

1. What is the project?

The City of Saskatoon, through its electrical utility – Saskatoon Light & Power, is developing a tall wind turbine at the Saskatoon Landfill. The tall wind turbine is one of three projects that are part of the Green Energy Park at the landfill. Other projects include a landfill gas power generation facility and turboexpander power generation facility to be operated in conjunction with SaskEnergy. Community engagement activities and feasibility studies have been undertaken over the past several years. Development of the project was approved by City Council in October, 2011.

The next step for the project is to issue a Request for Proposals for supply and construction of the wind turbine. The earliest operational date for the wind turbine would be January of 2013.

The wind turbine will produce electricity onto Saskatoon Light & Power's distribution system, and will be available to residents and businesses wishing to purchase Green Power. Electricity produced from the wind turbine will offset the cost of power that would otherwise be purchased from SaskPower.

The estimated capital cost of the Tall Wind Turbine project is \$5 million, with annual revenue projections estimated at \$410,000 beginning in year 2013. This project is partially funded (50%) by the Governments of Canada and Saskatchewan through the Canada-Saskatchewan Provincial-Territorial Base Fund.

2. What is a tall wind turbine?

Wind turbines capture energy from the wind and convert it to electricity. The wind turns the blades of the turbine, which spin a shaft connected to a generator that makes electricity. More energy can be extracted from the wind by using larger blades and increasing the height of the wind turbine (wind speeds generally increase with height).

The wind turbine will have a maximum capacity of 2.0 megawatts (MW) and will stand at 120 metres from the ground to the top of the rotating blades.

3. What are the expected benefits of a wind turbine in Saskatoon?

- An environmentally clean and revenue positive electricity source – enough to power over 500 homes.
- A visible benefit for local residents and businesses wishing to purchase Green Power to reduce their environmental footprint.
- The improvement of the City of Saskatoon's environmental footprint by offsetting the City's greenhouse gas emissions.

- The promotion of Saskatoon as an environmentally conscious and responsible city.
- A visible and educational tool for sustainable development in our City.

Wind power currently supplies approximately 5% of our electrical demand in Saskatchewan, and over the next few years will increase to 8% - one of the highest percentages in Canada. Most wind power facilities in the province include multiple wind turbines located within a small geographical area – this helps to reduce the overall construction, operation, and maintenance costs per unit of power produced.

Similarly for the Green Energy Park there are cost benefits and operational efficiencies that result from locating the projects together at the landfill – there is no need to purchase land or build new roads, the same staff can operate and maintain all facilities, and the power is produced right where it is consumed – saving transmission losses.

When it comes to greenhouse gas emissions, there is no perfect way to produce electricity. Considering life-cycle greenhouse gas emissions right from mining raw materials such as steel, to manufacturing, construction, and operations – all forms of electrical generation produce some greenhouse gas emissions – even wind power. When compared to conventional coal-fired generation, emissions from wind power facilities are about 200 times less over the life of the facility.

4. What is involved in choosing a site for a tall wind turbine?

An appropriate site for a tall wind turbine is determined by considering such factors as proximity to residential dwellings, environmental impacts, and wind speed. Approval is also required from NAV Canada and Transport Canada regarding air navigation and obstruction clearance restrictions.

5. What was involved in the feasibility studies?

Feasibility studies included an environmental assessment, and a year-long wind assessment and for the Saskatoon Landfill location. A preliminary design for the wind turbine foundation was also being completed, to help identify costs for constructing a tall wind turbine at the landfill location.

The environmental assessment included an occupational health and safety review, sound and shadow flicker assessments, and bird and bat studies.

The wind assessment required the installation of a meteorological tower (60 metres high), complete with wind sensors and instrumentation, to collect site-specific wind data for a one-year period. The manufacturers of large wind turbines require a full year of site-specific wind data at the location of a proposed wind turbine. This data is used to

determine the available wind resource at the location, and is required to select an appropriate wind turbine to match the site. Data is collected from anemometers (measure wind speed) and wind vanes (measure wind direction) installed on a meteorological tower.

One unique aspect of the project is that the wind turbine will be constructed on top of the landfill. This is to achieve a higher elevation above the surrounding area, and therefore increase energy production from the wind turbine. Experts from the University of Saskatchewan undertook extensive field and laboratory testing to determine the ability of the waste to support the wind turbine, and provide data for design of the foundation system. Similar projects have been constructed at landfills in Germany, and in Hull, Massachusetts.

6. Are there health and safety issues involved with operation of a tall wind turbine?

Typical health and safety concerns regarding the operation of a tall wind turbine are related to sound, shadow flicker, and ice throw. These concerns were a primary focus of the environmental assessment, and will not be an issue at this location.

Sound

- Standing at the base of a wind turbine, the sound is similar in intensity to the idling of a larger vehicle engine. The rotating blades make a “swish-swish” sound.
- Wind turbines also produce Infrasound (i.e. frequency below 20 hertz). Infrasound from modern wind turbines at common setback distances is not perceptible to humans.
- The most stringent guideline in place in Canada, and world-wide, requires a wind turbine setback of 550 metres from the nearest residence. This requirement ensures that the sound level is below 40 decibels (similar to a quiet library) at the nearest residence.
- The nearest residences to the wind turbine location at the landfill are approximately 780 metres from the site. At this distance, the sound from the wind turbine will not be audible, and the infrasound will not be perceptible.

Shadow Flicker

- Shadow flicker occurs when the sun passes behind a wind turbine and casts a shadow over neighboring properties. When the blades rotate, shadows pass over the same point causing an effect called ‘shadow flicker’.
- Shadow flicker within homes can occur if a wind turbine is close enough to a nearby residence, and is of a specific orientation in relation to the home. It does not occur if

the sun is not shining brightly enough to cause shadows from the wind turbine, such as during cloudy periods.

- The most stringent guideline in place world-wide (in Germany) requires that no residence is impacted greater than 30 hours per year by shadow flicker.
- The nearest residences to the proposed landfill location are approximately 780 metres from the site. At this distance, the shadow flicker effect will be below the 30 hour per year guideline.

Ice Throw

- Ice falling from a wind turbine, just as with any building, power line, or power line structure, is a possibility. If this occurs, fragments usually land less than 100 metres from the turbine. Ice strikes beyond 200 metres is extremely rare.
- The formation of ice is a function of humidity and temperature levels. Saskatoon, due to the low humidity levels associated with its low temperatures, has a significantly lower ice formation probability.
- Protective equipment is available to alarm and stop wind turbine operation should ice formation conditions exist.
- The first urban based commercial scale wind turbine in North America was installed in 2002 at Exhibition Place on the Waterfront in downtown Toronto. They indicate that there are no concerns with damage or injury due to ice falling from their turbine.

7. Would the wind turbine harm birds or bats?

It is expected that such a structure would, in all likelihood, lead to some bird fatalities every year. At a similar installation near Exhibition Place in Toronto, they record one to two bird fatalities every year from their wind turbine. This number is typically less than the number of yearly bird fatalities recorded by most large buildings and structures, or by collisions with vehicles and plate glass.

According to Environment Canada guidelines, the landfill site is considered as the lowest level of concern (Category 1) based on site sensitivity and facility size. The results of the bird and bat studies indicate that there may be some risk to certain gull species and migratory bat species. Mitigation measures may be required and could include curtailing operation of the wind turbine during heavy migration periods. Monitoring will continue through the first few years of operation to determine if mitigation measures are necessary.

8. What are the next steps?

The next step for the project is to issue a Request for Proposals for supply and construction of the wind turbine. Detailed design and construction would occur

throughout 2012. The earliest estimated date for an operational wind turbine at the Saskatoon Landfill would be at the beginning of 2013.

It typically takes about a year from the time of order until receipt of a wind turbine of this size. In addition to erection of the wind turbine, additional costs are involved to interconnect with the electrical grid, construct a foundation, and complete other site preparation. Ongoing costs include routine operation and maintenance, remote monitoring and control, and environmental monitoring.

Contact Information

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