

THINK EN3

THINK DURHAM



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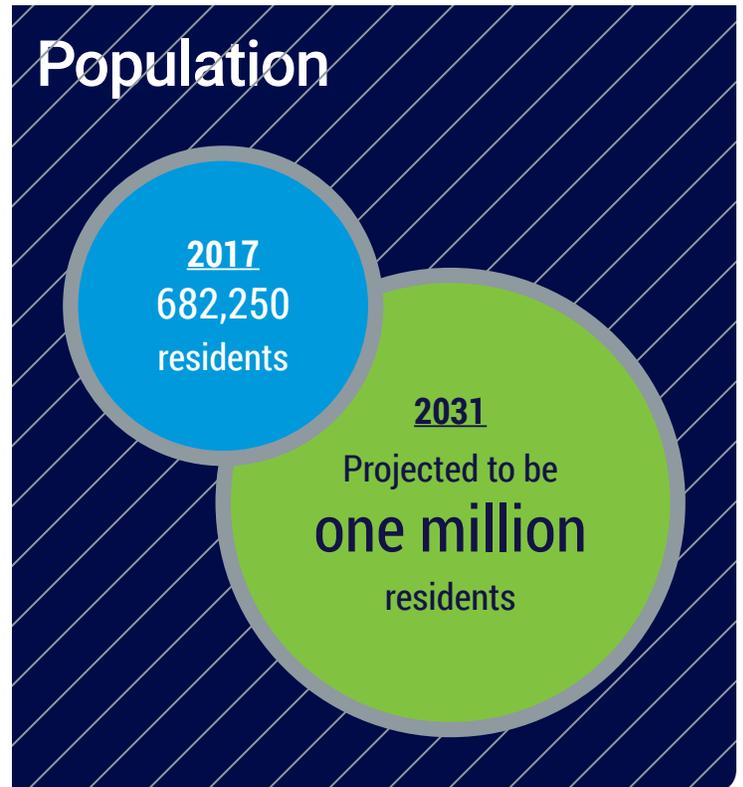
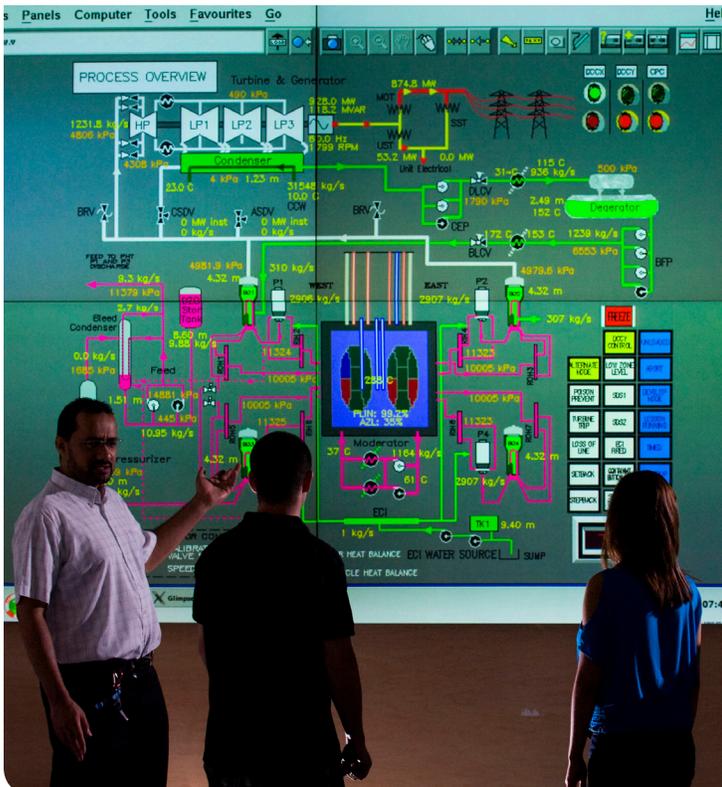
Meet **Durham Region**

A world-class location for the EN3 (Energy, Environment, Engineering) industries

Located on the eastern edge of the Greater Toronto Area (GTA), Durham Region's reasonable cost of doing business, skilled workforce, and high quality of life have combined to make it one of the fastest-growing regions in North America.

These attributes—in conjunction with an EN3-friendly business environment—have led to a prospering energy, environment and engineering sector that makes Durham Region an ideal location for the expansion or relocation of Energy, Environment, Engineering businesses.

The rise of smart manufacturing technology, known as "Industry 4.0," has created opportunities to advance traditional EN3 activity. Numerous corporations in Durham have successfully implemented these cutting-edge EN3 technologies and are investing in a sustainable future.



Energy, Environment, and Engineering (EN3)

Durham Region's strengths in the energy, environment, and engineering (EN3) fields are converging into a large integrated sector with services and manufacturing interests that span all three domains.

This fusion of interests will continue to accelerate as the federal and provincial governments develop and fund stepped-up power-generation, sustainability, and climate-change plans. Notable initiatives include:

- The \$1.8 billion Darlington nuclear plant refurbishment project, which solidifies Durham Region as an important nuclear industry supply chain node.
- Numerous environmentally-friendly infrastructure projects supported by funding from the federal and provincial governments, both of which place a high priority on infrastructure spending. Ontario's total infrastructure spending over the next decade will be \$182 billion, with the federal government providing \$11.8 billion. Opportunities to attract new businesses and expansions from Europe and the U.S. are heightened by Ontario's international reputation as a North American leader in utilizing the public-private partnership (P3) model for large infrastructure projects.

Firms locating in Durham can tap into the significant professional, scientific, and technical services talent pool that resides in the region. The growth of this talent pool is an important part of Durham's shift from manufacturing to services employment, in which highly qualified personnel are required.

During the "great recession" the employment decline

in the EN3 sector was much less than in other areas, and the rebound was faster and stronger. From mid-2009 to 2013, the sector grew by 141,000 jobs, 14 per cent of the national increase of just over one million jobs.

Durham has much more EN3 talent than is employed locally, with many professionals commuting to work elsewhere. The region has a significant net outflow of its resident workforce in engineering, architectural and related services; management, scientific and technical consulting services; computer systems design and related services; and residential and commercial construction.



Energy

Over the course of four decades, an energy cluster has developed in Durham Region. From the establishment of the first Pickering Nuclear Generating Station in 1965, through to the 2003 launch of Ontario Tech University—which brought internationally connected researchers to the area—Durham has developed a solid reputation in the energy sector.

With generation came infrastructure: a grid that transmits and distributes power throughout the province. Since then, Durham has not only become home to industry leaders in the energy sector, including Ontario Power Generation (OPG), Enbridge Inc., SNC-Lavalin, Veridian Corporation and Siemens Canada, it has also seen the local emergence of alternative sources of generation.



Forward-thinking energy planning in Durham

Region: The Durham York Energy Centre, a state-of-the-art 20 MW energy-from-waste generation collaboration between Durham and York Regions processes 140,000 tonnes of non-hazardous solid waste per year to generate electricity.

Many supply-demand relationships exist between players that produce, transmit, ship and/or

consume energy and their suppliers. In addition to nuclear power generation, Durham's business community includes several energy industry cluster-intensive characteristics such as:

- **Hydro One** – electrical power transmission
- **Elexicon Corporation** – electrical power distribution
- **Enbridge** – bulk oil and gas pipeline operation
- **Gas Distribution** – local gas distribution
- **Black and McDonald** – electrical equipment supply
- **Oshawa PUC** – power generation

This area is well suited as a base for companies created from energy-related university research and offers opportunities in alternative generation and fuels adjacent to a significant energy consuming market. Representing a full spectrum of the energy cycle, Durham's skilled labour force, transmission capacity and infrastructure are supported by research and development opportunities, along with specialized training and educational institutions to make this a major energy cluster in North America.

Nuclear Energy

Ontario is the centre of the Canadian nuclear industry, which is the seventh largest in the world. The national nuclear industry association, the Organization of Canadian Nuclear Industries (OCNI), is headquartered in Pickering. Durham Region's Economic Development Division and Ontario Tech University are both active members of OCNI.

Durham Region hosts two principal nuclear power generation operations—Ontario Power Generation's Pickering and Darlington facilities. The presence of these two facilities results in significant opportunities for manufacturing, engineering, and service companies in the nuclear and power generation sector.

Four units at the Darlington generating facility are undergoing a major \$12.8 billion refurbishment that will result in \$14.9 billion in economic benefits,

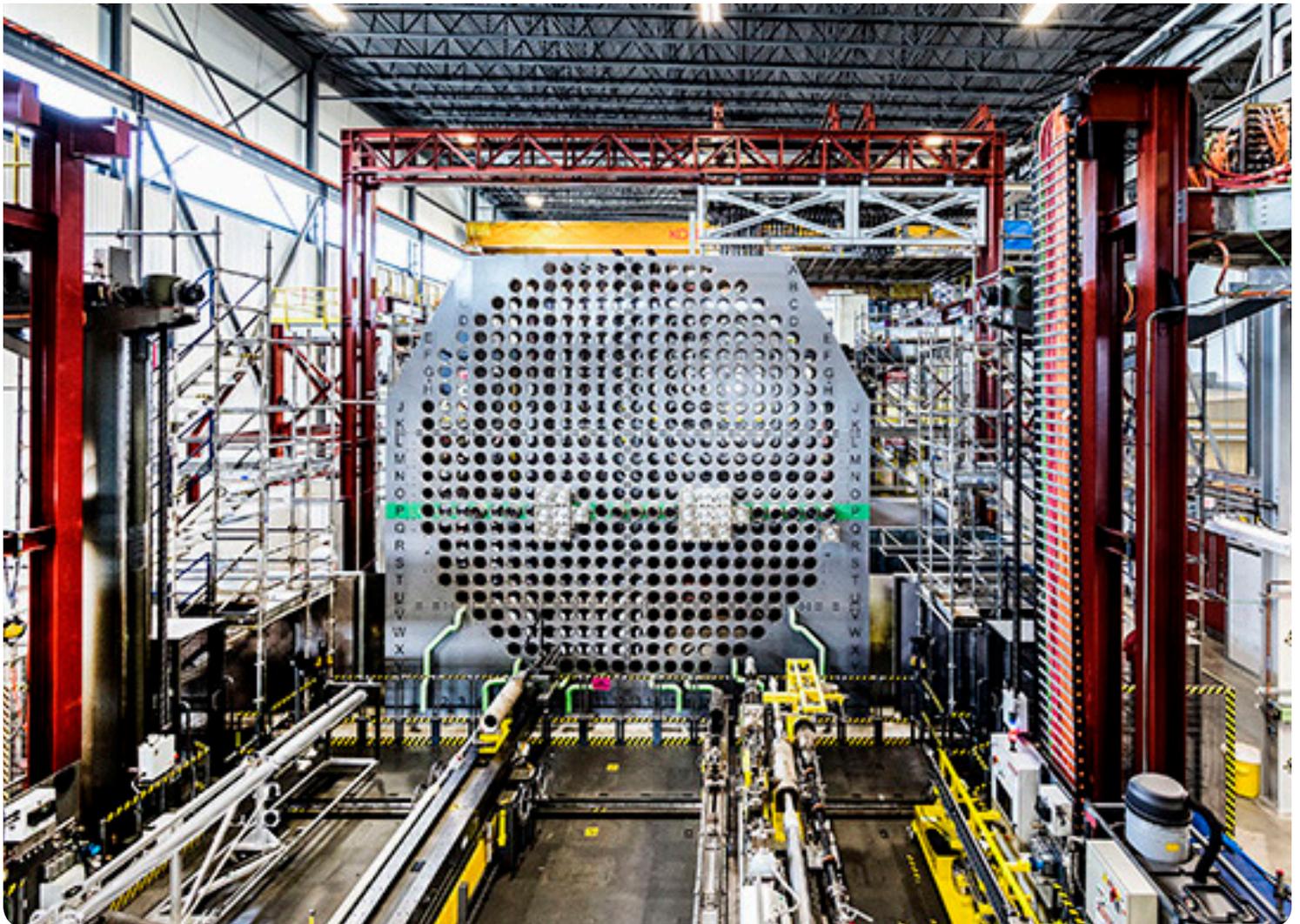
including thousands of construction jobs at Darlington and about 60 Ontario component suppliers. The project, which will provide 30 more years of baseload power, is scheduled for completion by 2026. (Many of the same suppliers will also be seeking contracts for the \$13 billion refurbishment of six of the eight reactors at the Bruce nuclear generating operation, located in Kincardine, Ontario. This refurbishment is set to begin in 2020.)



The operation of the Pickering nuclear generating station since the early 1970s, has been extended to 2024, after which it will be shut down. Employment levels at the Pickering facility are expected to remain high during the decommissioning phase. With an increasing number of nuclear facilities being decommissioned throughout the world, the engineering and technical experience demonstrated during the Pickering shutdown is expertise that can be marketed internationally from a Durham Region base. The Ontario nuclear industry is pursuing export prospects associated with the pending Argentina and Romania CANDU new-build projects, while seeking to tap into other significant opportunities in the rapidly expanding nuclear markets in China, India, and other parts of southeast Asia.

For example, SNC-Lavalin signed an agreement in principle for a joint venture with the China National Nuclear Corporation and Shanghai Electric Company to develop, market, and build the Advanced Fuel CANDU Reactor, with design centres in Canada and in China. Durham Region has the potential to position itself with major global firms as the location for their global or North American energy or nuclear industry headquarters.

Durham Region also has mutually beneficial opportunities to collaborate with complementary nuclear activities in Port Hope and Chalk River (east and north of Durham Region). In Chalk River, Canadian Nuclear Laboratories is exploring options for small modular nuclear reactors that could be used in more remote locations.



Engineering

Canada's consulting engineering sector, with gross revenues of more than \$31 billion, is very internationally oriented, ranking as the second-largest exporter of engineering services in the world.

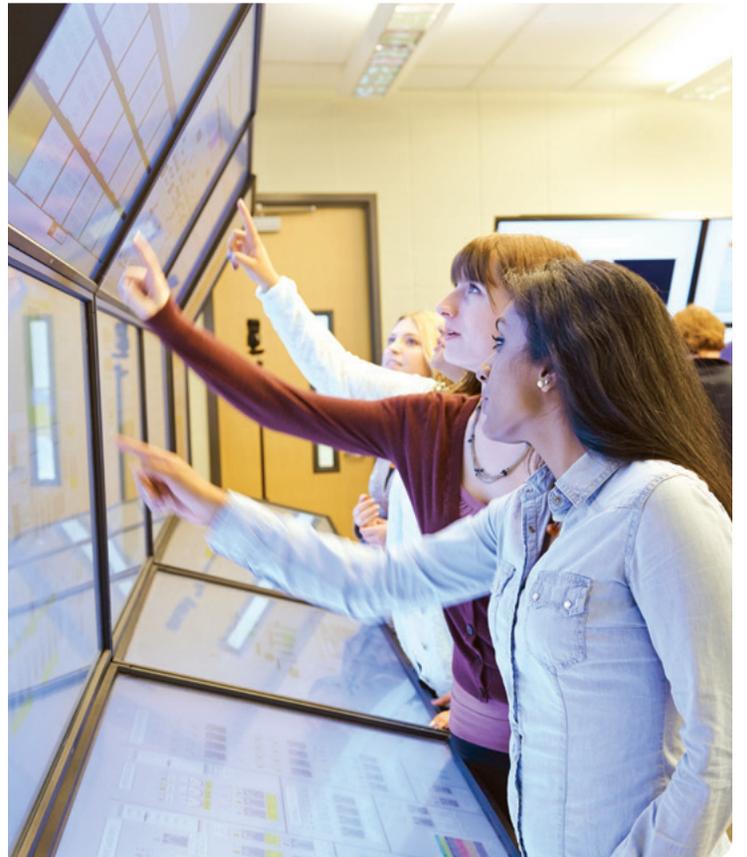
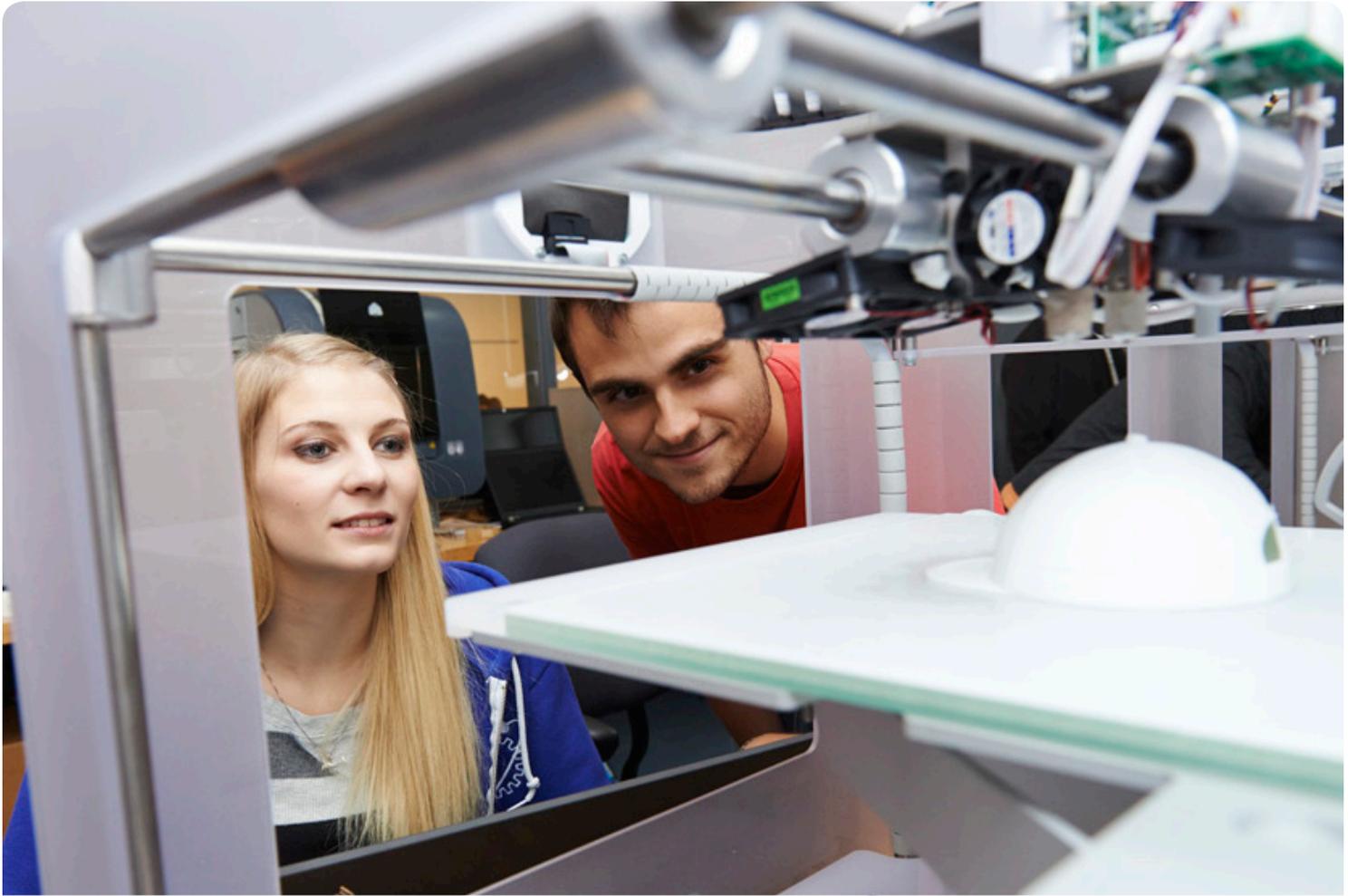
Major Sectors	% of total operating revenue
Petroleum and petrochemicals	19.9%
Commercial, public and institutional building engineering	13.2%
Mining and metallurgical	10.9%
Transportation	9.7%
Residential building engineering	6.3%
Power generation and distribution	6.1%
Project management	6.1%
Municipal utilities	4.5%
Construction services	3.5%
Environmental	2.6%

Because of the engineering sector's project dependence and cyclical nature, engineering businesses face tight deadlines to lease additional office space to accommodate new teams, and larger floor plates in multi-flex spaces are desired.

Engineering firms are attracted to Durham Region because of the availability of Class A office locations and an agile, responsive development community. The Durham Region Economic Development Division and its partners work closely with developers, contract furniture suppliers, and the realty community to take advantage of Class A office space, including the development of future locations to meet the needs of global engineering firms.

Engineering services companies also benefit from the research and talent partnerships available in Durham Region. For example, engineering firms focused on water issues can benefit from Ontario Tech University's involvement in the Southern Ontario Water Consortium, especially in ecotoxicology.

Immigration has been an important source of engineering talent, and some post-secondary institutions have taken steps to offer accelerated credentialing pathways for foreign-trained engineers. These immigrant engineers can link with Durham Region engineers through involvement with the Professional Engineers Ontario (PEO) Lake Ontario Chapter covering the East Central Region. The chapter delivers programs and events for 3,100 local professional engineers and engineers-in-training.



Post-Secondary Strengths

Both Ontario Tech University and Durham College provide students with a learning environment to prepare them for immediate entry to the EN3-sector workforce, with the skills to become long-term professionals.

Durham Region's concentration of energy sector assets and activities has led the university, and Durham College to develop strong programs and partnerships with Ontario Power Generation (OPG). OPG recently announced a further \$5 million investment to support capital expenditures, educational programs, equipment, scholarships, and bursaries for students at both institutions over five years.



Ontario Tech University

The Faculties of Engineering and Applied Science, and the Energy Systems and Nuclear Science at Ontario Tech integrates the best practices and successes of some of the leading universities in Canada and the world, with new and innovative ideas. It strives to be one of the foremost educational centres in Canada through high-quality and innovative programs, high-caliber and value-added research and excellence in education. Their exceptional students and graduates are prepared to be productive professionals and leaders of tomorrow.



Major research facilities at Ontario Tech include the Energy Systems and Nuclear Science Research Centre and the Clean Energy Research Lab. The lab is equipped to conduct research in hydrogen production, heat engines, and nanotechnology and is working on the world's first lab-scale demonstration of a copper-chlorine cycle for thermochemical water splitting and nuclear hydrogen production. The copper-chlorine cycle promises to achieve higher efficiencies, lower environmental impact, and lower costs of hydrogen production than any other existing technology.

Ontario Tech created the Borehole Thermal Energy Storage (BTES) system, one of the largest geothermal well fields in North America, to be a research resource for thermal energy storage and

to help heat and cool eight campus buildings. It also has a state-of-the-art Nuclear Simulations Lab and a Corrosion and Electrochemistry Lab.

Ontario Tech is also the site of a project that demonstrates the commercialization potential for a smart microgrid. This concept is a scalable emergency grid-tied islanded power application for hospitals, military bases, pharmaceutical manufacturing, and chemical processing plants. Research addresses wide-ranging energy topics such as:

- bio-fuels
- bio-based materials
- hydrogen fuel cell technologies
- energy storage
- energy transmission
- solar and wind energy generation
- energy management

The following EN3-related programs are offered at Ontario Tech:

- [Bachelors of Engineering, Automotive Engineering \(B.Eng\)](#)
- [Master of Applied Science, Automotive Engineering \(MASc\)](#)
- [Master of Engineering, Automotive Engineering \(MEng\)](#)
- [Bachelors of Engineering, Electrical Engineering \(B.Eng\)](#)
- [Master of Applied Science, Electrical and Computer Engineering \(MASc\)](#)
- [Master of Engineering, Electrical and Computer Engineering \(MEng\)](#)
- [Doctor of Philosophy, Electrical and Computer Engineering \(PhD\)](#)
- [Bachelors of Engineering, Manufacturing Engineering \(B.Eng\)](#)
- [Bachelors of Engineering, Mechanical Engineering \(B.Eng\)](#)

- [Master of Applied Science, Mechanical Engineering \(MASc\)](#)
- [Master of Engineering, Mechanical Engineering \(MEng\)](#)
- [Doctor of Philosophy, Mechanical Engineering \(PhD\)](#)
- [Bachelors of Engineering, Mechatronics Engineering \(B.Eng\)](#)
- [Bachelors of Engineering, Software Engineering \(B.Eng\)](#)
- [Master of Engineering Management \(MEngM\)](#)
- [Bachelor of Engineering in Nuclear Engineering \(Honours\) \(BEng\)](#)

***First in Canada

- [Bachelor of Science \(Honours\) in Health Physics and Radiation Science \(BSc\)](#)
- [Bachelor of Technology in Sustainable Energy Systems \(Honours\) \(BTech\)](#)
- [Fields – Master’s Programs in Nuclear Engineering – Nuclear Power Radiological and Health Physics](#)
- [MASc – Master of Engineering in Nuclear Engineering](#)
- [PhD in Nuclear Engineering](#)
- [MEng in Nuclear Engineering](#)
- [Graduate Diploma in Nuclear Technology](#)
- [Graduate Diploma in Nuclear Design Engineering](#)



Durham College

Consistently named one of Canada's top 50 research colleges, **Durham College (DC)** is widely recognized as an innovative training ground for new generations of skilled workers in the energy, environment and engineering fields (EN3).

Students enrolled in programs offered by the schools of **Science, Engineering & Technology** and **Skilled Trades, Apprenticeship & Renewable Technology** pursue their training in industry-grade, state-of-the-art learning facilities at both the college's Oshawa and Whitby campuses.

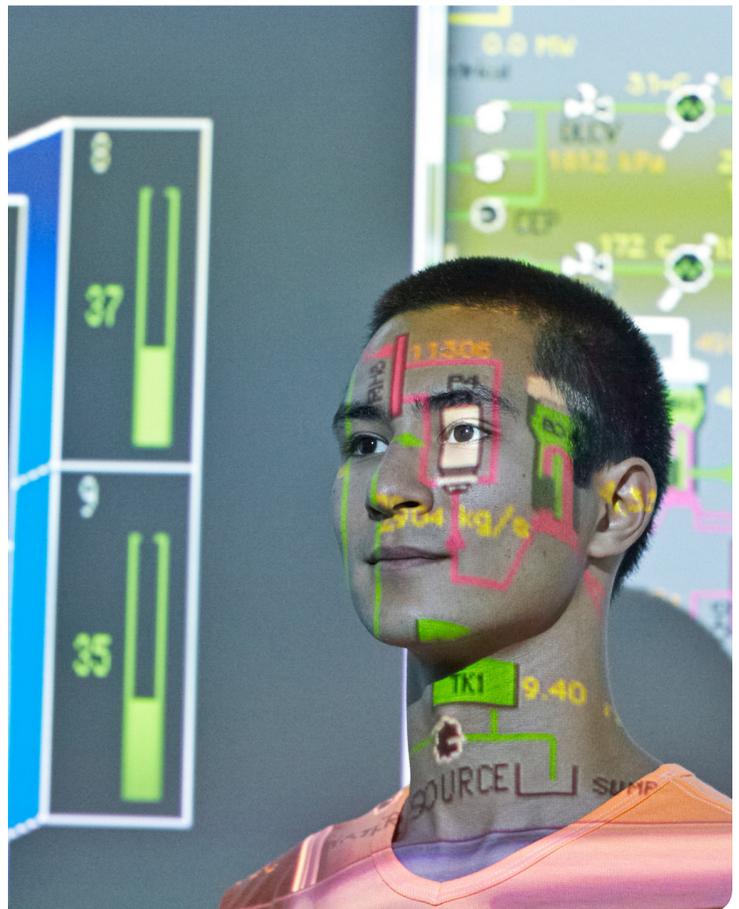
Opportunities to participate in applied research are also available to students through the college's **Office of Research Services, Innovation and Entrepreneurship (ORSIE)** which is dedicated to solving business and social challenges through innovation and collaboration. ORSIE student and faculty researchers work closely with industry partners to develop practical, pioneering solutions reflective of industry trends.

Durham College's residential construction lab consists of two houses: one with the latest energy efficient technology, and one with dated approaches that serve as a contrast for research.

The following EN3-related programs are among the more than 140 full-time and eight apprenticeship programs offered by DC:

- **Biomedical Engineering Technology**
- **Chemical Engineering Technology**
- **Civil Engineering Technician**
- **Civil Engineering Technology**
- **Electrical Engineering Technician**
- **Electrician – Construction and Maintenance**

- **Electromechanical Engineering Technology**
- **Electronics Engineering Technician**
- **Electronics Engineering Technology**
- **Elevating Devices Mechanic**
- **Environmental Technology**
- **Health Care Technology Management (Honours Bachelor)**
- **Industrial Mechanic (Millwright)**
- **Mechanical Engineering Technician**
- **Mechanical Engineering Technician – Non-Destructive Evaluation**
- **Mechanical Engineering Technology**
- **Power Engineering Techniques – Fourth Class**
- **Water Quality Technician**
- **Welding Engineering Technician**





Environment

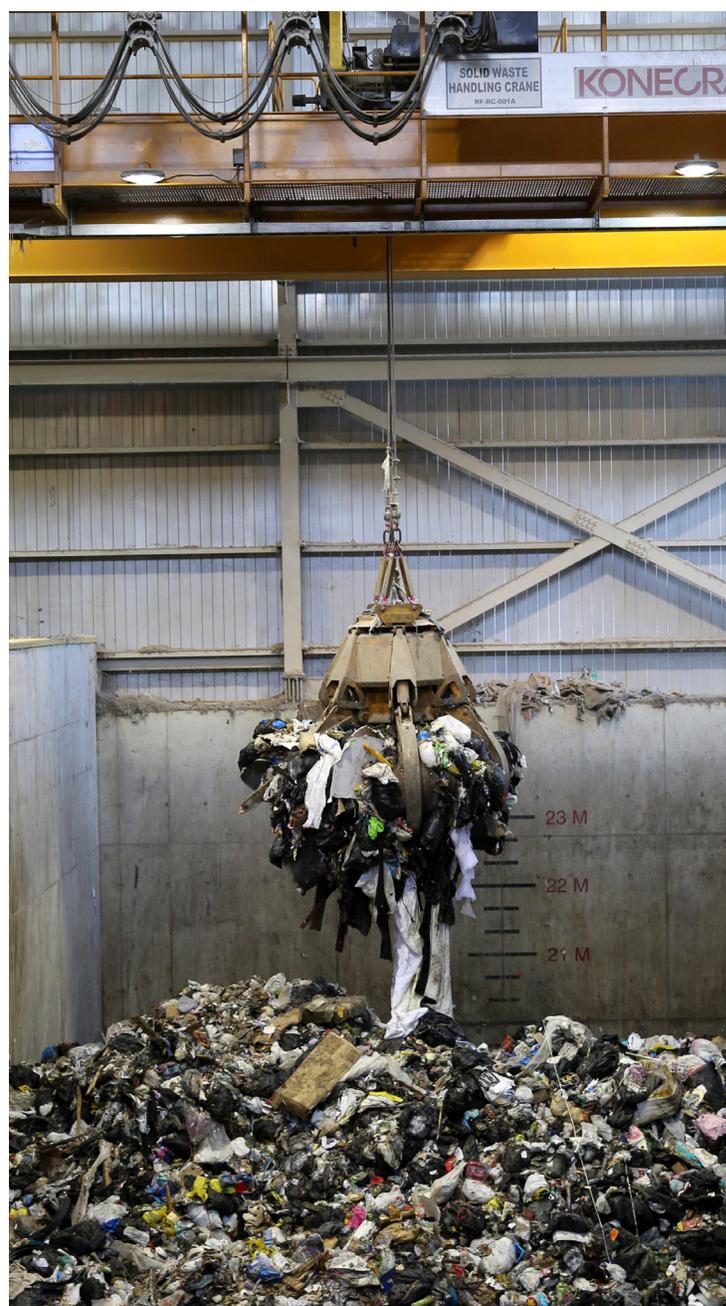
The environment sector in Durham Region is growing, due to the strong business government and post-secondary support for EN3 firms.

Ontario Tech University has a leading-edge Energy Systems and Nuclear Science Research Centre (ERC) which provides research in clean and green technologies. The facility houses the university's educational programs and research in geothermal, natural gas, smartgrid, solar and wind energy technologies.

Ontario Tech University has also announced plans for a new \$100 million Centre for Advanced Research, Innovation and Entrepreneurship (CARIE). CARIE will act as a catalyst for a new cluster of advanced manufacturing research and development in strategic industries such as alternative energy systems, automotive and transportation, new materials and robotics.

Durham College School of Skilled Trades, Apprenticeship and Renewable Technology also focuses on the energy sector and offers unique programs in a living lab environment with 350 rooftop solar panels, six vertical wind turbines and 35 geothermal wells located on the campus.

Durham Region's competitive advantages lie in its labour force pool, strength of its local industry cluster and development and related costs. For this reason, it was ranked second of the seven comparator municipalities in terms of competitiveness in the EN3 sector.





Environmental-Sector Players:

Durham-York Energy Centre

Durham Region and York Region own a state-of-the-art energy-from-waste facility. Capable of processing up to 140,000 tonnes of non-hazardous solid waste per year, the heat generated by waste combustion is used to generate electricity and steam. The Durham-York Energy Centre has the potential to power 10,000 homes and heat another 2,200.

eV Fern Ltd.

eV Fern Ltd. designs and builds high-density energy storage systems and is involved in research and development to further increase the efficiency of renewable energy products.

Global Emissions Systems

GESi® mandate is to design, develop and manufacture the finest emissions control technology in the world. Their Dry Selective Catalyst™ (DSC)™ technology stands out in the marketplace by reducing up to 99% of the Carbon Monoxide (CO), Hydrocarbon (HC), and Nitrogen Oxides (NOx) from fossil fuel combustion engines. Unlike other technologies, GESi® is recyclable and doesn't add toxic emissions to the environment.

Index Energy

Index Energy has constructed a state of the art co-generation facility in Ajax. With their facility,

they provide steam to the institutional, commercial and industrial base in Ajax. Partnered with Great Canadian Recycling (GCR), the plant is powered through the diversion of waste from landfills. GCR is affiliated with Simtor Environmental who operates a 30,000 square foot waste transfer and recycling facility in Whitby.

Solera Sustainable Energies Company Ltd.

Solera provides sustainable energy products and services to clients around the globe. Offering complete project design and construction, project feasibility analyses and system performance modelling, Solera started the community solar movement in Ontario in 1999/2000 in partnership with Greenpeace.

Federal Clean Energy Innovation Program

The Canadian government has signaled a strong commitment on its part to mitigating the effects of climate change. Its Energy Innovation Program has a Clean Energy Innovation component to accelerate research and development to support Canada's transition towards a low-carbon economy. Product areas include smart grid and storage systems, methane reductions, greenhouse gas reductions in the building sector, and reduction of industrial intensity.



Leading the Way in P3 and AFP

Canada has positioned itself as the North American leader in public-private partnerships (P3s), and P3 projects have been encouraged by the growing involvement of the federal and provincial governments. Nationally, Canada has the experience through involvement in 240 P3 projects with a capital value of \$116 billion. Within Canada, Ontario is the leader in P3 ventures.

Many projects have been undertaken by Infrastructure Ontario (IO), the Crown corporation tasked with provincial investments. IO uses what it calls Alternative Financing and Procurement (AFP) rather than P3. In its first decade, IO has completed (as of 2016) more than \$16 billion in projects, with another \$18 billion under construction and almost \$10 billion more in the planning stages. The two contracts for the Highway 407 extension and connectors to Highway 401 are examples of AFP projects.

Canada has EN3 companies that are major players in P3s/AFPs, such as Black and McDonald,

Ellis Don, PCL Constructors, Aecon, and SNC-Lavalin. Given the volume and large size of P3/AFP projects and Ontario's leadership, many European and U.S. firms have established a presence in Canada. These projects also attract international sub-contractors.

Toronto's legal, investment, banking and advisory communities have become a centre of P3 that is portable to other jurisdictions. Durham Region can position itself to attract new foreign entrants and firms that are expanding their P3 involvement. Durham Region's surplus talent in engineering and construction are an important advantage. If there are well-suited opportunities (generally \$100 million or larger), Durham Region could adopt the AFP model through IO for its own projects.

Durham Region's membership in the Canadian Council for Public Private Partnership raises its profile among members of the P3 industry and provides intelligence and potential access to foreign firms seeking to establish a presence in Canada.

Ready **for Business**

With approximately 682,250 residents in 2017, forecasted to one million by 2031, Durham Region has one of the fastest growing populations in Canada.

Durham Region is composed of the cities of Oshawa and Pickering; towns of Ajax and Whitby; Municipality of Clarington; and Townships of Brock, Scugog, and Uxbridge and is poised for continued economic growth. EN3 enterprises benefit from the expanding, technologically adept workforce. New business can easily develop mutually profitable relationships with existing businesses.

Through its proximity to the GTA—with a population of more than five million—Durham also offers prime access to Canada’s largest market and its key service providers, as well as to 135 million American and Canadian customers within a day’s drive.

Durham’s transportation infrastructure is made up of an integrated network of:

- Provincial and regional highways
- Cargo-loading and deep-sea shipping ports connected to the Atlantic Ocean via the St. Lawrence Seaway
- Transcontinental and commuter railway lines
- Local and international airports

In addition to EN3, Durham’s diverse economy includes strengths in:

- Agri-business
- Manufacturing
- Life sciences
- Innovative technology
- Professional and technical services
- Tourism

This sector diversification, educated workforce, affordable real estate and extensive transportation system have created an economy that’s thriving and is ready for continued growth.

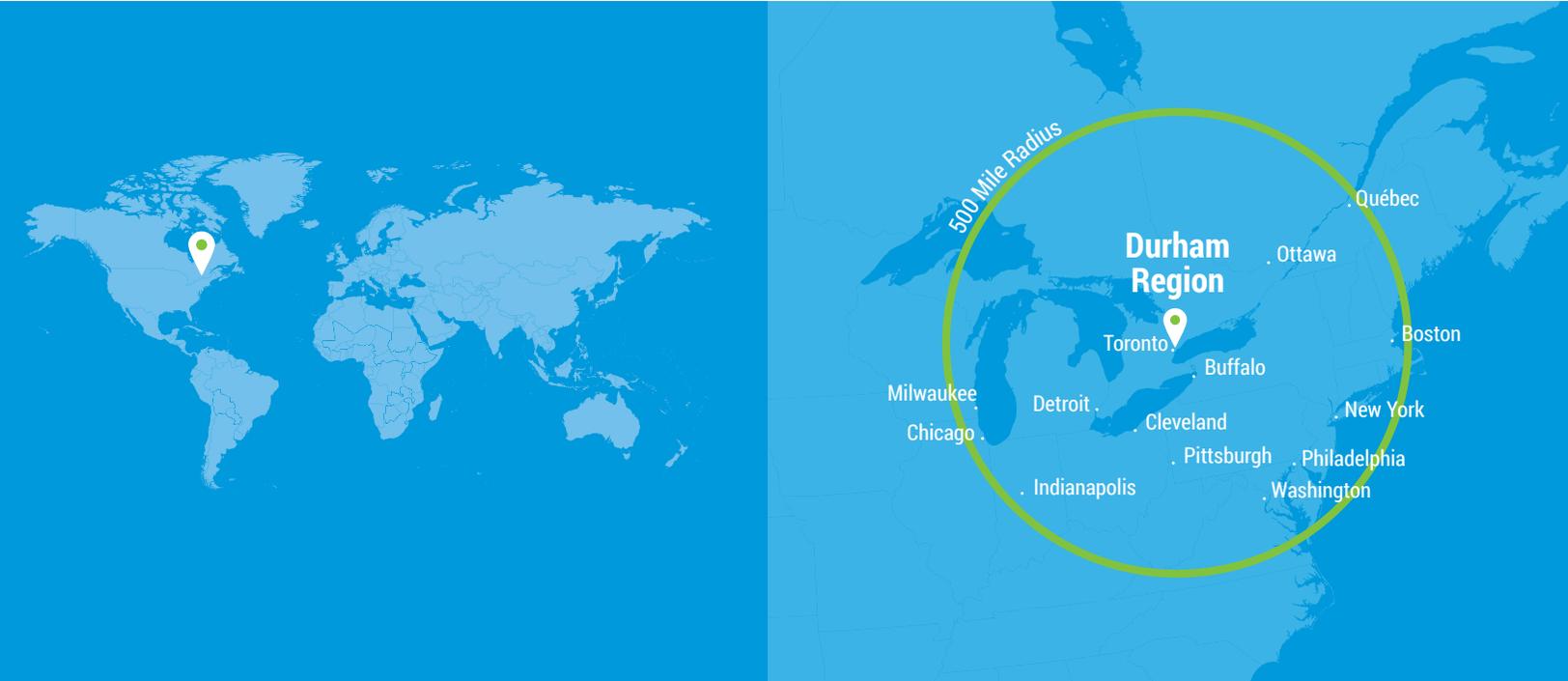


The Best of Both Worlds

With eight municipalities ranging from large urban centres to small towns, hamlets, and villages, Durham offers a rare, sought-after mix of cosmopolitan and rural living.

Access to ample green space, three lakes (Ontario, Scugog and Simcoe) and extensive urban amenities, Durham Region offers a high-quality standard of living for both city and rural dwellers.

The Ideal **Location**



Many **Resources Available**

EN3 businesses expanding or locating in Durham can collaborate with local organizations committed to helping businesses achieve growth and strategic development.



Spark Centre provides advisory services to early stage or growing innovation and technology companies. Executive coaching, functional advisory, co-location, incubation and day-to-day operational support are just a few of the services available.

Business Advisory Centre Durham (BACD)

provides business advisory services and guidance to individuals, entrepreneurs, start-ups and existing businesses in Durham Region.



Ontario Centres of
Excellence

Ontario Centres of Excellence (OCE) drives the development of Ontario's economy by helping create new jobs, products, services, technologies and businesses. In partnership with industry, OCE co-invests to commercialize innovation.

National Research Council of Canada Industrial Research Assistance Program (NRC IRAP)

offers technical and business advisory services, as well as funding programs, to help Canadian businesses build their innovation capacity, overcome barriers to growth, identify opportunities and turn great ideas into commercial success at home and abroad.



National Research
Council Canada

Conseil national de
recherches Canada



Let's Connect

Durham Region's Economic Development and Tourism Division loves nothing more than showing off our dynamic community.

Find out how Durham Region can work with you to achieve your business goals and aspirations by contacting us today. For questions and other inquiries, please contact **Simon Gill**, Director, Economic Development and Tourism at 905-668-7711, ext. 2611, by mobile at 905-903-5225, or simon.gill@durham.ca.

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