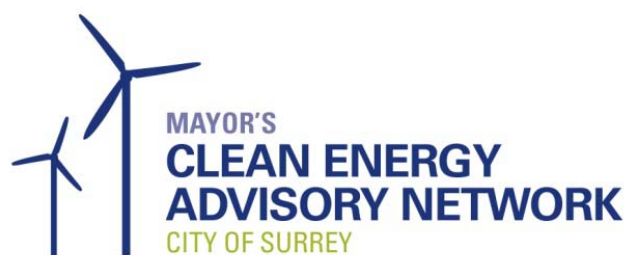


CLEAN ENERGY DEMONSTRATION PROJECTS

BOLD » INNOVATIVE » COMPETITIVE » THRIVING



For information, please contact: Vincent Lalonde, P.Eng. 604-591-4314 valalonde@surrey.ca
General Manager, Engineering
Engineering Department
City of Surrey
14245 - 56 Avenue, Surrey, B.C. V3X 3A2



CLEAN ENERGY DEMONSTRATION PROJECTS

BOLD » INNOVATIVE » COMPETITIVE » THRIVING

POWER GENERATION

Bio-Fuel Production Partnership with Metro Vancouver	1
Distributed Generation	2
District Energy.....	3
Micro-Hydro and Pico-Hydro Generation.....	4
District Energy – Geoexchange City Hall.....	5
Solar Thermal (Domestic Hot Water for Civic Buildings).....	6
<i>District Energy – Campbell Heights & Grandview Heights</i>	7
Biomass for Combined Heat and Power	8
Heat Recovery from Sanitary Sewer	9

POWER CONSERVATION

Solar Powered LED Flashing Beacons	10
LED Street Lights Retrofit - Assessment of Technologies	12
LED Street Light Retrofit – Pilot Project.....	14
Adaptive Street Lighting.....	15
New Standard for LED Street Lights (Neighbourhood Pilot)	17
Solar Ready Residential Buildings.....	18
Civic Facilities Energy Use Monitoring.....	19

CLEAN ENERGY HUB

Clean Energy Shift.....	20
Accelerator Centre (Powertech).....	21
Green Wall South Surrey Library	22

CLEAN ENERGY VEHICLES

City Fleet Electric Vehicle Pilot – Original Equipment Manufacturer
(OEM) Vehicles 23

Compressed Natural Gas (CNG) Waste Collection Vehicles24

City Fleet Electric Vehicle Pilot – Conversion Technologies: CEV 25

Hydrogen Fuel Cell Vehicles26

Implementation Of Two Hydrogen Fueling Stations28

City Of Surrey/SFU School of Mechatronics Postdoctoral Research
On Alternative Fuel Vehicles29

Electric Car Ready Residential Buildings31

E3 Fleet Gold Rating 32

CLEAN ENERGY DEMONSTRATION PROJECT

BOLD » INNOVATIVE » COMPETITIVE » THRIVING

BIO-FUEL PRODUCTION PARTNERSHIP WITH METRO VANCOUVER

To maximize the benefit derived from curb side organic waste collection (kitchen and yard waste), the City of Surrey is proposing to establish a bio-fuel facility in Surrey to process this waste into a carbon neutral fuel source. The facility will also accept commercial food waste from within the Metro Vancouver area.

Diversion of organic waste from landfills will assist the Region in achieving the goal of 70% waste diversion by 2015. Surrey's organic waste diverted from landfill will also reduce the City's GHG impact to the environment. This reduction will effectively offset the City's carbon footprint.



Bio-fuel is a product of anaerobic digestion of organic materials that can be used to fuel vehicles and/or with the agreement of Fortis BC (formally Terasen Gas), can be compressed and distributed through the natural gas pipeline network.

TIMELINES

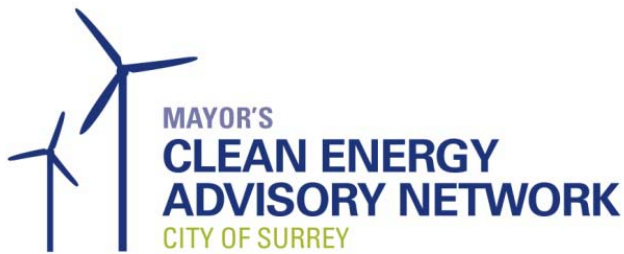
- | | |
|---|------------------|
| • Initial P3 Canada application (screening) | Completed |
| • Business Case/Risk Assessment Review | Completed |
| • Full application review – P3 Canada | Spring 2012 |
| • Acceptance of Projects – P3 Canada | Late Spring 2012 |
| • Selection of Proponent | Late 2012 |
| • Construction completion | 2014 |

POTENTIAL PARTNERS

- Fortis BC
- Private Sector Bio-fuel Facility Proponent (design, build, own, operate, maintain)

LEAD CITY DEPARTMENT

- Engineering Department - Operations Division



CLEAN ENERGY DEMONSTRATION PROJECT

BOLD » INNOVATIVE » COMPETITIVE » THRIVING

DISTRIBUTED GENERATION

Distributed electrical generation promotes the generation of electricity from numerous small sources that are located close to users. Distributed generation promotes efficiency, increased reliability and lower environmental impact and allows communities to influence their sources of energy. Distributed generation also presents an opportunity for the City to generate a non-tax-based revenue stream.

Working with BC Hydro, the City is evaluating the potential for distributed generation using BC Hydro's Distributed Generation Toolkit. This Toolkit included a mapping exercise to visually represent energy sources, a technology comparison table, and an annotated catalogue of sources for each technology.

Distributed generation opportunities evaluated include:

- Wood Biomass;
- Anaerobic Digestion of Municipal Organic Wastes;
- Anaerobic Digestion of Liquid Wastes;
- Anaerobic Digestion of Farm Wastes;
- Industrial Waste-heat Recovery; and
- Mixed Municipal Solid Waste.

TIMELINES

The study concluded that waste to energy, biomass CHP, and agricultural anaerobic digestion are viable opportunities for distributed generation in Surrey.

PARTNERS

- BC Hydro

LEAD CITY DEPARTMENT

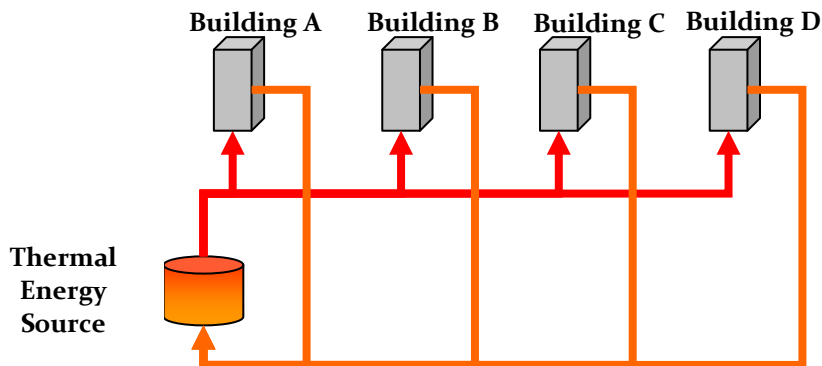
- Engineering Department - Utilities Division

CLEAN ENERGY DEMONSTRATION PROJECT

BOLD » INNOVATIVE » COMPETITIVE » THRIVING

DISTRICT ENERGY

A district energy system distributes thermal energy (e.g., heated water) by way of a common heat source and pipe system to buildings in a defined neighbourhood. The systems can be an efficient and effective means of reducing green house gas emissions by utilizing low GHG-emission energy sources. The following diagram illustrates the concept.



The City has established a district energy utility within the Engineering Department, operating under the name of Surrey City Energy. This utility is responsible for the implementation and operation of district energy systems within the City,

Surrey City Energy is implementing the City's first district energy system that will serve development in the vicinity of the Surrey Central Station including the New City Hall, the new City Centre Library and other future development in this area.

This first system will capture energy by utilizing a vertical, closed-loop geexchange system that uses heat pumps to extract heat from the ground under the parkade that is being constructed as part of the new City Hall/Community Plaza project.

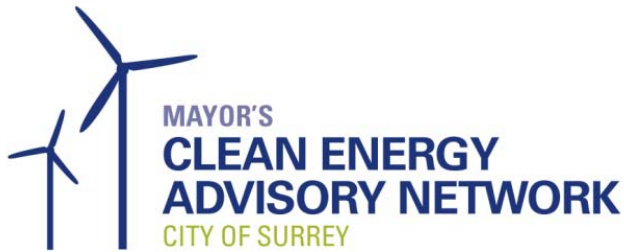
Construction has commenced on the City Centre District Energy System, and it is expected to be operational in 2013 with the opening of the new City Hall. The system will expand over time to service future development in the Surrey City Centre area and will use a variety of energy sources. In addition, opportunities for new systems will be evaluated in order to support future development in Campbell Heights, Grandview Heights and West Clayton.

TIMELINES

Completed.

LEAD CITY DEPARTMENT

- Engineering Department - Utilities Division



CLEAN ENERGY DEMONSTRATION PROJECT

BOLD » INNOVATIVE » COMPETITIVE » THRIVING

MICRO-HYDRO and PICO-HYDRO GENERATION

Micro-Hydro and Pico-Hydro generation are small-scale hydro-electric power generation projects that can be installed in a variety of situations to produce electrical energy.

As an example, there is the potential to retrofit existing pressure reducing valve (PRV) stations in the City's water system with small turbines that would recover energy from the water system that is currently lost as the water pressure is reduced. The City's water system would not be affected and this micro-hydro electric energy could be produced year-round.

TIMELINES

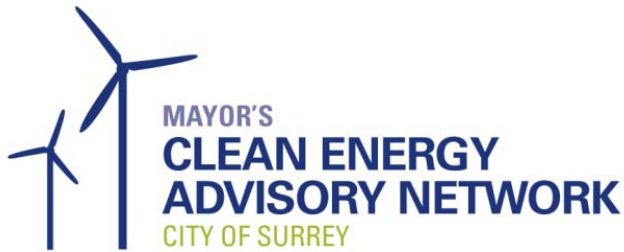
The City has assessed the feasibility of introducing this system at five specific PRV station sites. Based on the results of this study, the City will be upgrading several PRV sites to include micro-hydro power generation in the coming years in conjunction with their scheduled replacement.

POTENTIAL PARTNERS

- BC Hydro

LEAD CITY DEPARTMENT

- Engineering Department - Utilities Division



CLEAN ENERGY DEMONSTRATION PROJECT

BOLD » INNOVATIVE » COMPETITIVE » THRIVING

DISTRICT ENERGY – GEOEXCHANGE CITY HALL

A district energy system distributes thermal energy (e.g., heated water) to buildings in a specified neighbourhood and can be an efficient and effective means of reducing green house gas emissions (GHG) by utilizing low emission sources.

The City has established a district energy utility within the Engineering Department, operating under the name of Surrey City Energy. This utility is responsible for the implementation and operation of district energy systems within the City,

Surrey City Energy is implementing the City's first district energy system that will serve development in the vicinity of the Surrey Central Station including the New City Hall, the new City Centre Library and other future development in this area.

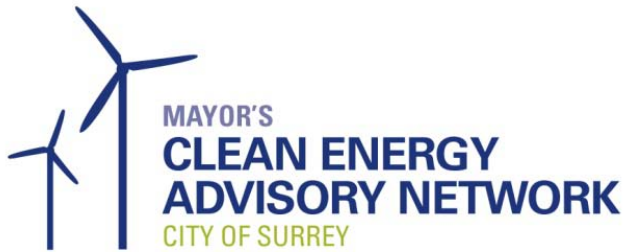
This first system will capture energy by utilizing a vertical, closed-loop geexchange system that uses heat pumps to extract heat from the ground under the parkade that is being constructed as part of the new City Hall/Community Plaza project.

TIMELINES

Construction has commenced on the City Centre District Energy System, and it is scheduled to begin operation in 2013 in conjunction with the opening of the new City Hall and will expand over time to support future development in the Surrey City Centre.

LEAD CITY DEPARTMENT

- Engineering Department - Utilities Division



CLEAN ENERGY DEMONSTRATION PROJECT

BOLD » INNOVATIVE » COMPETITIVE » THRIVING

SOLAR THERMAL (DOMESTIC HOT WATER FOR CIVIC BUILDINGS)

Surrey civic facilities, such as community recreation centres, host hundreds of thousands of visits per year. There is a significant demand in these facilities for hot water based on the high usage demand that these facilities experience. Heating the domestic hot water used in these facilities using solar panels would significantly decrease the amount of energy used in the facilities.

The City is implementing a pilot project in the construction of the new Fire Hall #14 in South Surrey located at 20 Avenue and 176 Street with a view to using information gathered through monitoring of this installation to install similar projects at other civic facilities.

TIMELINES

The pilot project at new Fire Hall # 14 is scheduled for completion March 2011. Monitoring will take place thereafter for the remainder of 2011 to establish the net benefit of making similar installations at other civic facilities.

POTENTIAL PARTNERS

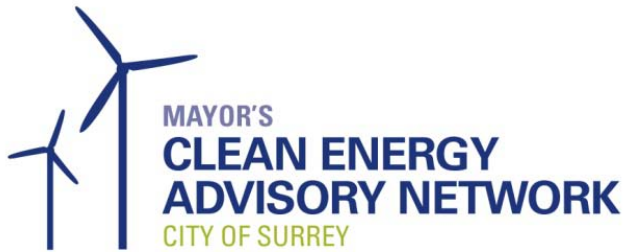
- Other Partners still to be identified

PARTNERS

- Solar BC
- SFU Surrey

LEAD CITY DEPARTMENT

- Planning and Development Department – Civic Facilities Division



CLEAN ENERGY DEMONSTRATION PROJECT

BOLD » INNOVATIVE » COMPETITIVE » THRIVING

DISTRICT ENERGY – CAMPBELL HEIGHTS & GRANDVIEW HEIGHTS

Building on the study related to the use of a district energy system in City Centre, the City is evaluating the potential for implementation of a district energy system in each of Campbell Heights and in Grandview Heights.

The City has established a district energy utility within the Engineering Department, operating under the name of Surrey City Energy. This utility is responsible for the implementation and operation of district energy systems within the City,

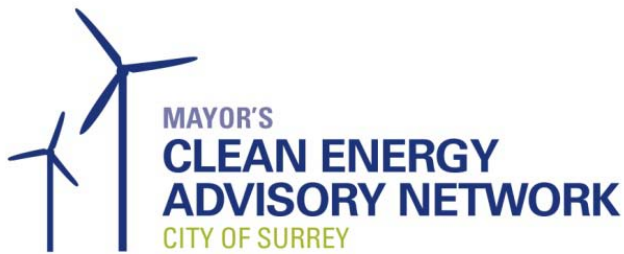
The utility has determined that expanding district energy to Campbell Heights and Grandview Heights is viable.

TIMELINES

Based on this evaluation, staff will be working with the development community to introduce district energy as appropriate opportunities arise.

LEAD CITY DEPARTMENT

- Engineering Department - Utilities Division



CLEAN ENERGY DEMONSTRATION PROJECT

BOLD » INNOVATIVE » COMPETITIVE » THRIVING

BIOMASS FOR COMBINED HEAT AND POWER

As part of the City's ongoing district energy system initiatives, the City is reviewing the use of biomass as a potential thermal energy source. In addition to providing thermal energy, biomass can also be used to generate electrical energy, in a combined system commonly referred to as Combined Heat and Power (CHP).

As part of the *BC Energy Plan: A Vision for Clean Energy Leadership*, BC Hydro has implemented a *Standing Offer Program* to encourage the development of clean energy throughout British Columbia through the purchase of energy from select clean energy projects.

Given the opportunities provided through the *Standing Offer Program*, the City as part of its biomass thermal energy source reviews will undertake a business case analysis of any CHP opportunities with a view to identifying cost effective projects for implementation.

TIMELINES

This project is being undertaken by the City's Clean Energy Collaborative with SFU, BC Hydro, and Powertech. The project team will begin to evaluate the opportunities for biomass to service the Surrey City Centre over the coming months, and are planning to make recommendations on its viability in early 2012.

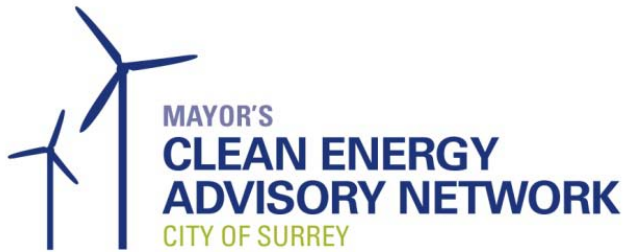
Should biomass prove viable, the City will actively seek funding partners beginning in 2012, in order to ensure that a biomass system can be constructed in advance of development, and their significant thermal energy demands.

PARTNERS

- BC Hydro
- SFU
- Powertech

LEAD CITY DEPARTMENT

- Engineering Department – Utilities Division



CLEAN ENERGY DEMONSTRATION PROJECT

BOLD » INNOVATIVE » COMPETITIVE » THRIVING

HEAT RECOVERY FROM SANITARY SEWER

There is a significant amount of energy in the form of heat contained within the sewage that flows through the City's sanitary sewer system. This heat energy is generally lost to the atmosphere. As part of the City's district energy system studies, the City is reviewing the use of sewer heat recovery as a potential thermal energy source.

A preliminary study has been completed that indicates that over time, as development continues, there is the potential for sewer heat recovery as a thermal energy source for a district energy system in each of the Semiahmoo Town Centre and the City Centre areas. Existing levels of development in these communities do not provide sufficient thermal energy at this time to provide for cost effective heat recovery.

The City will be reviewing the potential to implement sewer heat recovery as an element of any future district energy opportunity and will complete further analysis to identify when sewer heat recovery will be cost effective to service Surrey City Centre as thermal energy demand in the area increases.

TIMELINES

Completed.

LEAD CITY DEPARTMENT

- Engineering Department – Utilities Division

CLEAN ENERGY DEMONSTRATION PROJECT

BOLD » INNOVATIVE » COMPETITIVE » THRIVING

SOLAR POWERED LED FLASHING BEACONS

The City of Surrey uses flashing beacons to draw driver attention to pedestrian crossings and important signage at intersections such as stop signs. The flashing beacons are especially critical in poor weather conditions and where motorist sightlines are limited. Solar power combined with the low energy requirement of LED lights makes solar power an environmentally attractive option for the LED flashing beacons.

Solar powered flashing beacons are entirely self-contained systems and include a solar panel, battery and battery charging system that is mounted directly on top of a standard flashing beacon housing. The systems are very efficient and can maintain sufficient power levels to keep the beacon operating even through weeks of overcast conditions.

Reduced power and energy use are not the sole environmental benefits of solar powered beacons. The beacons require no trenching, no conduit installation and no disruption to traffic for installation or repairs. Solar beacons can also be installed where there is no readily available conventional power source resulting in saving time and money while increasing road user safety.

The City of Surrey initiated a pilot project in 2008 by installing solar powered LED flashing beacons on top of stop signs at two intersections: 92 Avenue/124 Street and 32 Avenue/140 Street.

More recently, the City has installed solar-powered LED flashing beacons at pedestrian crosswalks. The system, including the beacons, pushbuttons and communication equipment are all fully powered by the solar panels. The crosswalk locations include:



- 24 Avenue /134 Street
- 24 Avenue/136 Street
- 83 Avenue/160 Street
- 108 Avenue/165 B Street
- 104 Avenue/170A Street
- 25 Avenue/128 Street
- Martin Drive/Southmere Crescent



CLEAN ENERGY DEMONSTRATION PROJECT

BOLD » INNOVATIVE » COMPETITIVE » THRIVING

In 2012, the City introduced school zone flashers at the 18000 block of 8th Avenue. The amber LED beacons, which are in operation from 8 a.m. to 5 p.m. on school days, are used to enhance driver awareness of the school zone on this relatively rural stretch of road.

These projects have demonstrated that solar panels and LED lights are effective for flashing beacons and will be considered for all future installations.

Moreover, the City uses solar power to operate two permanent counting stations, located at:

- 16 Avenue, East of 192 Street
- 32 Avenue, East of 192 Street

TIMELINES

Completed.

POTENTIAL PARTNERS

- ICBC

LEAD CITY DEPARTMENT

- Engineering Department - Transportation Division



CLEAN ENERGY DEMONSTRATION PROJECT

BOLD » INNOVATIVE » COMPETITIVE » THRIVING

LED STREET LIGHTS RETROFIT - ASSESSMENT OF TECHNOLOGIES

The City of Surrey currently maintains approximately 29,000 street lights, with this total increasing on an annual basis as new development in the City occurs. To reduce power consumption and operating/maintenance costs of street lights, the City has completed a study on the viability of introducing LED street lights in place of high pressure sodium (HPS) fixtures that are currently the City's standard.

LED street lights have several advantages over traditional street light fixtures including reduced energy consumption, a longer lifespan and a clear white light that improves colour rendering.



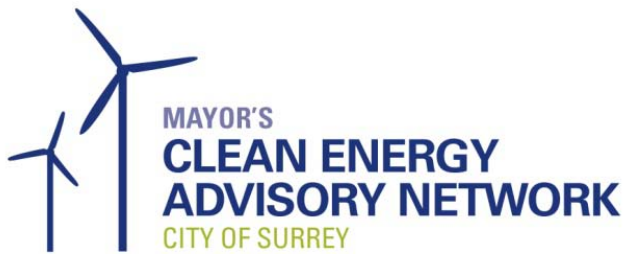
The installation cost of a new street light is approximately 10% (\$400) more for LED compared to high pressure sodium. This capital cost differential is expected to continue to shrink in the coming years. After the capital expenditure of installing the street light, the provision of electrical power is the most costly element in operating a street light system. The efficiency of LED street lights and improving price point are making them progressively more attractive. Compared to incandescent bulbs of the same luminance, LED street lights can save approximately 50% of the energy consumption of a comparable sodium vapour fixture. For Surrey that translates to approximately \$200,000 to \$400,000 per year (\$10 to \$11 per street light per year) in energy savings if the entire system were to be converted.

LED street lights have a longer lifespan than sodium vapour street light bulbs. An LED's useful life is projected to be between 50,000 and 75,000 hours or 10 to 15 years. The life span of a high pressure sodium (HPS) fixture is approximately 25,000 hours or 5 years.

The City had field testing of LED lights from 7 manufacturers undertaken over an 8-month period. Manufacturers included American Electric, General Electric, Lumec, Ruud, Cooper, Fawoo and Holophane.

TIMELINES

Complete



CLEAN ENERGY DEMONSTRATION PROJECT

BOLD » INNOVATIVE » COMPETITIVE » THRIVING

POTENTIAL PARTNERS

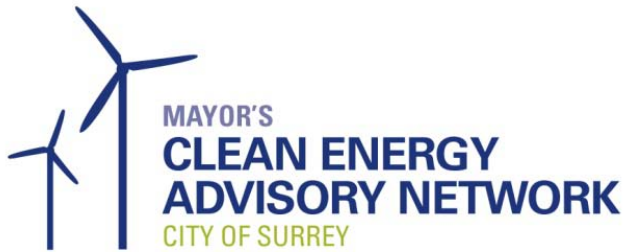
- American Electric
- General Electric
- Lumec
- Cooper Fawoo
- Holophane
- Ruud

PARTNERS

- B.C. Hydro

LEAD CITY DEPARTMENT

- Engineering Department - Transportation Division



CLEAN ENERGY DEMONSTRATION PROJECT

BOLD » INNOVATIVE » COMPETITIVE » THRIVING

LED STREET LIGHT RETROFIT – PILOT PROJECT

In order to better gauge performance and public opinion on this new technology, the City selected seven City streets for an LED Fixture Pilot Project. As of spring of 2012, the pilot project is in a preparation stage, where manufacturers are still determining which model to use for this project from their line of products.

Based on on-field testing, which includes consideration of light levels, uniformity, pole spacing and glare, the City will determine which manufacturers, along with their product, are acceptable for use on City roads. Furthermore, adjacent residents will be advised in advance of the change and asked to monitor and respond to a survey on the new lights.

TIMELINES

Results of the pilot and survey will be available in the spring/summer of 2012.

POTENTIAL PARTNERS

- Caberra
- General Electric
- Lumec
- Dialight
- Sylvania
- Holophane
- Ruud
- B.C. Hydro

LEAD CITY DEPARTMENT

- Engineering Department - Transportation Division

CLEAN ENERGY DEMONSTRATION PROJECT

BOLD » INNOVATIVE » COMPETITIVE » THRIVING

ADAPTIVE STREET LIGHTING

Conventional street lights are controlled by a photocell, which measures the ambient light around the street light and turns the light on or off based on the ambient light levels. When the street lights are on, they run at a constant power level throughout the night, regardless of the level of activity on the street for which they are providing lighting. Minimum lighting levels are based on design criteria established by the Transportation Association of Canada.

Adaptive street lighting technology introduces the ability to adjust street lighting levels to reflect the level of activity that is occurring in the area of illumination of the street light. This provides a significant opportunity to conserve energy by reducing lighting levels reactively when there is no activity on the street in the vicinity of the street light such as during the late night and early morning hours when traffic and pedestrian volumes on streets are usually very low.

The lighting reduction can be adjusted on a light by light basis and typically the public cannot perceive the change in lighting levels with a 50% power reduction. As a result, adaptive street lighting technology can reduce current energy consumption by 40% without a loss in service. An additional benefit of the technology is that it monitors on a continuous basis, each street light in the system and can accurately predict lamp failures, which allows for a more efficient maintenance program. Some adaptive lighting systems have the ability to automatically inform crews of maintenance requirements such as lamp outages.



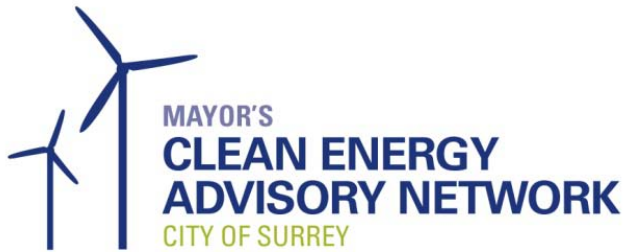
In 2009 the City, in conjunction with BC Hydro, commissioned a lighting consultant to examine the benefits of implementing an adaptive street lighting system in Surrey. The City has already modified its design criteria to allow for varying street lighting levels based on activity levels on the area served by the street light.

TIMELINES

The supplier of this technology has recently ceased operations. Staff will undertake further review of potential options for this technology in 2012.

POTENTIAL PARTNERS

- Adaptive lighting suppliers



CLEAN ENERGY DEMONSTRATION PROJECT

BOLD » INNOVATIVE » COMPETITIVE » THRIVING

PARTNERS

- BC Hydro

LEAD CITY DEPARTMENT

- Engineering Department - Transportation Division

CLEAN ENERGY DEMONSTRATION PROJECT

BOLD » INNOVATIVE » COMPETITIVE » THRIVING

NEW STANDARD FOR LED STREET LIGHTS (Neighbourhood Pilot)

The City of Surrey is looking to achieve sustainability objectives in the development of new neighbourhoods. One component of a sustainable neighbourhood is energy conservation and management to reduce GHG emissions. The City is looking to improve its efforts to minimize the use of energy management through traffic signal optimization and coordination and through the use of energy efficient traffic signals and street lights.

Ongoing efforts to reduce fuel consumption for the public are occurring through improved technology and management of our traffic signal network. The City's traffic signals have already been converted to LED signal heads to reduce their power consumption. The City has studied LED street lights and determined that the technology meets our lighting standards while reducing energy consumption by approximately 50% as compared to the current high pressure sodium lights (HPS). In addition, LED street lights have a much longer life span between replacement than current HPS technology. LEDs have an expected life of between 10 and 15 years compared to 5 years for incandescent lights.

Although LED street lights have an initial cost premium (\$400 or 10% per street light) in comparison to HPS, their implementation will further the ability of the City and developers to market new neighbourhoods as being "sustainable" based on the energy savings and operating cost reductions that will be achieved. It is also expected that the capital cost differential will continue to shrink in the coming years.



TIMELINES

LED technology will be required for all new street lights implemented in the new Sunnyside Heights (Grandview Heights #2) NCP.

PARTNERS

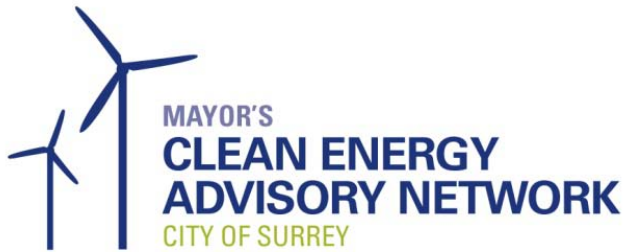
- BC Hydro

POTENTIAL PARTNERS

- Development industry
- Holophane
- Ruud

LEAD CITY DEPARTMENT

- Engineering Department - Transportation Division



CLEAN ENERGY DEMONSTRATION PROJECT

BOLD » INNOVATIVE » COMPETITIVE » THRIVING

SOLAR READY RESIDENTIAL BUILDINGS

As a means to encourage clean energy utilization by others, the City will become a “Solar Ready Community”. The City has researched the cost associated with requiring in the installation of ‘solar ready’ infrastructure in new single family homes built in Surrey and has concluded that making new homes in the City solar-ready is cost justified based on potential savings to future occupants of those homes. With the solar-ready infrastructure in place, home owners will be able to install solar panels easily for the purposes of heating water for domestic use, etc.

Consultation work has taken place with stakeholders is underway and additional information is being gathered for the purpose of developing provisions for inclusion in the Surrey Building By-Law.

TIMELINES

This project is proposed to be implemented in 2011 once consultation and the development of by-law provisions are completed.

PARTNERS

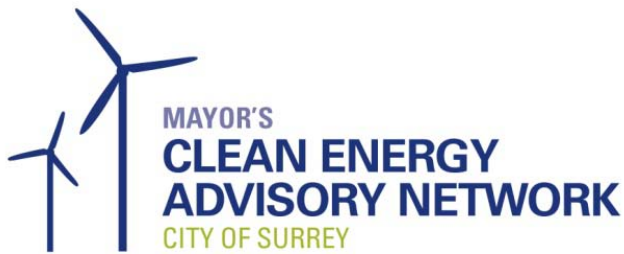
- Solar BC
- Development Advisory Committee
- Greater Vancouver Home Builders Association
- Urban Design Institute
- SFU Surrey

POTENTIAL PARTNERS

- Additional partners to be identified

LEAD CITY DEPARTMENT

- Planning and Development Department – Building Division



CLEAN ENERGY DEMONSTRATION PROJECT

BOLD » INNOVATIVE » COMPETITIVE » THRIVING

CIVIC FACILITIES - ENERGY USE MONITORING

The City's Civic Facilities Division is implementing two types of energy use monitoring. The first project, a pilot project, will be implemented at the Surrey Sports and Leisure Complex in Fleetwood, where "Pulse Energy" software will be used to monitor and communicate by way of the internet energy consumption in the facility. The second project will expand the use of energy monitoring and reporting software to all major civic buildings that are currently connected to the City's Direct Digital Control system. The intention of these projects is to demonstrate the City's commitment to the efficient use of energy in its business operations. Energy monitoring will help identify energy use trends and alert the City of potential system problems in relation to energy delivery systems at civic facilities. It will allow such problems to be addressed quickly, thereby, eliminating unnecessary energy use.

TIMELINES

The pilot at Surrey Sport and Leisure Complex will be implemented in early 2011. The second project related to facilities connected to the Direct Digital Control system will be implemented later in 2011.

PARTNERS

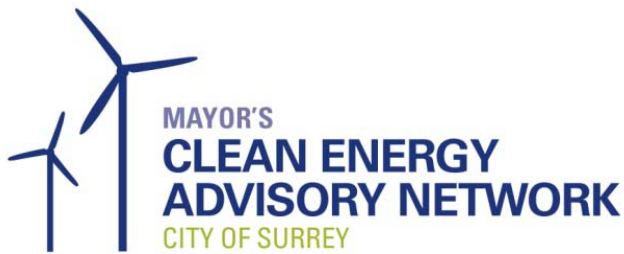
- BC Hydro
- Pulse Energy
- ESC

POTENTIAL PARTNERS

- Additional partners to be identified

LEAD CITY DEPARTMENT

- Planning & Development Department – Civic Facilities Division



CLEAN ENERGY DEMONSTRATION PROJECT

BOLD » INNOVATIVE » COMPETITIVE » THRIVING

CLEAN ENERGY SHIFT

The 2010 TownShift Design competition was an international ideas competition that “Shifted” thinking and identified new design opportunities for each of the City’s five “Town” hubs with a view to introducing more intense, public-minded and productive urban futures. Building on the success of TownShift, the City will launch a “Clean Energy Shift” competition.

The Clean Energy Shift initiative will be an international competition that will invite proposals from interested parties around the world in relation to clean energy demonstration projects that can be introduced into the City’s infrastructure and/or business operations with a view to demonstrating that the City of Surrey is leading edge relative to the use of leading energy production and utilization technologies.

The competition will include an evaluation of all submissions by an independent review panel and will result in a presentation of awards to selected entrants. The City will also evaluate each submission in relation to its implementation in Surrey.

TIMELINES

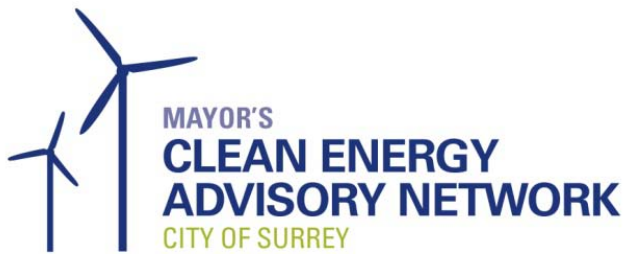
The Clean Energy Shift initiative is to be formally launched in January 2012 and be completed by the summer of 2012. Implementation of the products and ideas that are received through submissions to the competition will be on-going.

PARTNERS

- BC Hydro
- Powertech
- Simon Fraser University

LEAD CITY DEPARTMENT

- Engineering Department - Utilities Division



CLEAN ENERGY DEMONSTRATION PROJECT

BOLD » INNOVATIVE » COMPETITIVE » THRIVING

ACCELERATOR CENTRE (POWERTECH)

The partners (City of Surrey, Powertech, BCIC, BC Hydro, SFU Surrey and others) are looking to create a Clean Energy and Technology Accelerator at Powertech's Surrey campus. The Accelerator will be a place that creates significant value to local clean energy and technology start-ups by increasing the relevance of their innovation and reducing the time to market leading to economic growth for BC. The goal is to increase the size of the clean energy sector by building stronger start-up companies that can grow and mature in BC creating jobs and exports.

The Accelerator is planned to be an open to all, not-for-profit organization focused on clean energy and technology sectors. Based on global and local benchmarks there are several services that successful incubators offer to the start-ups:

- Mentoring and coaching (access to former Entrepreneurs and CEOs)
- Business training and market assessments and plans
- Objective technology advice, testing and validation
- Access to technology test beds (systems, laboratories and equipment)
- Access to specialized services such as design, legal, accounting, marketing etc.
- Access to demonstration sites
- General facilities services

The partners will play a role in providing the Accelerator services based on their capabilities. We are not looking to duplicate efforts already in place but supplement them with clean energy specific services and expertise. The Accelerator would target start-up companies especially in smart grid, renewable generation, and transportation electrification markets.

TIMELINES

- Concept development and feasibility assessment - fall 2010 / spring 2011
- Accelerator services (if feasible) launched – spring / summer 2011

PARTNERS

- Powertech Labs
- BCIC
- BC Hydro
- SFU Surrey
- Others TBD - possibly BCTIA, ACETECH, NRC, WED, UBC

LEAD DEPARTMENT

- Economic Development

CLEAN ENERGY DEMONSTRATION PROJECT

BOLD » INNOVATIVE » COMPETITIVE » THRIVING

GREEN WALL SOUTH SURREY LIBRARY

Green walls are recognized as a means to soften the urban environment with landscaping in constrained spaces, to reduce the heat island effect of large south facing walls and to reduce GHGs.

The City is undertaking a “green wall” pilot project on the south face of the Semiahmoo Library. This installation at the Semiahmoo Library covers a three storey facade and will help reduce the heat island effect of this large facade, reducing energy consumption related to cooling, will reduce GHGs, will provide habitat and food for birds and will improve the aesthetics of the building on which it is located.



TIMELINES

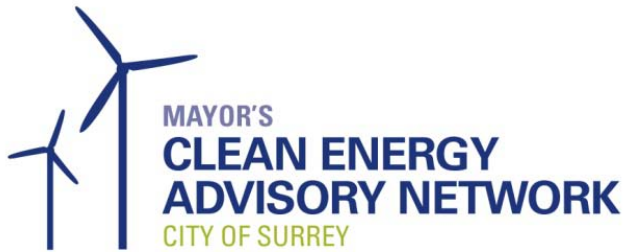
Completed.

PARTNERS

- Green over Grey

LEAD CITY DEPARTMENT

- Planning and Development Department – Facilities Division



CLEAN ENERGY DEMONSTRATION PROJECT

BOLD » INNOVATIVE » COMPETITIVE » THRIVING

CITY FLEET ELECTRIC VEHICLE PILOT – ORIGINAL EQUIPMENT MANUFACTURER (OEM) VEHICLES

The Fleet Section of the Surrey Engineering Department is piloting vehicles that incorporate a variety of energy technologies. This pilot will help the City develop a better understanding of the viability of these technologies compared to conventional gas and diesel powered vehicles and equipment that currently comprise the City's fleet.

A pilot is proposed in relation to various OEM 100% electric vehicles that will be procured by the City in partnership with Powertech. This OEM's vehicles will be available by late 2011 and will be used in existing City operations.

The pilot project will assist the City in assessing and establishing the appropriate level of operational changes required to ensure that this type of vehicle will be effectively deployed as part of the City's fleet. The vehicle fueling (time), the range of vehicle operation, vehicle reliability and vehicle maintenance requirements are all being studied. The number of EVs procured by the City for this pilot initiative will be dependent on funding from senior levels of government.

TIMELINES

- Completed.

POTENTIAL PARTNERS

- Powertech BC
- SFU Surrey

PARTNERS

- Powertech BC
- E3 Group

LEAD CITY DEPARTMENT

- Engineering Department - Operations Division

CLEAN ENERGY DEMONSTRATION PROJECT

BOLD » INNOVATIVE » COMPETITIVE » THRIVING

COMPRESSED NATURAL GAS (CNG) WASTE COLLECTION VEHICLES

Natural gas, in both compressed and liquefied form, is the primary alternative fuel being used in waste collection truck fleets. Natural gas releases up to 90% less air pollution than conventional diesel fuel is non-corrosive and not carcinogenic. Further since it does not pool when it is spilled, its use and storage is not as significant a threat from a contamination perspective to soil, surface water or groundwater.

Natural gas-fuelled waste collection trucks are also much quieter than diesel garbage trucks. A comprehensive study in the Netherlands found noise reductions of 90% inside the truck, 98% beside the truck, and 50% behind the truck. In the long run, natural gas engines require less maintenance than diesel engines.

The City is studying the possibility of exclusively engaging CNG waste collection trucks for its residential curb side waste collection services. In this regard, the City has acquired one CNG waste collection truck for use in an Organics Curb Side Collection Pilot Program that has recently been commenced. This program will provide a useful test of the vehicle as the basis for the City to determine its future course of action in relation the expanded use of such vehicles.



TIMELINES

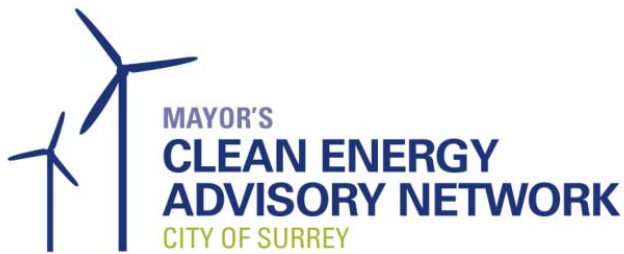
Completed. Selection of a new waste contractor delivering service via a CNG waste fleet will commence October 1st, 2012.

PARTNERS

- Fortis BC
- BFI Canada

LEAD CITY DEPARTMENT

- Engineering Department - Operations Division



CLEAN ENERGY DEMONSTRATION PROJECT

BOLD » INNOVATIVE » COMPETITIVE » THRIVING

CITY FLEET ELECTRIC VEHICLE PILOT – CONVERSION TECHNOLOGIES: CEV

The City's Fleet Section is piloting various vehicle technologies in an effort to find alternatives to gasoline and diesel powered vehicles and equipment.

The City is piloting one 100% electric light duty pickup truck supplied by Canadian Electric Vehicles (CEV). The retrofitted electric Ford pick-up vehicle was deployed in June 2011 for use in existing City operations.

The pilot will assist the City in determining the viability of the technology and the equipment and operating changes that the City will need to make to allow for the use of this alternative form of vehicle. The City will be studying the comparative differences in fueling (time), range of the vehicle operation, vehicle reliability and overall maintenance costs between electric vehicle conversion technologies contrasted against other alternative fuel technologies as well as conventional internal combustion engine vehicle technologies.

TIMELINES

- Deployed June 2011 and study is ongoing.

PARTNERS

- None.

LEAD CITY DEPARTMENT

- Engineering Department - Operations Division

CLEAN ENERGY DEMONSTRATION PROJECT

BOLD » INNOVATIVE » COMPETITIVE » THRIVING

HYDROGEN FUEL CELL VEHICLES

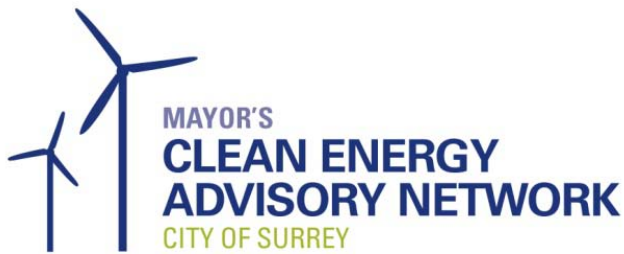
Fuel Cell Vehicles (FCVs) are revolutionary automobiles that produce no tailpipe emissions. Rather than burning conventional gasoline, these vehicles are propelled by electric motors that get their energy from fuel cells, devices that extract electricity from hydrogen fuel quietly, efficiently and without combustion.

The Vancouver Fuel Cell Vehicle Program (VFCVP) is putting fuel cell electric vehicles and hydrogen refueling systems to work. The VFCVP is a three year \$8.7 million joint initiative between the Government of Canada, Canadian Hydrogen and Fuel Cell Association (CHFCA), Ford Motor Company, and the Government of British Columbia.

The project is operating and evaluating five Ford Focus fuel cell electric vehicles in 'real world' conditions in British Columbia's Lower Mainland and Capital Regional District (Victoria), and is the first demonstration of fuel-cell electric vehicles in Canada. The Ford Focus is a third-generation hybrid-electric vehicle that uses Canadian-made Ballard Mark 902 series fuel cell engines and Dynetek 5,000 psi compressed hydrogen storage tanks.



These cars are among the first to fuel with hydrogen on British Columbia's Hydrogen Highway.



CLEAN ENERGY DEMONSTRATION PROJECT

BOLD » INNOVATIVE » COMPETITIVE » THRIVING

The VFCVP is a significant step toward establishing a sustainable, zero-emission-based transportation system in Canada that will help reduce pollution and greenhouse gases. This demonstration is providing valuable information on performance, durability and reliability that can be used to continue the evolution of fuel cell vehicles to the commercial marketplace in the transition to the hydrogen economy.

This demonstration project is also helping facilitate international codes and standards development and other activities critical to preparing the market for a clean-energy future.

The City of Surrey is proud to be a partner with the Vancouver Fuel Cell Vehicle Program and the Canadian Hydrogen and Fuel Cell Association in the extension and testing of this exciting initiative. Over the course of 2011 and 2012, Surrey employees will be using three hydrogen fuel-cell passenger vehicles and four hydrogen (non-fuel-cell) pick-up trucks for day-to-day City operations. The City will monitor and analyze the effectiveness and efficiency of these vehicles and use this information as the basis for developing a long term strategic direction with respect to implementing a “low carbon emissions” fleet for City operations.

TIMELINES

- Completed

PARTNERS

- Vancouver Fuel Cell Vehicle Program
- Canadian Hydrogen and Fuel Cell Association
- Powertech BC
- Sacré-Davey Group

LEAD CITY DEPARTMENT

- Engineering Department - Operations Division

CLEAN ENERGY DEMONSTRATION PROJECT

BOLD » INNOVATIVE » COMPETITIVE » THRIVING

IMPLEMENTATION OF TWO HYDROGEN FUELING STATIONS

The City of Surrey is the only municipality in Canada to operate two hydrogen fueling stations. The initial site opened in November 2010 at the Central Operations Works Yard with a second site recently established at the Hemlock North Surrey Depot Facility (a separate third site is located at Surrey's Powertech Labs).

These new stations will help the City become a hub for hydrogen fuel cell technology in the region, and maximize the efficiency of its increasing green fleet.

Given the limited number of hydrogen fueling sites, these facilities reinforce Surrey's position as a leader in the industry. It also firmly positions the City as a viable market for future FCV deployments from the major global automakers.

TIMELINES

Completed.

PARTNERS

- Vancouver Fuel Cell Vehicle Program
- Canadian Hydrogen and Fuel Cell Association
- Powertech BC
- Sacré-Davey Group

LEAD CITY DEPARTMENT

- Engineering Department - Operations Division



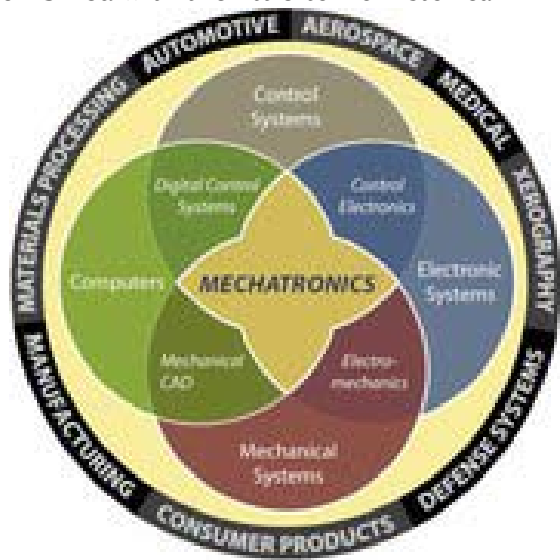
CLEAN ENERGY DEMONSTRATION PROJECT

BOLD » INNOVATIVE » COMPETITIVE » THRIVING

CITY OF SURREY/SFU SCHOOL OF MECHATRONICS POSTDOCTORAL RESEARCH ON ALTERNATIVE FUEL VEHICLES

Municipal fleets are facing mounting pressure to move towards alternative (green) fuels to reduce carbon impact to the environment. Our goal is to meet or exceed our fleet target of 20% reduced GHG's by the year 2020 in a cost effective way. While municipal administrators acknowledge the importance of moving towards reduced carbon emissions, there appears to be a general deficiency in viable alternative fuel vehicles specific for municipal fleet requirements. The current high price of many disparate alternative fuel technology vehicles, combined with the little-to-no historical data on the performance of these vehicles, can lead to challenging decisions that must balance an open-minded perspective to alternative fleets while ensuring no logistical impacts to municipal fleet operations.

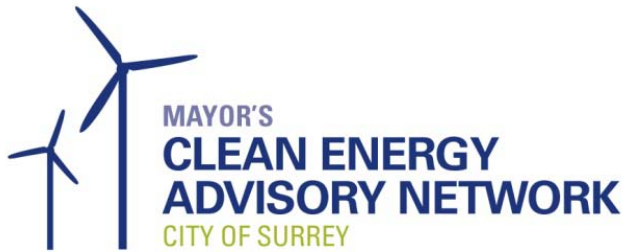
This research project is focused on developing a clean energy systems modeling tool that will help to better assess the benefit of low carbon alternatives to gas and diesel municipal fleet vehicles from a triple bottom-line perspective. The scope includes the evaluation of alternative fuel vehicles (i.e. electric, hydrogen/fuel cell, and compressed natural gas (CNG) vehicles versus incumbent gas engine vehicles) with respect to comparisons between full life-cycle costs (capital, operational, depreciated costs), environmental benefits/determents, operational and logistics benefits, limitations, etc.



The validated modeling tool will subsequently be utilized to develop an evolving "best fit or balance" for our municipal fleet based on gas/diesel combustion engine vehicles versus alternative technologies.

TIMELINES

- This research project was kicked off in early April 2011 and will conclude by the end of 2012.



CLEAN ENERGY DEMONSTRATION PROJECT

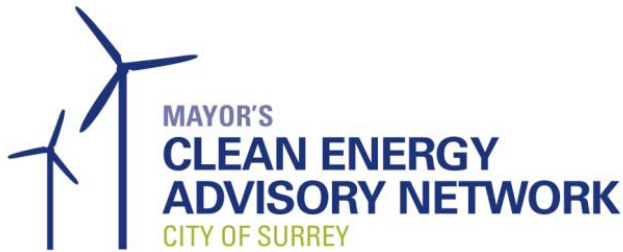
BOLD » INNOVATIVE » COMPETITIVE » THRIVING

PARTNERS

- Simon Fraser University (Surrey Campus) – School of Mechatronics Engineering
- National Research Council Canada

LEAD CITY DEPARTMENT

- Engineering Department - Operations Division



CLEAN ENERGY DEMONSTRATION PROJECT

BOLD » INNOVATIVE » COMPETITIVE » THRIVING

ELECTRIC CAR READY RESIDENTIAL BUILDINGS

Projections by recognized experts suggest that 20% of the licensed vehicles in North America will be electric vehicles by 2020. This has significant ramifications in relation to infrastructure that will need to be established to support the charging of these vehicles. The City of Surrey is interested in ensuring that its residents are not disadvantaged in relation to their ability to convert to this technology in relation to their personal vehicles. In this regard, residential buildings will require electric vehicle charging stations to accommodate increased use of electric vehicles. The City will study regulatory and policy alternatives, in consultation with stakeholders, to determine how new homes in Surrey should be constructed to ensure that they can be easily fitted with electric charging stations that will allow recharging of personal electric vehicles at home when such technology is commercially available. The outcome of this study could be amendments to the City's Building By-law that would require basic electrical infrastructure to be installed in homes during their construction to minimize the need for costly retrofits at a later date to accommodate vehicle charging stations.

TIMELINES

This project is scheduled for 2011.

POTENTIAL PARTNERS

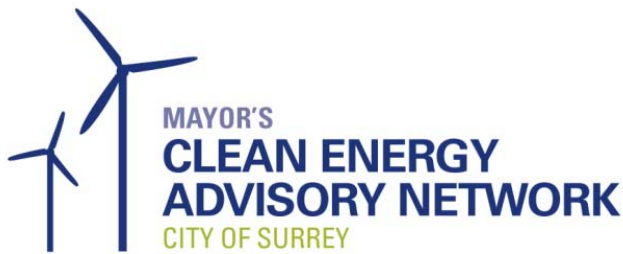
- Additional partners to be identified

PARTNERS

- BC Hydro
- Development Advisory Committee
- Greater Vancouver Home Builders Association
- Urban Development Institute
- SFU Surrey

LEAD CITY DEPARTMENT

- Planning & Development Department – Building Division



CLEAN ENERGY DEMONSTRATION PROJECT

BOLD » INNOVATIVE » COMPETITIVE » THRIVING

E₃ FLEET GOLD RATING

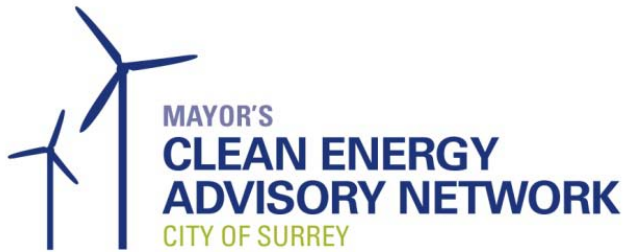
The Fraser Basin Council's E₃ Fleet Rating is Canada's premier green fleet rating and certification program that was designed and launched to provide a road map for fleet greening in public and private sector fleets. E₃ Fleet Rating uses a point-based Rating System Checklist for rating fleet performance, with points granted for excellence in fleet management and demonstrated energy / emissions performance. Using this framework, fleets can be rated at the Bronze, Silver, Gold or Platinum level. E₃ Fleet Rating is based on verification by a third party, who carries out a site visit in order to certify E₃ Fleet Standards. In order to maintain an E₃ Fleet Rating status, fleets must be rated at least every two years.

The City of Surrey recently achieved Gold rating that places Surrey amongst the top rated green fleets in Canada. A Gold rating for Surrey represents not only demonstrated reductions in GHG emissions and an investment in low or no carbon fuels and energy efficient technologies, but also a commitment to staff development, management excellence and a healthier community overall.

The following actions were taken to achieve an E₃ Fleet Gold rating:

- Fleet Action Plan: Fuel and GHG baselines from 2005-2008; a Council endorsed Green Fleet Action Plan, including a commitment to financial resources to implement the plan; and staff communications initiatives for the plan to create awareness and staff buy-in.
- Training and Awareness: New staff orientation and fuel efficient driving training for current staff.
- Idling Reduction: Adoption of an idling reduction policy, completion of driver training and investment in auto-shut-off technology.
- Vehicle Purchasing: Demonstrated commitments to specifying fuel efficient or alternative technology vehicles.
- Fuel Data Management: Automated fuel data management systems and consumption monitoring and reporting.
- Operations & Maintenance: Regular and consistent vehicle maintenance standards including emissions testing and environmental standards for waste management (e.g. for disposal of oil recycling and shop maintenance).
- Trip & Route Planning: Route and load optimization techniques and technologies.





CLEAN ENERGY DEMONSTRATION PROJECT

BOLD » INNOVATIVE » COMPETITIVE » THRIVING

- Utilization Management: Efficient and optimized use of vehicles (so as to ensure a minimum use of underutilized or idle vehicles).
- Fuel Efficiency: Demonstrated year over year increasing fleet fuel efficiency gains (expressed in km / L per unit of fuel), averaging 1.3% efficiency gain / year.
- Greenhouse Gas Performance: Demonstrated reductions in GHG emissions; an 18% reduction in emissions was recorded in a two-year period.

TIMELINES

Completed early 2011.

PARTNERS

- Fraser Basin Council

LEAD CITY DEPARTMENT

- Engineering Department - Operations Division