

Corporate Profile

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Website: www.eforenergy.com

The Company

E-Factor, Incorporated, (E-Factor) was established in November 2005 - owned and operated out of Vancouver by Brian Sikorski P.Eng. CEM. We currently employ two full-time mechanical engineers, a controls technologist, business/energy analyst, office manager, and contract other services related to our operations on as need basis. We also partner with electrical and structural engineers and sub-consultants for larger interdisciplinary projects. We aim to grow as a company and concentrate on our core business areas including mechanical design for HVAC, Plumbing, Fire Protection, Energy Conservation and Sustainability, advanced building diagnostics, and building energy-systems optimization.

HVAC and Controls Design

E-Factor has been engaged in various building HVAC and Controls fit-up and retrofit projects which typically including variable speed fans and pumps, VAV systems, humidification systems, building automation systems (BAS), chilled water plant upgrades, and heating and domestic hot water boiler replacements in multi-residential, commercial, institutional, industrial sectors.

E-Factor has extensive experience designing projects and working with most DDC control software platforms. We also integrated Automated Fault Detection and Diagnostics (AFDD) integration in several projects in Vancouver hospitals.

Fire Protection and Plumbing Systems Design

E-Factor has recently completed several plumbing and sprinkler system design projects in Vancouver, Richmond and North Vancouver. We have developed a custom hydraulic calculation simulation tool for sprinklers using Pipe-flo™ software. The program allows creation of live isometric representations of design areas for code compliance, including Hydraulic graphs and piping line, node, and fitting reports.

Energy Audit Consulting

E-Factor performed energy audits on over 1,000,000 sq m of commercial and institutional facilities in the past 10 years and implemented numerous related energy conservation measures (ECM'S). With many years of in-house corporate energy management experience, we are well positioned to assist our clients with ECM planning, budgeting, justification, and successful completion.

Building Retro-Commissioning

E-Factor completed several retro-commissioning projects. In March 2008, E-Factor became an accredited Continuous Optimization Service provider through BC Hydro and is an Alliance Member.

Revit and AutoCAD 3D MEP Design

We have recently added 3D design capability forming an alliance with Pinnacle Infotech in Houston Texas. Our designs can be created using 3D Revit or AutoCAD MEP and incorporated with Architectural models. E-Factor maintains models and utilizes Pinnacle expertise to reduce 3D design costs. 3D MEP models are available for HVAC, Plumbing, and Fire Sprinkler system design.

Recent Project Activity

E-Factor has been working on several projects in BC, Alberta, and Ontario including some notable projects as follows:

- **Lafarge Alternative Fuel Storage Building – Fire Protection Systems Design**
Detailed design of ESFR sprinklers and foam fire protection systems, hose reels, and custom spray-nozzle conveyor fire protection for 40,000 sq ft storage building in Richmond. One of the first such facilities in Canada for use of alternative recycled materials (wood, plastic, and rubber) for supplementing kiln preheating and heating for manufacture of concrete. Project was completed in early 2019.
- **825 Homer Street – Atelier Building – Parkade Heat Rejection and Reclaim Project**
The parkade temperatures in the commercial level of building were found to exceed 40 C in summer due to the installation more than 20 air-cooled condensing units. After performing a feasibility study to find ways to reduce excessive heating, a project was completed that involved the replacement of 9 of the condensers with 7 water-cooled condensing units and utilized an existing Fluid Cooler used for heat pumps serving several commercial spaces. The largest of the units served year-round cooling of the electrical vault serving the building. New piping was run from the third floor to the P1 parking level. The new system was monitored over extreme summer conditions and was able to satisfy all cooling loads while keeping parkade temperatures in an acceptable range.
- Recent Fire Sprinkler Systems Design Projects (2018-2019)
 - **8011 Leslie Road** - design for 14-unit short stay hotel in Richmond BC
 - **633 Bucketwheel** - system upgrade design for BC Housing apartment complex in Vancouver
 - **120 Lonsdale** - design for adding new sprinkler system to 3 story commercial building and restaurant in North Vancouver
 - **1450 Burnaby Street** – design for fire and domestic water backflow preventor installations for 9 story apartment complex in Vancouver
- **625 Powell Street Foundation – Mechanical/Plumbing/Fire Protection Design**
611 - 625 Powell Street: This design/build project involved the complete fit-up of a 26,000 sq. ft. facility in 2 adjacent buildings 611 and 647 Powell Street in Vancouver BC. The building is operated by Vancouver Coastal Health and is the main administration offices for the BC Centre for Excellence in AIDs Research. The facility serves the Downtown East Side community. E-Factor completed design of the HVAC, Plumbing, and Fire Protection (sprinkler and standpipe) system designs. Project construction began early in 2016.

Fire Protection used a wet pipe with an alternate dry pipe system for outdoor hazard. The existing fire system in place was unusable and was mostly redesigned by E-Factor. Hazards included

concealed spaces in a wood framed building and ducting systems passing through wooden ceiling spaces. System was installed by Kraico. E-Factor acted as FPER.

647 Powell Street: The building at 647 Powell Street is a 5,000 sq ft (465 sq m) research wet laboratory designed to meet the requirements of ANSI/AIHA Z9.5 Ventilation standard and exceeds the ASHRAE 90.1 2010 Energy standard with heat-wheel energy recovery on the 100% outdoor air system. Building will be occupied in late 2017. E-Factor also managed the laboratory systems selection, procurement, and certification. Systems included Fumehood, Sterilizer, Steam Generator, Class II Biosafety cabinets, and various custom laboratory plumbing systems including eye wash stations, foot pedal operated sinks, emergency showers, and potable and non-potable water distribution systems.

- **City of Richmond – RCMP Community Safety Building Water to Air Heat Pump Replacements**
E-Factor designed and completed drawings and specifications for the replacement of failed 60 Ton (refrigeration) heat pump units with alternate units and to resolve water flow issues in the facility that caused numerous heat pump and heat recovery heat pump failures. Solution required new control strategies and installation of new controlled piping by-passes allowing access to piping system water volumes and reducing heat pump short cycling times. System also converted to 25% glycol. The project value is \$700,000. Work at the 50,000 sq ft facility is complete March 2019.

- **City of Richmond - Watermania Aquatic Facility – Fortis CDDP Energy Efficiency Projects**
Watermania is a large aquatic facility operated by the City of Richmond BC, at 14300 Entertainment Blvd. In 2015, E-Factor, working together with Anthony Jones and Associates, completed a Fortis Commercial Custom Design Program study which identified energy and operational retrofits that would reduce fuel use and optimize the operation of an existing heat recovery chiller used for reclaimed heating use.

Based on the study and further design and operational review, several conservation measures were selected including the replacement of a non-condensing with a condensing boiler, conversion of the heating and DHW plant from constant to variable water flow to ensure operation at best efficiency, and addition of a new plate and Frame heat exchanger to heat the large Wave Pool with reclaimed heat from the chiller. The new boiler, a Vitocrossal CA-3 3500 MBH, was recently introduced by Viessmann Mfg in 2016.

- **City of Richmond - Watermania Aquatic Facility – Cooling Tower Upgrade Design**
E-Factor has completed the design for an upgrade of the existing oversized cooling tower with a new Fluid Cooler and variable speed pumping system. The fluid cooler is only required to serve the condenser bundle of the heat recovery chiller and normally runs at very low heat rejection loads. Energy use will be minimized through a sequence of operations that enables rejection to the tower only when heat recovery is at maximum utilization. The project design is complete as of January 2017 and implementation is expected later in 2017.

- **Air Canada – Winnipeg Hangar Base DDC Control Upgrades (2017-2018)**
This project involved the complete DDC control system upgrade for the 200,000 sq ft aircraft hangar and office complex in Winnipeg MB.

- **Air Canada – Winnipeg Hangar Base Energy Upgrades (2017)**
 This project involved the completion of a feasibility study for upgrades to the aircraft hangar heating and HVAC systems. E-Factor worked with Manitoba Hydro to obtain partial funding for the study and for incentives of 30% of project costs for a \$450,000 boiler replacement, variable flow distribution pumping, and retrofits to 24 hangar unit heater control valves and optimization of control sequences. Work will be completed in 2019.
- **Pacific Forestry Centre - Boiler and Controls Upgrades**
 This project involved a Retro-commissioning Study and implementations at the Pacific Forestry Centre (PFC) in Victoria BC. In 2013/14 we implemented many projects including a boiler plant upgrade to Condensing from Atmospheric boilers. We also redesigned the plant and controls to allow for advanced DDC control of pumps, boiler isolation, and air handlers. Testing and Balancing work was also done to correct air flow imbalance between buildings and to account for changes in Fumehood usage. In 2015 we completed the implementation of an extension to the project to replace the remaining heating plant with condensing boilers. Project final completion was February 2016.
- **Shaughnessy Place - High Efficiency Boiler Upgrades (2016)**
 In 2015, designed and implemented upgrades to boiler plant mid efficiency 3 boiler plant to with Viessmann 2,245 MBH condensing boilers and renewed the Domestic Hot Water system with plate and frame heat exchangers to replace shell and tube. The new condensing boilers installation uses BCSA approved common venting system. Project received a Fortis Boiler Program incentive. The existing 350 Gallon Domestic Hot Water tanks were retained and relined with new concrete liners and anodes. Systems is in progress of being converted to full variable flow with elimination of 2-way control valves to reduce pumping and reduce bypass of hot supply water.
- **Squamish General Hospital - Condensing Boiler and Controls Upgrade**
Boiler Upgrade: This project involved the installation of a new 1750 MBH condensing boiler, its corresponding systems, to achieve optimized and efficient hot water heating. The new condensing boiler serves as a lead boiler and the existing large Bryan boilers are only enabled on failure of the new boiler or if the outside temperature is too cold for the boiler to heat the hospital. Pumping power for the heating loop was reduced from 14 kW down to as low as 1 kW with the new variable speed pump and heating loop modifications. The project includes upgrade of the building controls required for the boiler upgrade, existing heating system circulation pumps, and hot water heating plant. For future optimization purposes, the BAS system was upgraded to the latest BACnet technology from Siemens Apogee.
- **Vancouver General Hospital – AFDD (DABO™) Installation at VGH Jim Pattison South Tower:** We initiated and managed the first large AFDD (Automated Fault Detection and Diagnostics) installation in BC in the 350,000 sq ft tower at VGH. The DABO system monitors 450 patient room and nursing areas over 12 floors of the tower and also looks at the main air handlers, chilled water, and heating plant serving the tower. The installation was co-funded by BC Hydro and VCH (Vancouver Coastal Health).
- **Vancouver General Hospital – Jack Bell Chilled Water Interconnect (2013):** Design and project management of an Interconnect between the existing Jack Bell Research building and the new

Robert Ho addition. The piping project involves the installation of 150 feet of 100 mm supply and return piping installed outdoors with Heat Trace. The resulting interconnect provides redundancy for the site by linking two chilled water plants and it will also allow for the decommissioning of a 150 Ton absorption chiller that is high maintenance and high energy use.

- **Vancouver General Hospital Banfield Pavilion – Heat Pump Heat Recovery System (2011):** Designed and implemented a hybrid heat pump heat recovery for a 45,000 CFM 100% outdoor air system for the Banfield Pavilion Extended Care home. Hybrid system uses a steam heat exchanger in combination with heat pumps in the same heating coil to save cost and pressure drop. Project was completed in January 2012 but was operational in October 2011. Estimated energy savings of 4500 GJ/yr steam. The system also provides cooling to the building in summer under peak conditions up to 70 Tons of refrigeration.
- **Lions Gate Hospital – Heat Pump Heat Recovery System (2010):** Designed and implemented a hybrid heat pump heat recovery for a 25,000 CFM operating suite air handling system. Hybrid system uses a steam heat exchanger in combination with heat pumps in the same heating coil to save cost and pressure drop. Project was completed spring 2011. Estimated energy savings of 3500 GJ/yr steam.
- **Mount Saint Joseph’s Hospital – Energy Retrofits (2010-2012):** Designed and implemented a **DDC Control System** replacement for the 228,000 sq. ft. hospital to replace the outdated Walker system. Project was completed in April 2013. Designed and implemented a new 3,000 lbs/hr **steam boiler replacement** and 2 condensing hot water boilers for the hospital as well as adding electronic isolation valves for existing hot water boilers. The project is complete as of October 2012.
- **Energy Retrofits– Brock Fahrni Residence (2011):** Completed design and implementation for a new DDC Control System for the 110,000 sq. ft. extended care facility. No DDC controls in the building. New zone isolation dampers were installed for energy savings and several optimized control strategies. Project was completed since March 2102.
- **Riverway Golf Course Energy Study – City of Burnaby:** An energy conservation review of the Riverway Golf course Club house was done in winter of 2012/2013. The facility is a high use Commercial Kitchen and Restaurant with higher than normal energy consumption for similar facilities. Many important measures and issues were identified with high fuel savings potential by increasing the use of the pond source heat recovery system, and addition of Kitchen demand ventilation control.
- **Evergreen Line Rapid Transit Project RFP Specifications (2010-2011):** E-Factor Engineering developed the *mechanical* and *fire protection* specifications for the Evergreen Line design-build project. The work involved review of specifications for generations of previous Rapid Transit lines – Expo Skytrain Line, Canada Line, and the Millennium Line. The final submission of fire protection and mechanical specifications were reviewed and abridged into succinct guidelines for supporting the project RFP. The scope of the rework/update of the mechanical for HVAC and *Fire Protection* systems specifications was for the six proposed stations, the Vehicle Storage Facility, and the stand pipe and water supply piping for the new tunnel. E-Factor worked with CH2M Hill, Empac

Engineering (Castlegar), Via Architecture, and Translink to prepare a design/build guideline spec for construction of the new ELRT line stations.

- **Implementation of PSECA and ecoEnergy Projects for Vancouver Coastal Health (2010-2011):** E-Factor has completed a series of energy conservation projects at Vancouver General Hospital and Lions Gate Hospital in North Vancouver. The projects were derived from various energy studies and projects previously developed by E-Factor for their client Vancouver Coastal Health. The projects are mainly funded by BC Hydro, Terasen (Fortis) and PSECA (BC Provincial Government) incentive funds, and the client has been approved for additional incentives for the new work. The value of these projects are over \$1,500,000 and include the following:

Vancouver General Hospital

- **Banfield - Hybrid Heat Recovery - Heat Pump System** for 45,000 CFM 100% OA systems
- **Energy Centre - Install new 75 hp steam boiler feedwater pump** hp in lieu of 200 hp for lower loads up to 45,000 lbs/hr
- **Skin Care Centre – Condensing Boiler Retrofit** and Optimize Controls
- **Parkade - Comprehensive Lighting Upgrade**
- **ICORD Building - Variable Speed Drives** on Main AHU1, AHU2 and EF1 for Off Peak Flow Reductions

Lions Gate Hospital

- **PSECA – Hybrid Heat Recovery Heat Pumps** on 25,000 CFM 100% OA System serving Operating Suite.

The energy savings from these projects was estimated at 1,900,000 kWh and over 11,000 GJ of fuel.

- **Vancouver General Hospital - 2010 Thermal Energy Conservation Review:** E-Factor with Stantec Engineering has completed a study on the 300,000 sq m Vancouver General Hospital campus funded by Terasen Gas. This project examined the potential for district heating using the VGH Energy Centre (180,000 lbs/hr steam plant) and also looked at energy conservation potential for thermal systems on the campus. E-Factor was selected by Stantec, due to our extensive knowledge of the site, to complete the site energy analyses and develop the energy conservation measures for HVAC and plant equipment upgrades.
- **Corporation of Delta –2010 - Municipal Hall DDC Upgrade, George Mackie Library, Tillbury Ice Arena DHW Upgrades.** Several projects have been completed for the Corporation of Delta including design and specification for a DDC control upgrade for Municipal Hall, Retrofit of a conventional Roof Top HVAC Unit with 25 Ton heat pump unit to nearly eliminate boiler heating requirements, and replacement of a conventional Domestic Hot Water heating boiler at Tillbury Arena with a near-condensing potable Hot Water heating boiler.
- **Air Canada – Toronto Pearson Airport – Building Automation System Upgrade for 11 Hangar Bays – Quality Assurance (2009-10).** Worked with Corporate Properties at Air Canada in Toronto to assist in the quality assurance, project management, testing and commissioning, of a Lon Based DDC control upgrade to eleven (11) Aircraft Hangar Bays and associated offices and shops.
- **Mechanical and Controls Upgrades for Condex Property Management (2009-13) -** Shaughnessy Place, Cartier St. Vancouver. Upon completion of a mechanical systems engineering analysis for the 70 unit residential complex in 2009, E-Factor has completed a DDC control upgrade using

Reliable Controls to optimize the operation of the mechanical systems of this 120,000 ft² residential site. We were able to obtain funding for more than 25% of the project costs from the (former) federal ecoEnergy program. Energy savings have exceeded 10% in fuel and electricity.

Other projects for this site include: 1. Upgrade to variable volume pumping system with install of a new pressure controlled hot water distribution pump and VFD to reduce water flows during lower loads and manage boiler flows. 2. Upgrades to modular boiler loop by de-coupling the supply and return header piping of the boilers to eliminate problems with high temperature tripping. 3. Upgrades to boiler venting,

- **BC Hydro Continuous Optimization Projects (2009-2016).** Building controls and equipment recommissioning and optimization for 25 buildings in the Lower Mainland (see table). This work is sponsored by BC Hydro as part of the Continuous Optimization program.

Site	Client	Floor Area (sq ft)
UBC Hospital Koerner (Vancouver)	Vancouver Coastal Health	450,000
Mount Saint Joseph’s Hospital (Vancouver)	Providence Health	220,000
Minoru Residence (Richmond)	Vancouver Coastal Health	117,000
Municipal Hall (Delta)	Corporation of Delta	62,000
Walnut Grove Secondary (Langley)	School District #35	170,000
Adanac Park Lodge (Vancouver)	Little Mountain Residential Care	65,000
One Kingsway (Vancouver)	City of Vancouver	60,000
Vancouver Aquatic Centre (Vancouver)	City of Vancouver	65,000
Vancouver General Hospital Phase I (5 main buildings including JP South Acute Tower and main Chilled Water Plant)	Vancouver Coastal Health	1,700,000
Vancouver General Hospital Phase II (Eye Care Centre, Research Pavilion, Energy Centre)	Vancouver Coastal Health	200,000
Vancouver General Phase III (Jack Bell and Robert Ho Research Centre)	Vancouver Coastal Health	145,000
Powell River General Hospital	Vancouver Coastal Health	160,000
UBCH Purdy Pavilion	Vancouver Coastal Health	200,000
UBCH Detweiller Pavilion	Vancouver Coastal Health	200,000
Childrens Hospital Sunny Hill Centre	Provincial Health Authority	85,000
Pacific Forestry Centre	Natural Resources Canada	175,000
	Total Area	4,252,000

- **Project Energy Consultant for Vancouver Coastal Health Authority (2008/09).** Focused on development of energy conservation projects from implementation at various health care locations in Coastal BC. After completion of extensive energy studies, project financing was requested from the BC Government/BC Hydro PSECA program for Public Sector buildings. Nearly \$3,500,000 million in projects were identified.

- **Project manager and engineering consultant for Vancouver Coastal Health Authority (2007/08):** Development and implementation of over \$2,000,000 in energy conservation projects across the Lower Mainland and South Coast to Powell River. The projects range from energy-efficient lighting upgrades to new, efficient steam boiler installations, and DDC Recommissioning of several hospital facilities. Over 25 separate projects were completed and are currently saving nearly 5 GWh (gigawatt hours) of electricity and 25,000 GJ (gigajoules) of natural gas across the system. BC Hydro is also contributing to the projects with cost incentives based on electrical savings. Other engineering and design assistance was provided by Prism Engineering, Quantum Lighting Ltd., Pacific Boiler Ltd., and Inproheat Industries, as well as numerous contractors and equipment suppliers.
- **Telus Toll Building Sites Recommissioning.** E-Factor acted as a consultant for BLJC Ltd. working in Alberta and Ontario performing extensive reviews of 2 office tower and data centre buildings in Calgary (Len Werry and 7th Avenue Toll Building) and also 2 Telus operations centers in Toronto (Laird St. and Bartor Road facilities). In the Alberta sites, we worked with Johnson Controls Inc. and implemented control sequence revisions to the chilled water systems, air handling systems, and lighting control systems. The efforts have saved about \$80,000/year in energy costs since June 2007.
- **HVAC Design for Affordable Housing Society Head Office (2007/2008):** Engineering design, specification, and tendering of the HVAC system for a rebuilt 10,000 m² office complex in New Westminster, BC. The design included the installation of 8 heat pumps and a networked control system. An exhaust system and a fresh air supply system were also included in the design. The project was completed in September 2008. Installation was done by Broadway Refrigeration and Air Conditioning Systems Co Ltd.
- **Boiler Retrofit for Vancouver 40 suite Apartment Building (2007/08):** Engineering specification and project management for the replacement of a boiler in an Alma St. apartment complex. Replacing existing atmospheric boiler with a new, near-condensing Evolution boiler and a new control strategy to maximize energy savings from the retrofit increased operating efficiency by 20%.
- **DDC Recommissioning Pilot project (2007):** Completed a project with the City of Vancouver Sustainability Group that involved building control optimization on a sample group of buildings in Vancouver. Recommissioning is a proven method of optimizing existing building controls and equipment for energy savings, as well as improvements in occupant comfort and maintenance procedures. The pilot project buildings include a high-rise hotel, high-rise office tower, and a health care facility and laboratory in Vancouver. The initial phases of the project were completed and many measures identified and implemented. The energy savings from the measures were estimated to save 5% to 10% of total building energy consumption for fuel and electrical. One of the buildings indicated a fuel savings of 18% after optimizing temperature control in the main ventilation system and hot water distribution systems.
- **Humidification System Upgrade at the Morris and Helen Belkin Art Gallery at UBC (2006).** This project involved the replacement of existing Steam to Steam humidifiers with new electric to steam humidifiers. The electric humidifiers are downsized to reduce overshoot and increase response time and include greatly improved controls. As a major side benefit, the upgrade has been shown to

reduce building steam energy usage by 50%. These savings comes with a marginal increase in electrical usage, minimized by eliminating winter dehumidification from the chilled water system, and optimizing summer dehumidification and re-humidification.

- **Energy Projects at Vancouver General Hospital (VGH).** A series of projects were completed costing over \$850,000 started in 2004 by Brian Sikorski after working as an Energy Manager with VGH. Some components of the project were identified by a detailed Energy Study and specified with assistance from Prism Engineering, others components were discovered through energy management activities. A package of eligible energy saving retrofit projects was assembled and submitted for financial incentives of \$140,000 from NRCan and \$60,000 from BC Hydro. E-Factor acted as the primary consultant to ensure the successful completion of the project, monitoring, and verification for incentive payments. The project saved over 17,000 GJ of natural gas and electrical energy. More details about these projects are available on our web site.
- **Calgary Hangar 101 Heating and Controls Upgrade for Air Canada.** Working as a sub-consultant to Prism Engineering Ltd. (Burnaby BC), E-Factor acted as project lead design engineer. Starting in 2006, E-Factor performed the engineering design and specification and oversaw the installation of a new high-efficiency combined intensity infrared heating system in this 60,000 square foot hangar and a controls upgrade to the remainder of the 220,000 square foot line maintenance aircraft hangar and operations facility. The project cost approximately \$1,000,000, but with the new equipment, and revisions to building operation and control strategies, Air Canada is projected to save up to \$100,000 in annual energy costs.
- **Calgary Hangar 101 Additional Projects.** In addition to the HVAC Upgrade project, E-Factor was involved in the design and specification of the paint spray-booth make-up air systems, an operational review of 30 Roof Top units with recommendations for upgrades and replacements, and completed a Walk-Through Energy Audit of the facility to identify additional opportunities.

Memberships

E-Factor and its employees have memberships with APEGBC, ASHRAE, AEE, ASTT, BC Hydro Alliance, and Fortis Commercial Custom Retrofit Program.