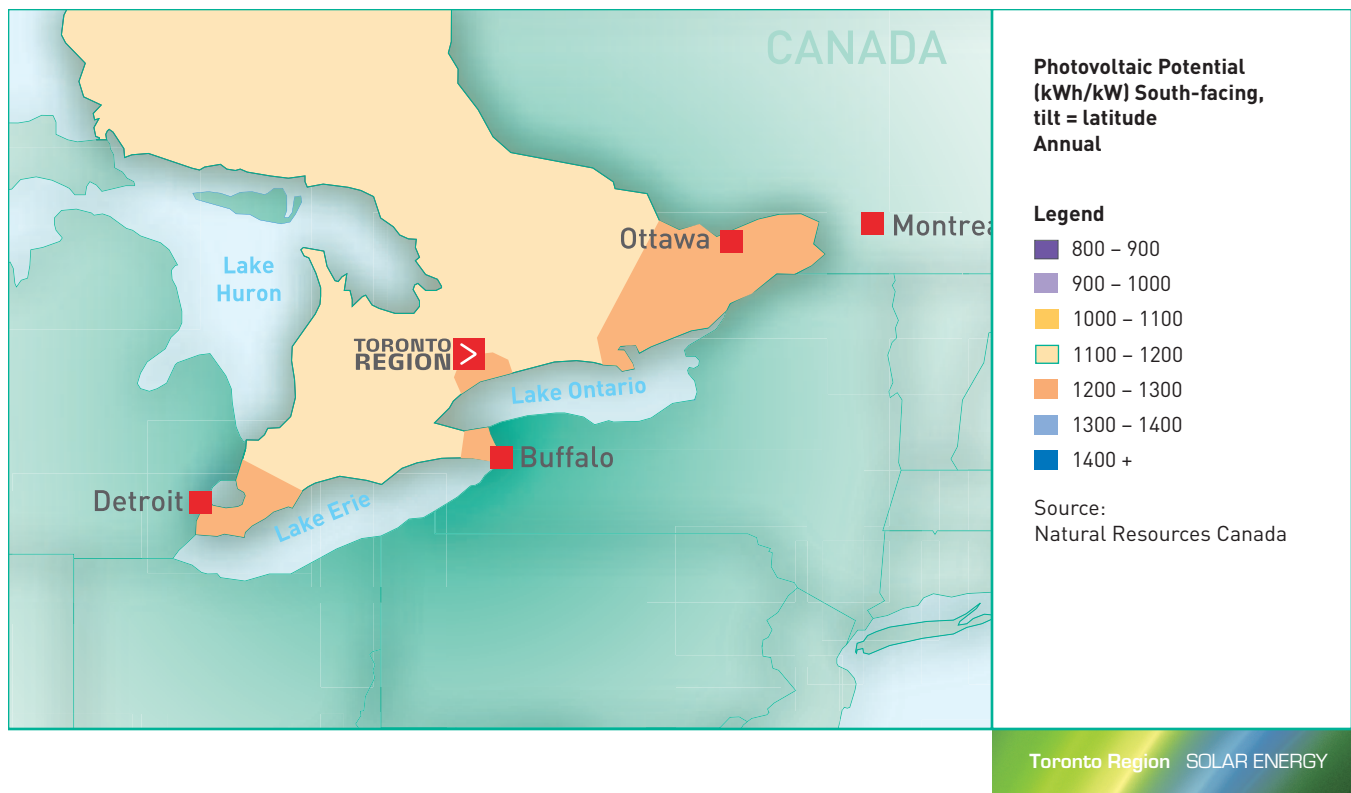


# GLOBALLY-RECOGNIZED CLUSTERS IN THE TORONTO REGION: SOLAR ENERGY

## THE TORONTO REGION IS ...

- Located in the heart of 25 million acres of farmland – an ideal place to set up solar power technology due to the relatively high annual south-facing photovoltaic potential
- Part of a sophisticated electricity infrastructure and a growing demand for clean, reliable electricity generation:
  - Government of Ontario recently introduced the *Green Energy Act (GEA)* which aims to increase investment in renewable energy projects and increase conservation
- The site of Canada’s first solar-powered community in Waterloo in 2002
- A growing hub with over 130 companies that design and install photovoltaic products for public and commercial needs, including: Arise Technologies, ATS Automation Tooling Systems, Bodycote, Danfoss, Enersource Hydro Mississauga Services, GE Energy, Hydro One Networks, Meikle Automation, Mondel Engineering, Pall, Sanyo Corp., SkyPower Corp., Taco, Toronto Hydro, Umicore Catalyst, and Viessmann Manufacturing
- Home to more than 100 university programs in engineering, physical and environmental sciences
- Producing an educated and highly-skilled workforce – over 3,400 university graduates (all levels) in solar energy related programs in 2007

## Toronto Region Photovoltaic Potential



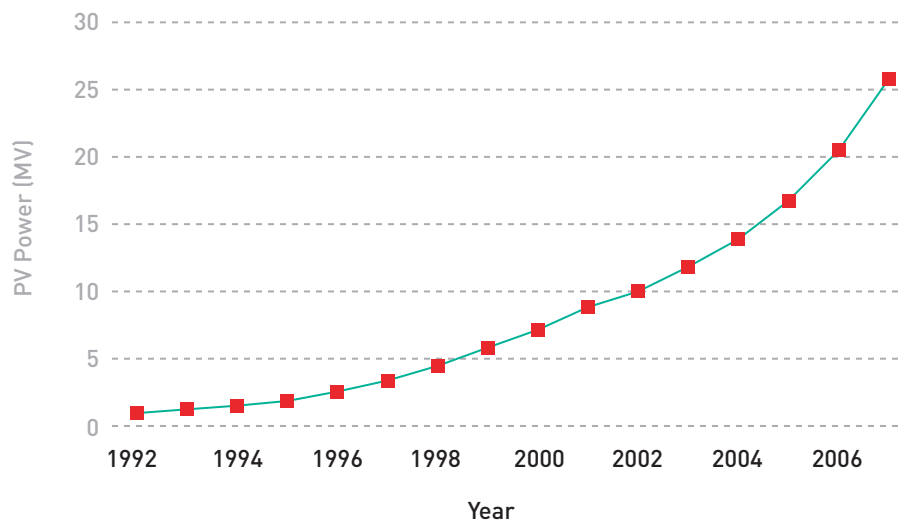
## ADVANTAGES

- A world-leading economic region:
  - Ranked #1 for the soundness of its banking system by World Economic Forum (*Global Competitiveness Report 2008-2009*)
  - Ranked #3 in North America by MasterCard's Worldwide Centres of Commerce (2008)
  - Ranked #7 Top City Regions of the Future by Foreign Direct Investment magazine (2009)
  - Ranked #10 of the World's Top Global Cities (Global Cities Index (2008)
  - Ranked #10 most economically powerful city by Forbes.com (July 2008)
  - Ranked #11 of 62 in the 2009 Global Financial Cities Index
- 7.4 million people live in the Toronto Region, making it the 4<sup>th</sup> largest urban region in North America
- Immigration responsive to company needs:
  - Uncapped number of work permits available to foreign workers
  - Process for intra-company transfers is fast and straightforward
  - Special programs allow employers to permanently recruit high-end research staff and other workers within defined occupations
- Business-friendly environment:
  - Canada ranked #1 in number of procedures required to start a business, and #2 in time required to start a business (World Economic Forum, *Global Competitiveness Report 2008-2009*)
  - Ranked #4 globally for Ease of Doing Business by MasterCard Worldwide Center of Commerce Index (2008)
- Canada's largest centre for research and education – location for 35% of all R&D conducted in Canada
- Highly-skilled workforce of 1.8 million (25-64 years of age) drawn from the most educated population in the G8: 64% hold a post-secondary degree or equivalent
- Part of a well-developed transportation infrastructure – air, rail and highway corridors – that easily moves people and goods to cities in the US Midwest and Northeast

## SUPPORTIVE GOVERNMENT PROGRAMS

- **Government of Canada:** Sustainable Development Technologies Canada; Scientific Research & Experimental Development Expenditures; NRC Industrial Research Assistance Program; New Environmental Technologies Evaluation; Financial Support – Science & Technology; and Canadian Environmental Technology Information Centre

Growth of Photovoltaic Power in Canada, 1992 - 2006



The domestic market growth of solar energy products has been approximately 25% per year between 1992 and 2006, with a total installed capacity of 20.5 megawatts in 2006

- **Government of Ontario:** ecoEnergy for Renewable Heat; Ontario Solar Thermal Heating Incentive; Renewable Energy Standard Offer Program; Ontario Research Fund; Innovation Demonstration Fund; Investment Accelerator Fund; Business Mentorship and Entrepreneurship Program; Next Generation of Jobs Fund: Strategic Opportunities Program; and Ontario Business Research Institute Tax Credit

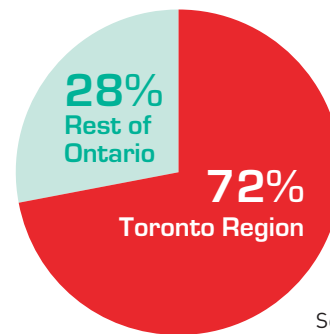
## WORLD-LEADING RESEARCH AND EDUCATION

- Toronto Region universities are a hub of research excellence recognized by major Canadian granting agencies:
  - Canada Foundation for Innovation awarded \$3.3 million in infrastructure grants 2001-2008
  - Natural Sciences and Engineering Research Council (NSERC) awarded \$3.5 million to projects in the Toronto Region (2003-2008)
- A centre of advanced research and development based in Toronto Region universities, including:
  - **McMaster University:** Centre for Electrophotonic Materials & Devices, Management of Innovation & New Technology Research Centre, McMaster Institute for Energy Studies (MIES), McMaster Manufacturing Research Institute, Power Research Laboratory, and Brockhouse Institute for Materials Research
  - **Ryerson University:** Thermofluid Research Lab
  - **University of Guelph:** Electrochemical Technology Centre, and Centre for Agricultural Renewability Energy and Sustainability
  - **University of Toronto:** Centre for Applied Power Electronics, Energy Systems Group, Photonics Group, Institute for Optical Science, U of T St. George Campus Sustainability Office, and UTM Environmental Affairs Office
  - **University of Waterloo:** The Center for Advanced Photovoltaic Devices and Systems (CAPDS),  $\alpha$ -SiDIC: Amorphous Silicon Devices and Integrated Circuits Laboratory, Power and Energy Systems Group, Building Engineering Group (BEG), Waterloo Institute of Sustainable Energy, Waterloo Inorganic Materials Division
  - **York University:** Institute for Research and Innovation in Sustainability

### Web Links

Toronto Region Research Alliance	<a href="http://www.trra.ca">www.trra.ca</a>
McMaster University	<a href="http://www.mcmaster.ca">www.mcmaster.ca</a>
Ryerson University	<a href="http://www.ryerson.ca">www.ryerson.ca</a>
University of Guelph	<a href="http://www.uguelph.ca">www.uguelph.ca</a>
University of Toronto	<a href="http://www.utoronto.ca">www.utoronto.ca</a>
University of Waterloo	<a href="http://www.uwaterloo.ca">www.uwaterloo.ca</a>

### Solar Companies in Ontario



Source: Industry Canada



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# The Solar Energy cluster stems from Toronto Region's research and development in photovoltaic devices

