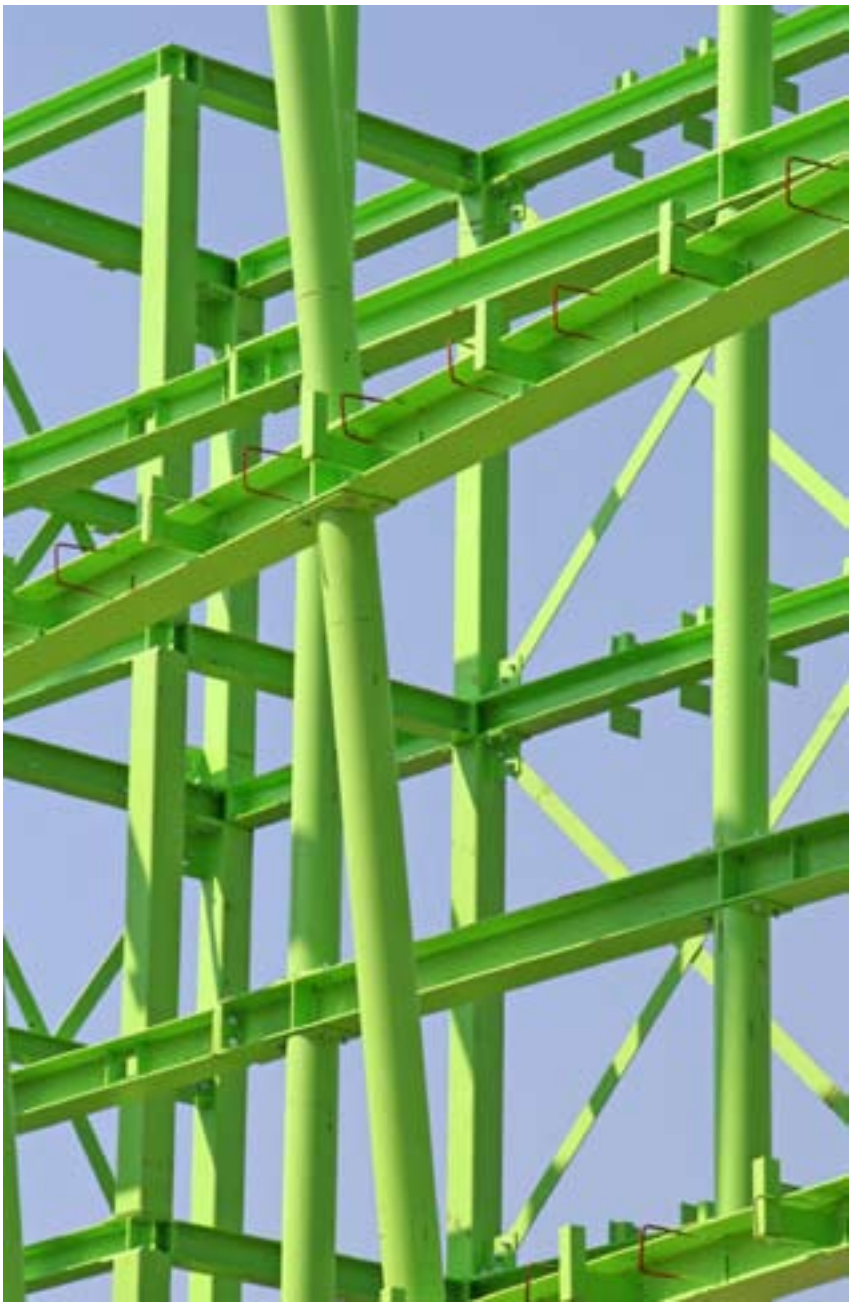
BUFFALO NIAGARA

Where Industry

Creates Energy



EXECUTIVE BRIEFING

A summary report on the green economy & Western New York's alternative-energy manufacturing potential

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Keith W. Rabin, President, July 2009

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BUFFALO NIAGARA:
WHERE INDUSTRY CREATES ENERGY

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Executive Briefing

BUFFALO NIAGARA:
WHERE INDUSTRY CREATES ENERGY

By KWR International, Inc.
for Buffalo Niagara Enterprise
July 2009

RENEWABLE ENERGY WILL BE A KEY DRIVER OF GROWTH IN THE 21ST CENTURY

Buffalo Niagara stands at the threshold of a major opportunity to apply its industrial capacity within the renewable energy sectors that will increasingly drive global economic growth in coming decades. With its diverse manufacturing heritage and skilled work force, the region can become a key asset in U.S. efforts to expand its competitive presence in emerging green industries and technologies. This will create thousands of new jobs and position the region as a laboratory for the rejuvenation of America's rust belt cities. This opportunity builds off the region's existing strengths to help create a transformative and supporting business environment where "Industry Creates Energy."

For more than 20 years, some proponents for a new "green" economy have advocated less out of environmental concern than as a trigger for an economic transformation that could rival the industrial and technology revolutions of the late 19th and 20th centuries. The high volatility of fossil fuel costs, excessive reliance on energy sources in politically insecure areas of the world and environmental issues, such as climate change, are all increasing interest in this sector.

The 2008 economic collapse is accelerating this trend. U.S. and foreign governments—on national as well as state and local levels—are pledging unprecedented public spending on green jobs and technologies to drive innovation and stimulate economic activity during troubled times. This promises a leveraging effect beyond the actual investment—providing incentives and helping green technologies to gain the scale and improvements needed to increase usage and commercial viability.

While some are skeptical and even critical of the transformative nature of the "green jobs" movement, the magnitude of global government spending being proposed means this is a phenomenon that cannot be ignored. For this reason, cities and regions across the U.S. and Canada are now defining the role they can play in the accelerating transformation toward a new green economy.

GREEN JOBS ARE LARGELY IN MANUFACTURING, TRADE & RELATED SERVICE INDUSTRIES

While research and development in alternate energy technologies plays a part in green job creation, an equally important factor is the repurposing of existing manufacturing techniques and skills to the creation of products required in the new green economy.

According to a University of California—Berkeley report that reviewed 13 studies examining the impact of renewable energy on job creation, renewable energy and efficiency improvements create twice as many jobs per unit of energy and per dollar invested than traditional fossil fuel-based generating technologies. The Center for American Progress, a think tank that has supplied a number of President Barack Obama's top administration officials, said "These jobs are impossible to offshore. Making buildings more energy efficient, constructing

mass transit lines, installing solar panels and wind turbines, expanding public green space, growing and refining biofuels—all this work must take place right here in America, in both urban and rural areas."

For example, large turbines that harness wind energy call for technical expertise from sheet metal workers, machinists, engineers, mechanics, welders, millwrights, construction workers and maintenance people as well as sales, management and administrative support. Because energy costs are anticipated to remain volatile and rise higher over time, the need for conservation also creates a market for energy efficiency. This necessitates new construction and retrofits, which require architects, engineers, roofers, insulators, carpenters, inspectors, truck drivers and other support services.

Green jobs, therefore, require exactly the skills and facilities that have been idled in Buffalo Niagara.

GOVERNMENT STIMULUS TO ACCELERATE DEVELOPMENT OF GREEN JOBS & INDUSTRIES

At the start of 2009, the Obama administration and the U.S. government authorized the spending of more than $150 billion in renewable energy. This will serve to enhance U.S. competitiveness in these emerging growth sectors and to create or retain up to 5 million green jobs in an economy that has plunged into a serious worldwide recession.

Buffalo Niagara has the potential to capture a significant portion of the green jobs and development activities that result from major government investments, which stimulate further private sector investment in technologies, goods and services. These investments are driven by the need to preserve the environment and to provide an alternative to U.S. dependence on fossil fuels.

STARTING POINT FOR MOST GREEN INDUSTRIES IS GENERATION OF RENEWABLE ENERGY

There are five main renewable energy generation sectors:

•Wind is the most rapidly growing source of renewable energy and the most recognizable. Naturally occurring wind currents are used to spin wind turbines to generate power.

•Solar is energy collected from sunlight used to generate electricity via photovoltaic cells. The cells can be in large arrays for supplying power to the national grid, or in small rooftop units that power just one building.

•Hydropower is where flowing water is used to spin turbines connected to generators. Niagara Falls and Hoover Dam are well known hydro-energy projects, but there is strong interest in hydrokinetic energy, which uses river flows and coastal currents to spin submerged turbines to create energy.

•Geothermal is power generated by geysers fueled by heat located deep within the earth's core. Geothermal heat pumps can also be used in small-scale residential and commercial buildings.

•Biomass is energy created by burning organic waste, using methane gas generated from landfills, or even harnessing energy produced by algae. Biomass includes alternative fuel creation like ethanol for vehicle use.

•Nuclear energy is created by the process of nuclear fission within a nuclear reactor. Nuclear is not usually classified as a renewable or alternative energy source, even though it does not rely on fossil fuels. It stands apart largely because of perceived environmental concerns.

The renewable energy industry also encompasses sectors that are not energy producing, including:

•Energy Transmission and Storage: Renewable energy use will increase the need to replace America's aging electrical distribution system with a "smart grid" that combines alternative and fossil fuel energies to deliver consistently and efficiently to meet peak demands. Since some renewable energy sources such as wind and solar are intermittent, the smart grid also requires new methods of bulk energy storage.

•Green Buildings: The creation of energy efficient buildings will be required in the new green economy since energy costs are expected to be high. Also, energy efficient buildings reduce overall demand and the detrimental impacts on the environment that accompany nearly all types of energy generation. The industry creates good-paying jobs with relatively short vocational training and in particular can provide job opportunities in the poverty pockets of American cities. As more and more communities across the nation revise building codes to require that rehabilitation and new construction incorporate energy conservation, an immediate demand is created that generates new jobs.

•Transportation: America is moving rapidly toward

alternative (non-petroleum) fuel vehicles. These include biofuels (ethanol, methanol and other fuels made from plants oil or animal fat); compressed natural gas; electricity stored in batteries and hydrogen fuel cells.

•Waste Remediation/Recycling: Effective control of the generation, storage, treatment, recycling and reuse, transport, recovery and disposal of hazardous wastes is of paramount importance for sustainable development. New industries are being developed around this need as well as new opportunities for traditional manufacturing.

BUFFALO NIAGARA CAN PROVIDE CAPACITY ACROSS SECTORS IN RENEWABLE ENERGY

The region's key job creation opportunities are found in the supply and value chain of all renewable energy sectors. The region's unique ability to participate in the development, design and manufacture of component parts across all sectors gives it a potential competitive edge in attracting green economy jobs.

The renewable energy supply chain can be significant. Wind energy, for example, uses large turbines with over 8,000 parts. Buffalo Niagara's counties already have established firms and skilled workers with experience in making products similar to the blades, gearboxes, brakes, cooling fans, drives, bearings, generators, towers and sensors that make up a wind tower.

These jobs fall into the familiar durable manufacturing sectors of plastics and rubber, primary metals, fabricated metal products, machinery, computer and electronic products and electrical equipment.

Solar energy, as another example, is a little less manufacturing intensive, but it still covers nearly 25 individual manufacturing sectors in its component parts. Photovoltaic cells—the primary component —require a high-grade silicone being produced in Buffalo Niagara.

Some component industries and services such as meters, control devices, electrical connections, computer storage and engineering design services are required in nearly all sectors of renewable energy.

BUFFALO NIAGARA'S INDUSTRIAL BASE IS MORE DIVERSE & BALANCED THAN COMPETING REGIONS

Buffalo Niagara is uniquely situated to serve the major Northeast population centers while receiving goods and

Freerange photo

materials from the Midwest—the same role it played in its growth at the beginning of the 20th century. The region is defined as an eight-county area in western New York consisting of Allegany, Cattaraugus, Chautauqua, Erie, Genesee, Niagara, Orleans and Wyoming counties.

Location

Buffalo Niagara is 500 miles from 41% of the U.S. population and 59% of Canada's population. It is a midway point between New York and Chicago and Toronto and Pittsburgh. It is also a part of the Golden Horseshoe, a nearly continuous metro area that covers Toronto, Hamilton, and St. Catherines in Ontario; and Niagara Falls, Buffalo, Batavia and Rochester in New York.

In many renewable energy sectors, most notably wind, solar and biofuels, there are distinct advantages to proximity to production sites in the manufacture of component parts for renewable energy facilities since components and raw materials can be difficult or costly to transport. The rural areas of the region have the potential to supply bio-stock, including timber and wind resources, for the direct generation of energy. The region is also in the major northeast grid corridor, which allows energy generated in the region to be easily transmitted to major population centers.

The Great Lakes

Buffalo Niagara's access to two of the Great Lakes, Erie and Ontario, may prove to be its greatest attraction in growing renewable energy jobs. The lakes provide

maritime access for the transport of raw materials and manufactured goods and abundant fresh water for manufacturing processes. The Great Lakes shores have been shown to be excellent for the development of wind energy generation with both on-shore and off-shore facilities now in planning stages. Lake currents, tides and the currents of the Niagara River are being studied as potential new sources of hydrokinetic power as they flow towards Niagara Falls, one of the largest and oldest renewable energy generators in the world.

International trade

Buffalo Niagara is strategically located to recruit new investment from growing Canadian companies in the renewable energy field. The region is only 90 minutes by car from Toronto, Canada's financial hub and investment center, allowing companies to maintain corporate offices in Toronto while managing production facilities in the US. Buffalo Niagara's manufacturing and distribution facilities allow Canadian companies easier access to the much larger American market.

Canadian-US trade is well established in Buffalo Niagara, with $57 billion worth of goods crossing local borders annually or $156 million each day. The region has eight international ports of entry (four auto, three rail, one water). Buffalo Niagara has experience and a successful track record in providing assistance to Canadian companies seeking U.S. facilities.

Transportation

Buffalo Niagara is a transportation hub, providing first-class freight transport by land, sea and air. A Logistics Today magazine study ranked the Buffalo region 30th out of 362 U.S. metropolitan areas in being a "logistics friendly" city. Because local infrastructure was planned during an earlier age when the region supported a larger population and industrial base it now operates under capacity, and regional companies can operate more efficiently with fewer delays and logistical constraints.

Buffalo-Niagara International Airport ranks 72nd of all U.S. airports in terms of cargo landed weight with almost 317 million pounds per year. Niagara Falls International Airport handled over 50 million pounds, placing it 115th in the rankings. The Niagara Falls airport has a 10,000 foot runway—the state's third largest—capable of handling the world's largest cargo planes.

Four of the seven U.S. Class I Railroads operate in this region including CSX Transportation (CSX), Norfolk Southern (NS), Canadian Pacific Railway (CP) and Canadian National Railway (CN). There is also one Class II (or Regional) railroad, and three Class III (or Short Line) railroads. Several major freight yards provide large intermodal and bulk distribution facilities.

Buffalo Niagara's principal waterborne commerce center is the Port of Buffalo. It consists of 28 terminals including the three terminals of Gateway Trade Center. The Welland Canal, a westerly part of the St. Lawrence Seaway, is 27 miles long and provides the navigational connection between Lake Erie and Lake Ontario, which provides access to the Port of Toronto. The Erie Canal provides barge traffic through Upstate New York to the Hudson River and the Port of New York.

Work force, cost of living

Buffalo Niagara has a well-deserved reputation for a hard working, educated and affordable work force. More than 1.5 million people live in the region, which ranks 18th in the U.S. for workforce education. Over 37% of Buffalo Niagara residents have at least an associates degree, compared to 38% for all of New York.

Blue-collar jobs comprise 41.5% of the work force. Manufacturing comprises 16% of the total workforce or 105,000 workers, with 4% working in construction. The region has the sixth highest employment concentration of machinery jobs out of the 50 largest U.S. metro areas.

One factor that makes Buffalo Niagara attractive for renewable energy job creating projects and expanded manufacturing operations is its low cost of living. The region's cost of living is just below the national average, with an average regional income of $53,000. Buffalo Niagara compares favorably to other "rust belt" areas where costs are higher than the national average (Detroit—9 % higher; Cleveland—5 % higher). The low cost of living for employees can translate directly into lower cost of labor.

Housing stock is affordable and has held value. The 2008 real estate bubble burst has had minimal impact on the region. Median home prices are just over $100,000.

Research & education

Buffalo Niagara has a strong base of universities and colleges. Many are involved in research and development and have training programs related to renewable energies.

Neighboring Rochester further strengthens Buffalo Niagara's capabilities, along with the strategic alliances of the Centers for Excellence in the State University of New York system. Together with Southern Ontario, Buffalo Niagara hosts over 60 colleges and universities with an enrollment of more than 300,000 students.

Engineers are critical to renewable energy, from design and construction to operations and maintenance. The University at Buffalo (UB) has the state's second-largest engineering program and offers degrees in all major engineering fields through the School of Engineering and Applied Sciences. It is ranked in the top 15% of America's 300 engineering programs. In 2011, UB will open a new $61 million building for engineering and applied sciences that will house research projects on energy battery storage and renewable energy technologies. Other programs related to renewable energy include The Center for Excellence in Global Enterprise Management, The Center for Unified Biometrics, the Energy Systems Institute, and The New York State Center for Engineering Design and Industrial Innovation.

Additionally, The Center for Industrial Effectiveness (TCIE), based at the University at Buffalo, is a major regional resource for industrial manufacturing firms, offering technical assistance in advanced manufacturing, business system improvements and product testing and development. The center also matches product development requirements with faculty members doing research in a related field, and it provides access to virtual reality systems, prototyping, finite element analysis and complex modeling and animation. It also helps companies access university testing labs for quality assurance or material analysis and identify funding support and grant assistance for productivity improvements and workforce training.

Insyte Consulting is a private, non-profit organization that works with Buffalo Niagara manufacturers to provide assistance in process improvement, marketing and business planning, quality system implementation, information technology support and new technology application. They also provide access to financial assistance programs that help develop new technology processes and products in Buffalo Niagara.

Alfred University conducts photonics research and related solar sector training programs. The Rochester Institute of Technology hosts the Advanced Fuel Cell Research Laboratory and is one of only four Hydrogen Technology Learning Centers.

The region has four community colleges and a two-year technical school. All have successfully partnered with business and industry in work force development programs to create skills training based on needs.

BUFFALO NIAGARA HAS THE NATURAL RESOURCES NEEDED FOR RENEWABLE-ENERGY SUPPLIERS

Given current technologies, Buffalo Niagara has direct renewable energy generation possibilities significant enough to supply bulk energy to a national smart grid or a more local micro-grid. The development of these resources has a ripple effect on the economy since there are often advantages in having the manufacture of components and parts in energy-production regions.

Wind energy generation on a large scale is viable in Buffalo Niagara. Various parts of the region receive wind forces strong enough for commercial production and supply to the grid. These areas exist on and off the shores of Lakes Erie and Ontario and as well as in some rural inland areas. Since some wind turbine components are large and difficult to transport, the development of the region's wind energy generation potential can also yield advantages in attracting component parts manufacturing firms. In addition, there is a core base of manufacturing in the region that has the potential to add on capacity for production of wind component parts.

Buffalo Niagara also has potential for solar energy generation. Given current technology, large solar arrays that feed the grid are not feasible, but solar arrays that feed defined areas through a micro grid are possible. A potential also exists for the use of solar energy in individual homes and buildings, since despite its winter reputation, Buffalo has more than adequate solar days to take advantage of such systems.

Hydropower has long contributed to the success of Buffalo Niagara due to the proximity of Niagara Falls. The Niagara River holds potential for additional hydrokinetic energy by using the river's swift currents to turn submerged turbines. There are both technical and ecological issues surrounding the development of the technology, but it could prove to be a very viable alternate energy resource for the region.

BUFFALO NIAGARA MANUFACTURING IS THE KEY TO GREEN SECTOR GROWTH

Buffalo Niagara has a large, vibrant economy with a particular focus in manufacturing. Manufacturers of such hard goods as transportation equipment, machinery and fabricated metal products are the most important export income generating industries in the

region. Many products manufactured in the region are of the type required for the development of renewable energies, and these firms are often among the largest employers in their respective counties.

A survey of the largest manufacturers in each of the eight counties shows manufacturing activity that matches the needs in all sectors of renewable energy. Manufacturing operations in the eight-county area include:

Allegany: Dresser-Rand (turbines); Alstron Power (air cleaning and purifying equipment); Vesuvius High Tech Ceramics (industrial ceramics products); Baldwin's Forest Products (lumber); PM Research (industrial coil machinery); Genesee Metal Products (structural steel) Deming Electro Plating (metal finishers).

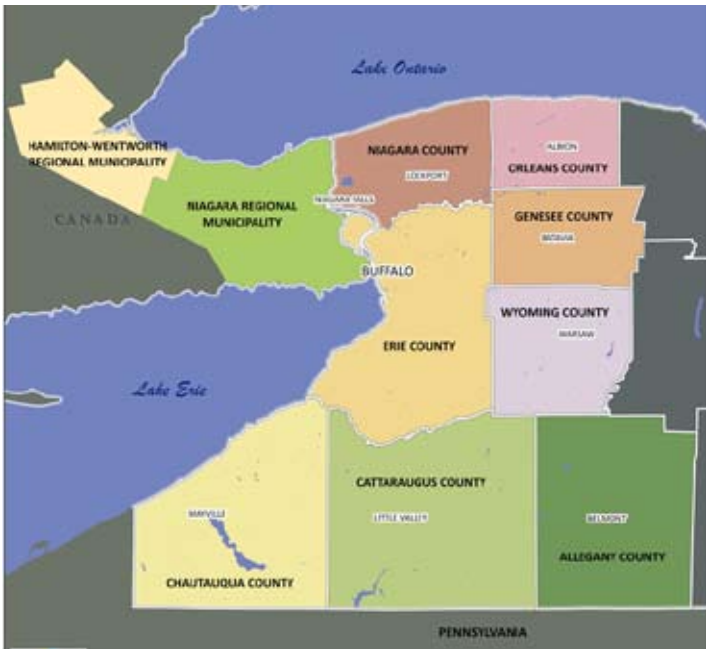
Cattaraugus: Alcas Corp. (cutlery); AVX (electronic equipment); Cooper Power Systems (electric equipment); Gowanda Electronics (electronic coil and transformers); Cytec Industries (chemicals); Mazza Sheet Metal (sheet metal fabrication); OSM (sheet metal fabrication).

Chautauqua: Cummins Engine (diesel engines); MRC Bearing (ball and roller bearings) Truck-Lite (vehicle safety lighting); Valeo Engine Cooling (engine cooling systems); Carborundum/Monfrax Fused (cast refractories); Hope's Architectural Products (steel and aluminum windows); Crawford Furniture (wood furniture); Jamestown Metal Products (laboratory furniture); Weber-Knapp (specialty metal products); Monfrax (refractories); Blackstone (sheet metal fabrication); Dunkirk Specialty Steel (bar, rod, wire specialty steel).

Erie: GM Powertrain (auto parts); Ford Motor Co. (automotive stampings); Praxair Inc. (industrial gases) Dunlop (tires); DuPont (chemicals); Luvata Buffalo (brass manufacturing); Cameron Compression (air and gas compressors); Strippit Inc. (punching and shearing machinery); PCB Piezotronics Inc. (sensors); Invitorgen (biological products); ISG Lackawanna (galvanizing).

Genesee: United States Gypsum (gypsum products); Graham Corp. (vacuum equipment and systems); Batavia Metal Products (metal goods); Byron Enterprises Inc. (grain handling equipment); Liberty Pumps (pumps); Summit Lubricants (lubricants); Strong Force & Fabrication (forgings); Pinnacle Manufacturing (aluminum die castings).

Niagara: Delphi Thermal and Interior (auto radiators); Kadmea (machinery); DuPont (industrial inorganic chemicals); Sherwood Valve (valves); Vishay Thin Film (semiconductors and resistors); Precious Plate (plating); Olin Chlor-Alkali Products (inorganic



BNE map

chemicals); Tam Ceramics (zirconium); Snyder Industries (gears); Diversified Manufacturing Inc. (machine shops); Metal Cladding (powder coatings); Delroyd Worm Gears (industrial drives and gears); Sherwood (valves); Confer Plastics (molded plastics) Tulip (molded plastics); Stollberg (flux manufacturers)

Orleans: Bruner International (brakes); Saint-Gobain Technical Fabrics (tire cord and fabrics); Trek Inc. (electrostatic equipment); BMP America (textile converting); Empire Coating (metal finishers); Standex AirDistribution Products (duct and duct fittings); Penasck (sheet metal fabrication); Phinney Tool & Die (tool and die makers); Monroe Electronics (measuring instruments); F & H Metal Finishing (metal finishing).

Wyoming: Markim Tubing (steel pipe and tubes); Koike Aronson (welding equipment); Foamex (foam plastics); Steel & O'Brien (machine shops); SMD (semiconductors and related devices); Hilec, (noncurrent-carrying devices); Farrant Screw Machine (screw machine products); Vimco Manufacturing (lighting fixtures); Burt Tool and Die (machine shops).

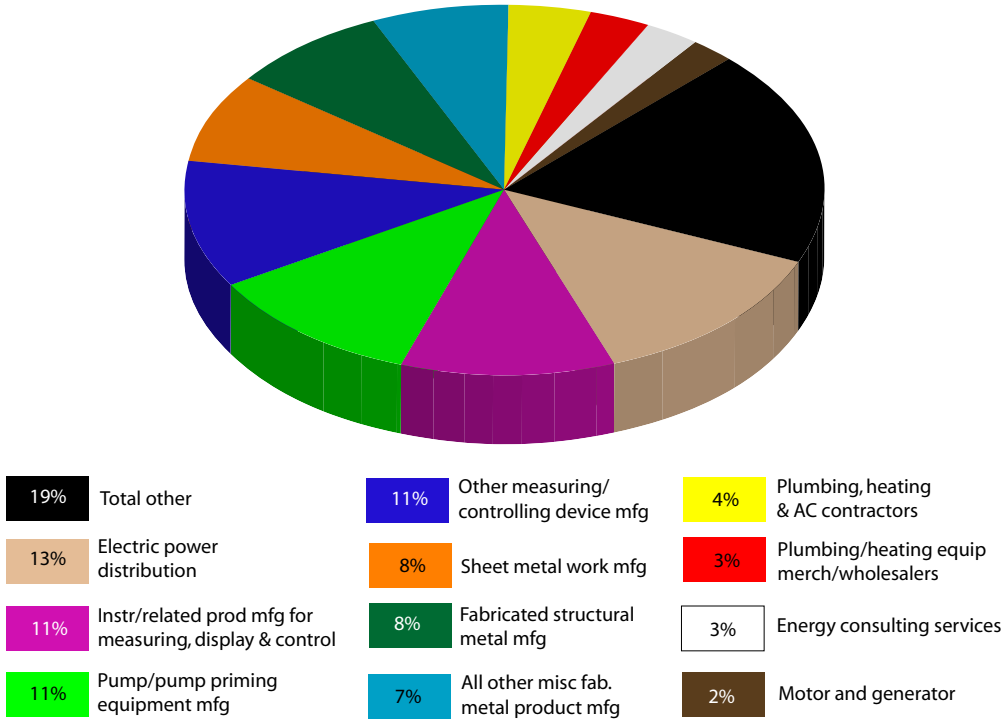
BUFFALO NIAGARA'S INDUSTRIAL BASE IS MORE DIVERSE & BALANCED THAN COMPETING REGIONS

Many U.S. locations can demonstrate strength within individual sectors, but few can demonstrate the same across-the-board competitiveness as Buffalo Niagara. Using manufacturing sector revenues to compare Buffalo Niagara to other localities, the region's scope of manufacturing diversity becomes apparent. Buffalo Niagara's counties were compared to other locations in 10 sectors using standard codes within the North

American Industry Classification System (NAICS). In almost every instance, manufacturing activity of the type required to produce renewable energy component parts or services in these other locations was highly concentrated, with a small number of codes accounting for the vast majority of revenues generated. This was true even in large markets, such as Dallas (where two codes related to Waste Management accounted for 57.4% of revenues) and Los Angeles (where four codes in Energy Transmission and Storage accounted for 66.5% of revenues), even though these markets might be assumed to have greater diversity than Buffalo Niagara.

Solar NAICS Industries Distribution in Buffalo Niagara Region

(Revenue per NAICS code)



But few renewable energy related manufacturing codes in Buffalo Niagara's case exceeded 12% of revenues, and only one in all ten sectors examined (Electric Power Generation in Energy Transmission and Storage) reached 14.1%. Buffalo Niagara clearly has a diverse and balanced industrial base. This provides it with a major advantage as it seeks to provide industrial capacity and ancillary services to firms seeking to manufacture equipment, components and other green and renewable energy-related products and services.

Buffalo Niagara's broad manufacturing capacity provides it with an opportunity to take a leading role in developing commercial applications for renewable energy and to become a component supplier in renewable energy use and production.

This capacity is growing in importance as the current economic turmoil is causing U.S. business, government and academia to more seriously face up to the problems of deindustrialization and to determine how best to reinvigorate U.S. manufacturing.

While the success of this policy debate is to be determined, Buffalo Niagara can become a model for America's re-industrialization in the new green economy and serve as a national laboratory for restoring manufacturing jobs. With additional efforts it can be a North American center for the commercialization of green and renewable energy related products.

THE GREEN ECONOMY IS ALREADY GROWING IN BUFFALO NIAGARA

The green economy is based on synergies. Buffalo Niagara already has strong activity in renewable energy sectors.

Solar Sector

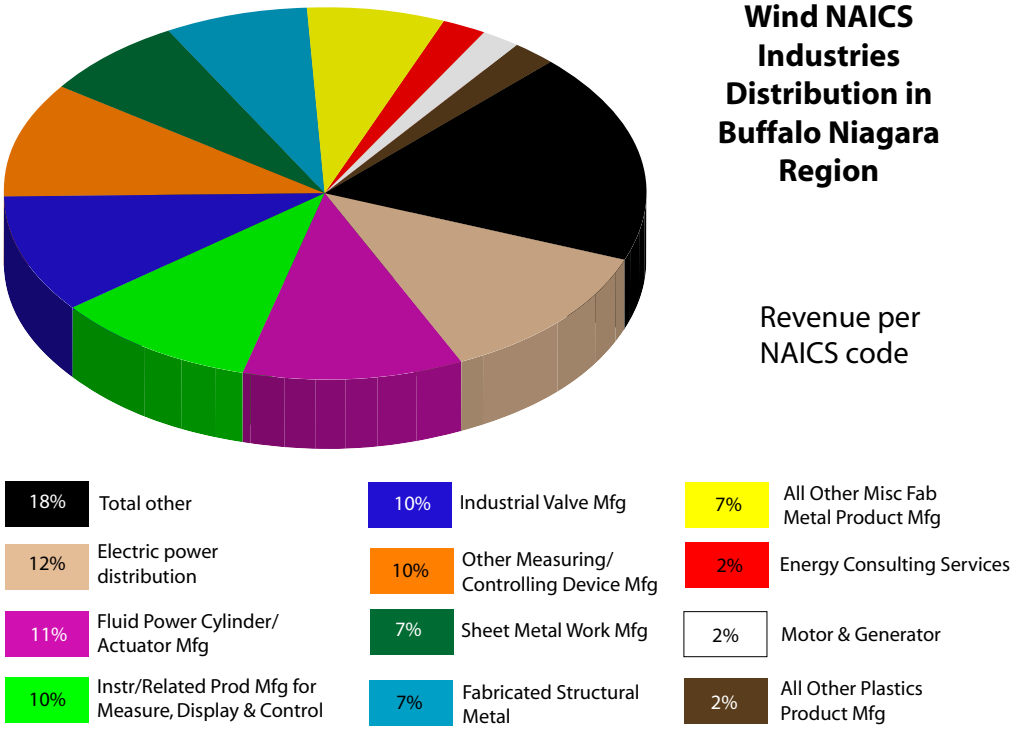
Buffalo Niagara has strong potential for further growth in the manufacturing of smaller PV and solar thermal installations. The region has research/development companies and facilities in solar technology.

Buffalo has an image as a cold and snowy city, but it has more sunny days from May through September than any Northeast city and a total snowfall significantly less than other upstate New York cities.

One of the region's advantages in the solar sector is Globe Metallurgical, Niagara Falls, a division of Globe Specialty, which is investing $60 million in a facility to manufacture high-grade silicon products. Globe will have capabilities to produce about 30,000 tons of metallurgical-grade silicon annually, and 25% of its

production will be available annually at discounts up to 15% for local companies.

Two other large Buffalo companies are also important in the industry. Praxair, Inc., a global Fortune 500 company, manufactures and distributes industrial gases that are an important part of the solar supply chain, and it also produces liquid hydrogen, an important alternative fuel source. DuPont is a leading materials supplier to the PV industry.



The region also has a strong metal manufacturing base, and major companies producing solar energy components include glass, solar cells and other manufactured components. Canrom Photovoltaics, in Niagara Falls, is a manufacturer of solar cells, systems and related products for home, industrial and custom uses. National Solar Technologies develops and manufactures off-the-shelf and custom products for solar/wind energy power sources and solar lighting systems. Solar Liberty Energy Systems, Inc. is one of the largest commercial and residential solar system design and installation companies in North America.

The University at Buffalo has a number of advanced engineering and research programs with applications to solar. In particular, the Integrated Nanostructured Systems Strategic Initiative uses new approaches for fabricating inorganic nonmaterial that may play a role in creating more efficient solar cells. Alfred University conducts state-of-the-art photonics research and related workforce training programs. The university is a leader in ceramic research. This is key to developing solid oxide fuel cells and the university works closely with nearby Corning Inc.

Wind Sector

The hundreds of mechanical parts that go into wind turbine operations match Buffalo Niagara's traditional manufacturing base of metal and plastic manufacturing. In addition, the region has the capacity to generate wind energy in large quantities. The Renewable Energy Policy Project (REPP)—a coalition of the Sierra Club and the United Steelworkers—estimated that 124 manufacturing companies in Buffalo Niagara have the potential to produce component parts for the wind industry.

A landmark after just a few years of operation, Steel Winds is a 20-megawatt wind turbine project on Lake Erie. The project, developed by Niagara Wind Power and BQ Energy, spent more than $40 million to develop the eight wind turbines that rise over 400 feet on a brownfield site. Noble Environmental Power, a Connecticut-based wind energy company operates 67 wind turbines in Wyoming County.

The New York Power Authority announced in April 2009 that it would spend more than $1 billion to develop 25 to 40 offshore turbines in Lake Erie and Ontario, with the energy generated sent to Western New York. To facilitate private sector participation and partnerships, NYPA is offering 20-year power purchase agreements, along with other incentives, and anticipates completion by 2014.

Geothermal Sector

Buffalo Niagara lacks the natural resources for large-scale geothermal power generation, although, geothermal

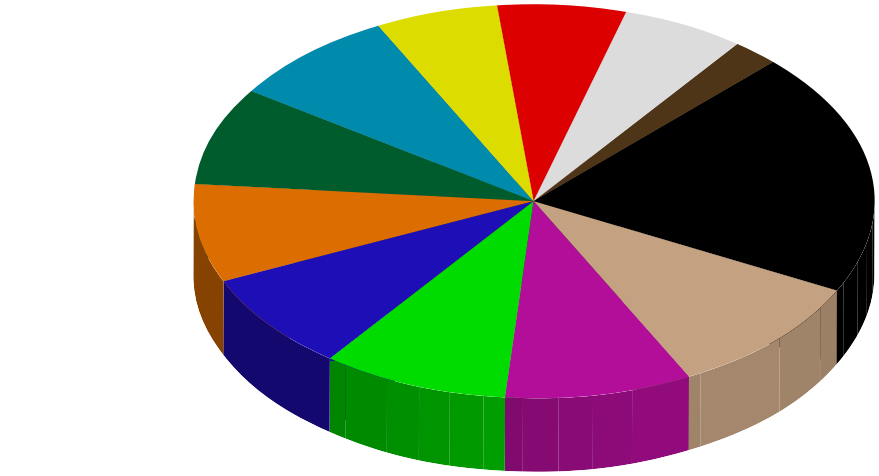
heat pumps are practical in many areas, especially in the eastern and southern areas of the region.

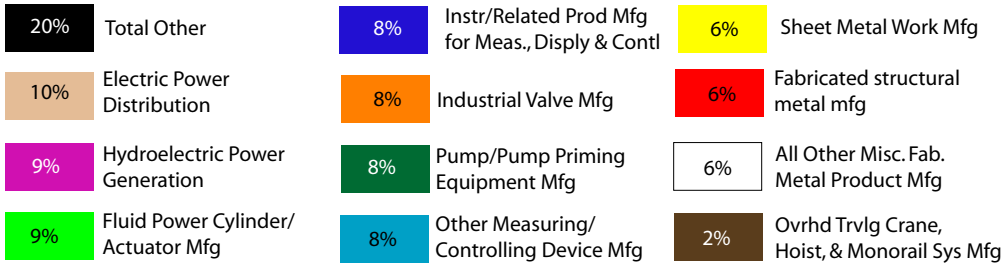
Several area equipment and component manufacturers focus on the smaller-scale geothermal industry, and several school districts and high-heat users, such as dairies, have installed or are considering geothermal systems. Two architectural preservation projects—The Frank Lloyd Wright Darwin Martin House and Babeville, an art space in the former Asbury Delaware Church—used geothermal systems in recent renovations.

Cal Research, Ransomville, is a supplier of geothermal energy system components and steam calorimeter instruments. Caster Drilling Enterprises designs and installs residential and commercial geothermal systems, providing well field design, loop field installation, excavation, test well drilling, thermal conductivity testing and other services.

Geothermal NAICS Industries Distribution in Buffalo Niagara Region

(Revenue per NAICS code)



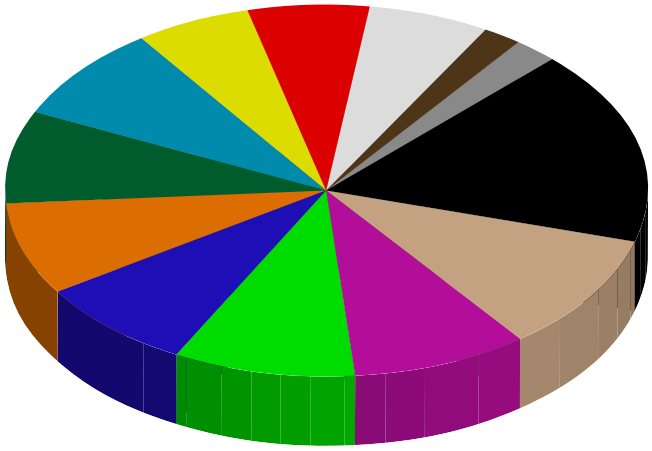


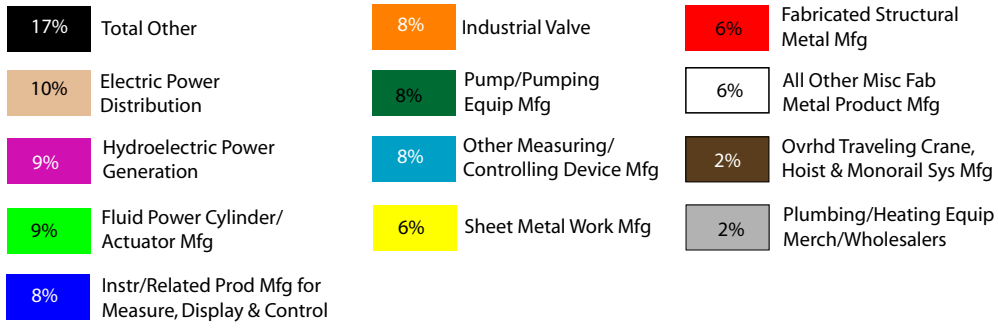
Hydropower Sector

Due largely to Niagara Falls, New York State produces more hydropower than any state east of the Mississippi. The New York Power Authority sells electricity generated at its Niagara Power Project to selected businesses in Western New York. Their hydropower is classified as either replacement or expansion power, and it is delivered through an arrangement with the utility company supplying electricity.

Hydropower NAICS Industries Distribution in Buffalo Niagara Region

Revenue per NAICS code





Biomass

Biomass and biofuel operations

generally require bulk transport, an advantage Buffalo Niagara's offers by highway, rail and water. The industry's component parts generally match the profile of the region's traditional manufacturing base. Plans are being made to reuse Buffalo's abandoned grain elevators as bulk storage for biofuel production.

Buffalo company RiverWright plans to produce 110 million gallons of ethanol per year in a facility on the Buffalo River. In late 2008, Northern Ethanol announced plans to spend $245 million on a 70-acre site in Niagara Falls for an ethanol producing plant.

NanoDynamics Energy, Buffalo, used a grant to develop a process to fabricate a single tubular cell capable of generating more than 20 watts. The cells were tested and assessed for performance on fuels, including hydrogen, methane and biogas. The company has a DOE contract to develop a 400-watt solid-oxide fuel cell designed to operate on hydrogen, methane and other biogas fuels.

Double A Willow, Fredonia, has developed a fast-growing and durable plant for a biomass source. Laidlaw Energy Group is developing a clean wood biomass-fueled power plant that uses a wood gasification system to handle various types of wood biomass fuel.
In short, the region has an existing base to support the development, production and distribution of renewable energy storage components and systems.

Nuclear

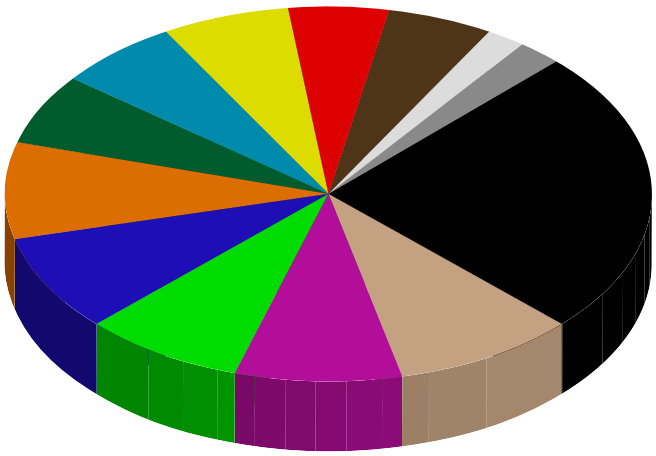
Buffalo Niagara has no operating nuclear facilities but is home to the West Valley Reprocessing Plant,

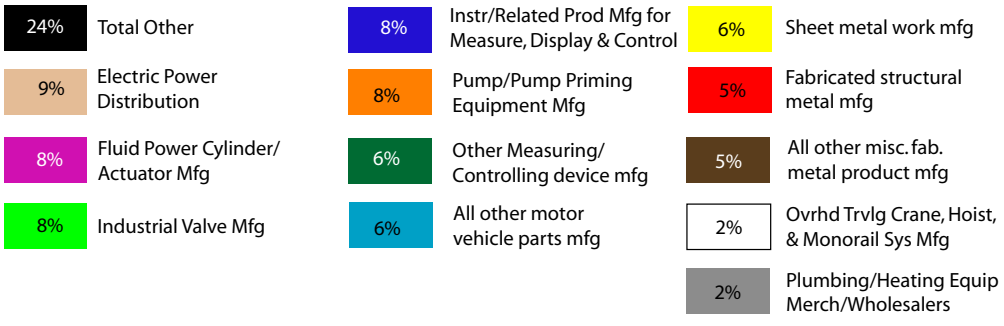
iStock photo

Although Niagara hydropower is considered to be at capacity given current technology, there is strong interest in using the Niagara River as a source of hydrokinetic power in locations both upstream and downstream from the Falls.

Biomass NAICS Industries Distribution in Buffalo Niagara Region

(Revenue per NAICS code)





which has done important research in nuclear waste storage and transporting. The plant employs dozens of nuclear engineers and technicians in a radioactive waste remediation project.

Should the U.S. industry have a resurgence in nuclear plant construction, Buffalo Niagara has idled heavy industry plants, notably steel, that may be appropriate for making the large component parts that would be required in a revived nuclear industry.

Green Buildings

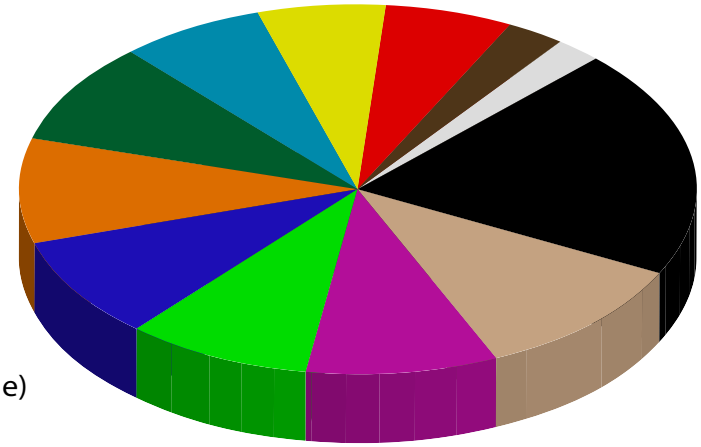
Buffalo is rapidly gaining ground in green building. Major developers and builders in the area, including Ciminelli Development, Uniland Development and McGuire Development, had significant LEED buildings under construction at the end of 2008.

The most prominent were the $137 million federal courthouse being built downtown and the $35.5 million Buffalo State College Burchfield Penney Art Center. Recently completed projects include UB's Life Sciences Complex and BlueCross BlueShield's downtown Buffalo headquarters.

Buffalo has received attention for innovative deconstruction. National publications featured the nonprofit ReUse for an ambitious program to salvage and resell materials from housing slated for demolition. In 2004, UB adopted new construction and renovation-design guidelines that prioritize energy efficiency and guarantee a commitment to high performance and green building principles. UB has

Nuclear NAICS Industries Distribution in Buffalo Niagara Region

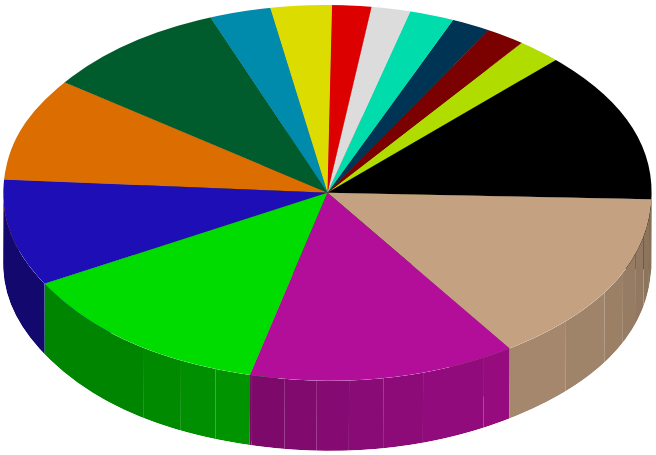
(Revenue per NAICS code)



20%	Total other	9%	Instr/Related Prod Mfg for Measure, Display & Control	6%	Fabricated Structural Metal Mfg
11%	Electric power distribution	9%	Pump/Pumping Equip. Mfg	6%	All Other Misc. Fab. Metal Product Mfg
9%	Fluid Power Cylinder/ Actuator Mfg	9%	Other Measuring/ Controlling Device Mfg	3%	Overhead Trvlg Crane, Hoist, & Monorail Sys Mfg
9%	Industrial Valve Mfg	7%	Sheet Metal Work Mfg	2%	Energy consulting services

Green Buildings NAICS Industries Distribution in Buffalo Niagara Region

Revenue per NAICS code



13%	Total other	9%	Fabricated Structural Metal Mfg	2%	Power, Distr, & Specialty Transformer Mfg
15%	Electric power distribution	9%	All Other Misc Fab Metal Product Mfg	2%	Engeneering Design Services
13%	Instr/Related Prod Mfg for Measure, Display & Control	3%	Energy Consulting Services	2%	Air/Gas Compressor Mfg
13%	Other Measuring/ Controlling Device Mfg	3%	Motor & Generator	2%	Charge Controller
9%	Sheet Metal Work Mfg	2%	All Other Plastics Product Mfg	2%	Printed Circuits & Electronics Assemblies

committed to LEED Gold standards for all new buildings.

Energy Transmission & Storage (ETS)

Buffalo Niagara has an existing manufacturing, technology and research base to support the development, production and distribution of renewable energy storage components and systems.

Energy Curtailment Specialists has grown from a two-person operation in 2001 to become North America's largest private demand response provider, offering turnkey and administrative services. NanoDynamics energy division manufactures products, devices and systems for the portable power and energy generation markets, including a solid oxide fuel cell. ENrG Inc., also in Buffalo, specializes in technologies for fuel cells and gas separation.

The largest global supplier of turbine-rotating equipment to the oil and gas, chemical, petrochemical and process industries, Dresser-Rand has invested $14.7 million to build a new state-of-the-art technology center in Olean.

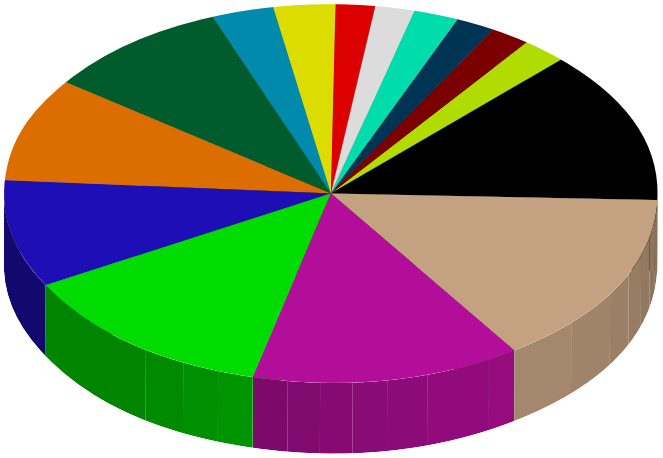
A strategic initiative of UB, Integrated Nanostructured Systems, is doing research on the enabling technology for future generations of energy storage, developing batteries for the electric and plug-in hybrid-vehicle markets.

Transportation

In 2009, New York Gov. David Patterson announced the creation of a consortium on hybrid electric batteries and energy storage technologies to advance the development of technology for

ETS NAICS Industries Distribution in Buffalo Niagara Region

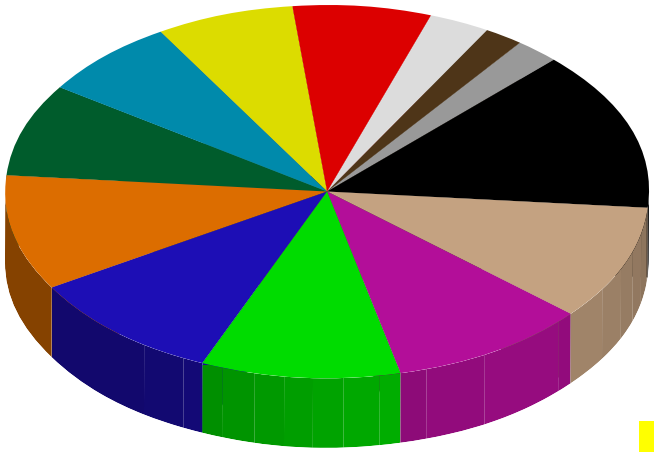
Revenue per NAICS code



13%	Total other	9%	Fabricated Structural Metal Mfg	2%	Power, Distr, & Specialty Transformer Mfg
15%	Electric power distribution	9%	All Other Misc Fab Metal Product Mfg	2%	Engeneering Design Services
13%	Instr/Related Prod Mfg for Measure, Display & Control	3%	Energy Consulting Services	2%	Air/Gas Compressor Mfg
13%	Other Measuring/ Controlling Device Mfg	3%	Motor & Generator	2%	Charge Controller
9%	Sheet Metal Work Mfg	2%	All Other Plastics Product Mfg	2%	Printed Circuits & Electronics Assemblies

Transportation NAICS Industries Distribution in Buffalo Niagara Region

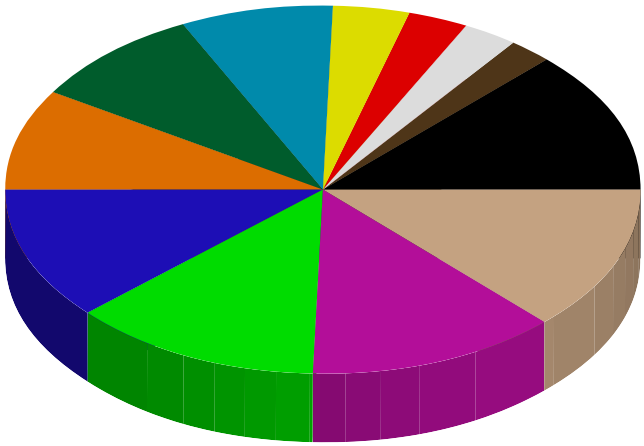
Revenue per NAICS code



14%	Total other	10%	Pump/Pumping Equip Mfg	7%	Fabricated Structural Metal Mfg
10%	Fluid Power Cylinder/ Actuator Mfg	10%	Other Measuring/ Controlling Device Mfg	7%	All Other Misc Fab Metal Product Mfg
10%	Instr/Related Prod Mfg for Measure, Display & Control	8%	All Other Motor Vehicle Parts Mfg	3%	Ovrhd Trvlg Crane, Hoist, & Monorail Sys
10%	Industrial Valve Mfg	7%	Sheet Metal Work Mfg	2%	Energy Consulting Services
				2%	Motor & Generator

Solid Waste Management NAICS Industries Distribution in Buffalo Niagara Region

(Revenue per NAICS code)



13%	Total Other	12%	Other Measuring/ Controlling Device Mfg	4%	Ovrhd Trvlg Crane, Hoist, & Monorail Sys Mfg
13%	Fluid Power Cylinder/ Actuator Mfg	9%	Sheet Metal Work Mfg	3%	Energy Consulting Services
13%	Industrial Valve Mfg	9%	Fabricated Structural Metal Mfg	3%	Motor & Generator Mfg
13%	Instr/Related Prod Mfg for Measure, Display & Control	8%	All Other Misc. Fab. Metal Product Mfg	2%	Engineering Services

plug-in hybrid electric vehicles. The creation of a New York Energy Policy Institute to coordinate the knowledge base and expertise of New York's higher education institutions will bring important research and technical support to the consortium.

Buffalo-based ENrG Inc. will produce thin ceramic membranes for solid oxide fuel cells used for auxiliary power units in vehicles. Delphi Corp., a major auto supplier with plants in Buffalo Niagara, maintains a fuel cell research and development center at the Rochester Institute of Technology.

GM invested $31 million in 2008 at its Tonawanda Powertrain Engine Plant to upgrade the current Ecotec 2.2-liter engines to make them E85 (ethanol) capable and improve emissions. Cummins, Jamestown, employs 1,300 in diesel engine manufacture for heavy-duty trucks. Ashland Advanced Materials, Niagara Falls, is establishing a plant to produce carbon and graphite products to support lithium battery manufacturing for hybrid-electric vehicles.

Solid Waste Management

As part of its industrial heritage, Buffalo Niagara has many sites suitable for brownfield development. A number are planned and "shovel ready" but have not proceeded for lack of government funding.

Brownfields can be well suited to renewable energy reuse. In some cases, more intense use of land is not practical because of weak market conditions or because contamination issues may make redevelopment with commercial buildings impractical. However, wind farms and solar fields can be developed on sites that may not work for other uses. The Steel Winds site in Lackawanna is considered one the nation's best examples of brownfield use for renewable energy.

Bethlehem Steel has pledged $5 million to help prepare 1,150 unused acres of its former plant adjacent to Steel Winds. The money will also go to 1,200 acres in the South Buffalo Redevelopment Area ("Buffalo Green Belt") for light and heavy industries, distribution businesses, and recreational uses. Erie County has committed $1 million to upgrade infrastructure. The South Buffalo Redevelopment Area will develop an area of 3 million square feet at a cost of approximately $45 to $65 million. It is estimated this development will create approximately 4,500 to 10,500 new jobs.

Sevenson Environmental, Niagara Falls, is one of the country's leading environmental cleanup contractors. The region is also the home of Ecology and Environment,

of Lancaster, a leading global environmental consulting firm working on ranging from mitigating environmental damage to fighting global climate change.

BUFFALO NIAGARA HAS SIGNIFICANT INCENTIVE PROGRAMS AVAILABLE

The renewable energy specific incentive programs in New York State are highly competitive with other states and can offer Buffalo Niagara significant opportunities to attract new businesses when marketed to target companies. In most surveys, New York ranks in the top ten of the states that have programs to aggressively pursue renewable energy and energy conservation.

They include tax credits, grants, low-cost loans, rebates, bond financing, production incentives, renewable portfolio standards, interconnection standards, green building standards, power purchase agreements, net metering and feed-in-tariffs.

They are constantly being changed and improved to meet the needs of the market. While the economic downturn has created financial problems for many states, green energy incentive programs are likely to continue and even increase as state's access federal economic stimulus funds for green energy development.

The New York State Energy Research and Development Authority (NYSERDA) is the central hub of the state's energy initiative programs and works with regional development agencies to assemble assistance packages for job creating projects.

THERE ARE SUBSTANTIAL OPPORTUNITIES FOR GROWING THE REGION'S GREEN ECONOMY

Businesses creating green jobs have shown a strong tendency to incorporate environmental sustainability as part of their corporate culture. In addition, communities with a strong green commitment are more likely to generate new entrepreneurs to participate in the green economy as well as to convince existing companies to look at possible new opportunities stemming from the move to alternative energies.

Green identity

In a recent survey in 2008, more than 170 organizations were identified as working in environmental issues in the region. The momentum for a green business

Freerange photo

movement is well under way with major collaborative initiatives such as WNY Environmental Alliance, Buffalo First, Green Gold Development Corp., Upstate Green Business Network and the Apollo Alliance.

The city of Niagara Falls has recently made a commitment to make Niagara Falls a green city. The city actively, and successfully, is working to recruit new green industries to take over idled plants. They are also working on measures to green fuel the city fleet.

To create a unified green movement in the WNY region, the WNY Environmental Alliance was formed in 2008. The Alliance reaches out to the 170 plus groups working in the environment across all sectors to coordinate efforts. To centralize the voice of the environmental groups, the Alliance is creating the WNY GreenTable, a virtual meeting place for organizations, businesses, government agencies and community members to share information and promote green practices in the region.

Canada

Buffalo Niagara is in a unique position to recruit and interact with Canadian firms in the renewable energy sector. As noted previously, the region's proximity to the metro Toronto area allows Canadian companies to manage cross-border manufacturing and distribution facilities that service the larger American market. As Canada's business and financial center, Toronto also houses representatives from numerous governments, multinational corporations and other potentially useful entities from around the world, giving the region greater access to possible global opportunities.

Canada is particularly strong in the active solar thermal field and provides a broad range of technology products

that might be recruited for manufacturing operations in Buffalo Niagara as a way to enter the U.S. market.

With a major supplier of photovoltaic grade silicon located in Niagara Falls—and its ready availability of product at a discount—there are immense opportunities in photovoltaic production in Buffalo Niagara. Photovoltaic (PV) technologies are used in a variety of applications, ranging from large-scale solar utility plants and remote industrial power systems to roof-mounted residential power units, small battery chargers and power sources for consumer electronics.

As the home of one of the world's largest hydropower projects and with the marketing advantage of instant identification, Buffalo Niagara should find opportunities in hydropower.

In particular, smaller scale hydrokinetic power that takes advantage of tides and water currents is gathering more and more attention. New York State has taken a leadership role in testing this new technology, and synergies can be established with Canada, which has world class expertise in hydropower project design and construction due to its vast water resources. Nearly two-thirds of the power produced in Canada is hydropower.

Education

As the renewable energy industry continues to grow throughout the world, there is an increasing need for specialized workers in the field. Many schools are taking notice of this and pursuing greater research in the field

LEADING BUFFALO NIAGARA CROSS-SECTOR INDUSTRIES IN RENEWABLE ENERGY

NAICS	Description	Bio	Hydro	ETS	Geo	Bldg	Grid	Nuke	Solar	Trans	Waste	Wind
221122	Electric Power Distribution	■	■	■	■	■	■	■	■			■
331421	Copper Rolling, Drawing & Extruding	■	■	■	■	■	■	■	■	■	■	■
332312	Fabricated Structural Metal Mfg	■	■	■	■	■	■	■	■	■	■	■
332322	Sheet Metal Work Mfg	■	■	■	■	■	■	■	■	■	■	■
332999	Other Misc Fab Metal Product Mfg	■	■	■	■	■	■	■	■	■	■	■
333415	AC/Warm-Air Heating & Refrig Equip Mfg	■	■		■	■	■		■	■		
333613	Power Trans Equip	■	■	■	■		■	■	■			■
334112	Computer Storage Device Mfg	■	■	■	■	■	■	■	■	■	■	■
334513	Instr Mfg for Measure, Display Control	■	■	■	■	■	■	■	■	■	■	■
334515	Meter	■	■	■	■	■	■	■	■			■
334519	Other Measuring/Control Device Mfg	■	■	■	■	■	■	■	■	■	■	■
335311	Power, Dist & Specialty Transformer Mfg	■	■	■	■	■	■	■	■	■		■
335312	Motor and Generator	■	■	■	■	■	■	■	■	■	■	■
335313	Switchgear/Switchboard Apparatus Mfg	■	■	■	■	■	■	■	■	■		■
335314	Relay & Industrial Control	■	■	■	■	■	■	■	■		■	■
335931	Electrical Connections	■	■	■	■	■	■	■	■	■	■	■
335999	Charge Controllers		■	■	■	■		■	■	■		■
541310	Architectural Svcs	■	■	■	■	■	■	■	■		■	■
541330	Engineering Design Svcs	■	■	■	■	■	■	■	■	■	■	■
541380	Testing Laboratories	■	■	■	■	■	■	■			■	
541620	Envir. Consulting Svcs	■	■	■	■	■	■	■			■	■
541690	Energy Consulting Svcs	■	■	■	■	■	■	■	■	■	■	■

Note: Colored boxes indicate NAICS codes where Buffalo Niagara possesses strength and that are relevant across different sectors. Blank boxes indicates little or no NAICS activity in targeted sector.

and offering degree and certification programs. In the Buffalo-Niagara region, initiatives towards a new green economy at the collegiate and vocational training levels have already begun.

The University at Buffalo was one of the first schools in the nation to work towards a "green campus," and continues to pursue this goal by offering environmental studies degree programs and an environmental engineering degree as part of the school of engineering. Other universities and community colleges in the area also offer associate and bachelor level degrees in environmental studies.

The majority of colleges and universities that have made progress in the field of alternative energy are not surprisingly located in areas where manufacturing, alternative energy and sustainability are gaining the most momentum. As can be seen by the success of green industries in other states and nations, education at both collegiate and vocational levels as well as outstanding research is necessary to promote green industry.

A good opportunity for the region would be to strengthen its alliances with schools across New York State and the colleges and universities of Southern Ontario, which have research programs in areas necessary to renewable energy. In particular, starting a cross-border academic discussion on renewable energy technologies could yield economic growth on both sides of the border and distinguish Buffalo Niagara in the competition for green jobs.

Manufacturing resources

Buffalo Niagara has manufacturing activity in nearly all of the industrial sectors that are part of the renewable energy supply and value chain. The region has an opportunity to help existing companies to retool, remarket and reinvent themselves as green economy companies.

The region could also expand its "green belt" concept by putting together manufacturing sites and facilities that would reduce a manufacturer's carbon footprint in "low carbon energy zones."

Niagara Falls hydropower could be used to supplement micro-grid systems of wind, solar and hydrokinetic generated power on brownfield sites to drastically reduce the pollutants (carbon footprint) used in the manufacture of a product, creating an even greater competitive edge for companies in the linked manufacturing sites.

BUFFALO NIAGARA IS POSITIONED TO BECOME A CENTER FOR GREEN MANUFACTURING

The new green economy offers unique opportunities for job growth in Buffalo Niagara as demand grows for renewable energy. The potential stems from Buffalo Niagara's ability to provide advantages to manufacturing suppliers in all alternative energy sectors, rather than any one sector.

Buffalo Niagara can be competitive in securing green jobs because it has a more diverse and balanced industrial base than other competing regions. The broad manufacturing capacity of the region provides it with an opportunity to take a leading role as a component supplier in all aspects of renewable energy use and production.

Buffalo Niagara can establish itself as a model for the re-industrialization of America in the new green economy and serve as a national laboratory for restoring manufacturing jobs. It has the opportunity to establish itself as a North American center for the commercialization of green and renewable energy related products.

Positioning Buffalo Niagara as a region where "Industry Creates Energy" can allow the region to participate in a revitalized American economy by capitalizing on its historic industrial advantages to reclaim its manufacturing heritage and create jobs.

BUFFALO NIAGARA'S SUCCESS IN THE NEW GREEN ECONOMY REQUIRES COMMITMENT & EFFORT

Buffalo Niagara must continue its efforts to both developing a supporting business environment as well as to becoming a region dedicated to green technologies and practices.

To take full advantage of its green opportunities, the region should consider the formation of a regionally based "Green Team" to facilitate and guarantee the region's participation in the new green economy. Utilizing input from government, business, academia and the community as a whole, the region could further encourage participation in the global dialogue on alternative energy production to establish a leadership role in green manufacturing processes and green jobs.

These actions could result in an integrated regional green initiative with an action plan that will further generate new jobs and investment.

In addition, the overall report makes a number of additional suggestions that can enhance the region's participation in a new green economy and the creation of green jobs. These could also be part of an agenda and action plan for regional efforts.

BUFFALO NIAGARA CAN BUILD A REGION WHERE 'INDUSTRY CREATES ENERGY'

The goal is to utilize the same strengths and attributes that led to Buffalo Niagara's original rise. These include access to water and hydroelectric power, a strategic position between the Northeast and Midwest and near Canada, a skilled workforce, established manufacturing capacity and industrial real estate. This will provide the platform needed to attract the businesses, manufacturing and jobs that will be essential to building U.S. competitiveness in renewable energy. The renewable energy industry draws on these same strengths the region possesses and is an industry that is likely to constitute a primary source of global economic growth in coming decades.

Buffalo Niagara's ability to provide credible capacity in almost all alternative energy solutions now being proposed, the presence of one of the largest public universities in the Northeast and a relatively low cost structure are just a few of the many factors that provide the region with an ability to become a center of innovation and renewed manufacturing strength.

With united and coordinated action, Buffalo Niagara has the potential to show the world how an old, declining manufacturing center can transform itself into a focal point within a new growth economy. With new and continued initiatives based on the generation of renewable energy, green practices and sound environmental policies, Buffalo Niagara can truly be a region where "Industry Creates Energy."

BUFFALO NIAGARA:
WHERE INDUSTRY CREATES ENERGY

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