

Appendix B – City of Regina’s Energy Story

Energy and GHG Units and What They Mean

There are different ways of measuring energy consumption and energy generation. This can make comparisons difficult, particularly between hydrocarbons such as natural gas or gasoline and electricity. To allow for easier comparisons and explanations all types of energy can be converted to a common energy unit – the watt.

The watt is an instantaneous representation of the amount of energy being consumed or generated. For example, a 100-watt lightbulb consumes 100 watts at any given time. Because the watt is such a small unit of energy it is often expressed as a kilowatt (kw)(1,000 watts) or megawatt (mw)(1,000,000 watts). The watt is further converted to the watt hour (kwh or mwh). The watt hour is how electricity is purchased and billed. It is a representation of the intensity of the energy as well as the duration it is used. For example, a 100-watt light bulb that is left on for 24 hours will consume 2,400-watt hours or 2.4 kilowatt hours of electricity (100 watts x 24 hours = 2,400 kwh).

Below is a table of different fuel types and how much energy each contains.

1 kilogram of dry wood	5.3	kwh
1 kilogram of coal	8.1	kwh
1 cubic metre of natural gas	8.8	kwh
1 litre of diesel	10	kwh
1 kilogram of Uranium 235	22.2	million kwh
1 litre of gasoline	8.9	kwh

To put this into perspective, an average home uses roughly 1 kw of electricity at any given time and will consume 7,200 kw hours of electricity per year. With the average home as a benchmark, the following table shows how City projects are reducing electricity consumption or, in the case of the Landfill Gas to Energy Generator, producing electricity:

Average Home	7,200 kwh	1 home
WWTP energy savings	5,000,000 kwh	> 700 homes
LFGTE Generation	7,800,000 kwh	>1000 homes
Potential Victoria Park Savings	61,000 kwh	> 8 homes
Maple Leaf and Wascana Pool Savings*	175,000 kwh	>24 homes

* Assumes 4 month operation

Greenhouse gas emissions (GHG) take many forms and result in significantly different effects on the environment. For example, methane released into the atmosphere is about 25 times more harmful than carbon dioxide (CO₂) as a greenhouse gas. Different types of energy sources, such as natural gas or gasoline, produce different quantities of GHG emissions. As with energy, all emissions are converted to a common unit of CO_{2e} or CO₂ equivalent. If a vehicle consumes the average 1700L of gasoline per year it will emit

approximately 3.75 tonnes CO_{2e} into the atmosphere. The Landfill Gas To Energy Converter can remove approximately 30,000 tonnes of CO_{2e} each year or the equivalent of emissions from 8,000 cars.

The sustainability and renewability of City electricity is currently dependent on the sustainability and renewability of SaskPower's energy sources. Roughly 23 per cent of SaskPower's energy mix comes from renewable sources. By extension, the City's electricity is 23 per cent renewable. One of the bigger challenges to the City becoming more renewable is that SaskPower offers limited ability for its customers to produce electricity *if* customers still wish to connect to SaskPower's electricity grid. SaskPower's full energy mix is displayed in the graphic below. The City uses an average of five (5) megawatts (MW) of electricity at any given time.

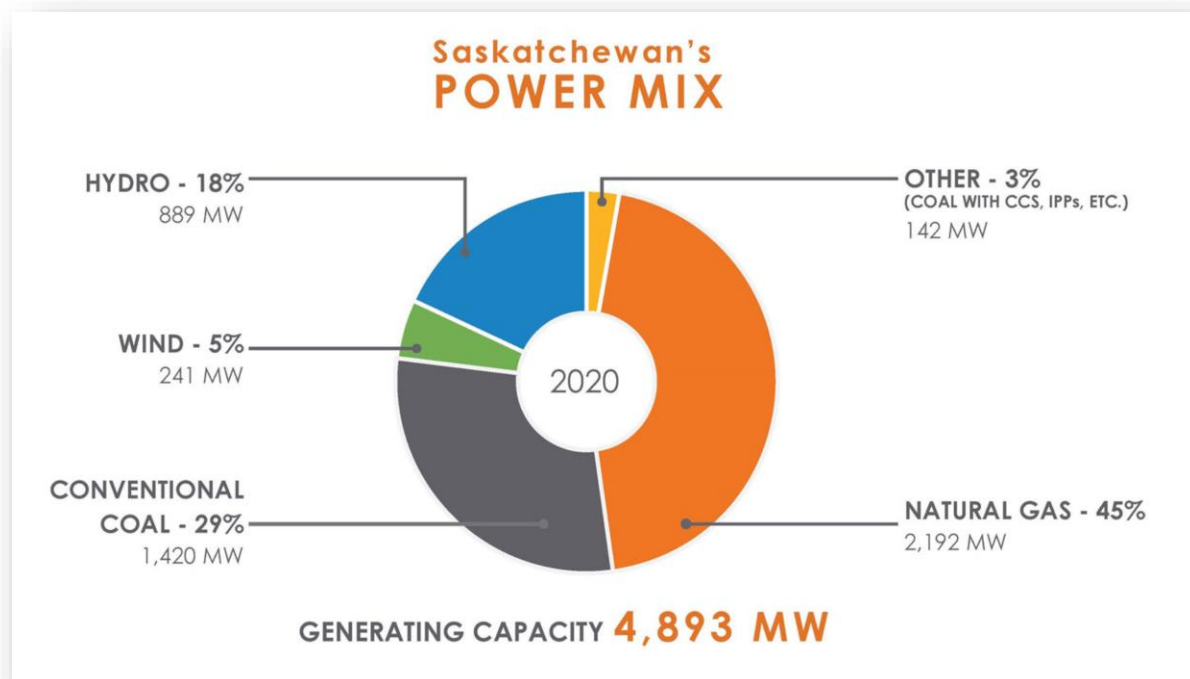


Figure 1: SaskPower Energy Mix

SaskPower does have a Power Generation Partner Program (PGPP) that allows organizations to develop power generation projects to sell electricity to SaskPower. Projects are selected through a competitive procurement process. According to SaskPower, the PGPP accepts up to 10 megawatts (MW) of renewable generation, but individual projects can only produce a maximum of one (1) MW. The City went through a similar process to install its single gas-to-energy generator that produces one (1) MW of electricity at the landfill. The City applied for permission to install a second landfill gas-to-energy system but was denied approval because SaskPower did not have adequate grid capacity in the area.

SaskPower also offers a Net Metering program where their customers can produce energy for their own consumption and then provide any excess power generated to the grid for credit on their bill which can be applied to future consumption of energy from SaskPower.

Under this program, the City of Regina can implement up to 500kW in Net Metering projects (per calendar year), but no one project can be more than 100kW. For example, the City can have 5X100kW, or 10X50kW, 2X100kW + 5X60kW, etc. This program provides little opportunity for the City to produce renewable energy to immediately offset its 5MW of average consumption. However, the City is well positioned to incrementally add renewable generation projects over time.

Efforts are being made to improve the environmental sustainability of non-renewable energy sources such as coal. Burning coal produces roughly one-third of SaskPower's energy supply. While relatively cheap and abundant, coal is one of the world's largest producers of carbon dioxide – one of the greenhouse gases that causes climate change and global warming. Carbon capture and storage is a technology process that helps diminish coal's negative environmental impact and Boundary Dam Power Station near Estevan became one of the first power stations in the world to use carbon capture and storage technology. Federal government guidelines are requiring that coal plants be decommissioned at the end of their useful life or be retrofitted by 2030 to include carbon capture and storage technology. At this time, SaskPower has decided not to expand the technology on anymore coal-fired plants and is instead, looking to switch to more renewable options.

Even without implementing carbon capture and storage, any new coal power plants would likely implement High-Efficiency Low-Emissions (HELE) technologies. HELE technologies can generate the same amount of electricity while burning less fuel, emitting less carbon, releasing less local air pollutants, and consuming less water. This is an example of the types of innovations within the oil and gas sector that make fossil fuels more environmentally sustainable. The City looks forward to leveraging such innovations the sector is pursuing.

The City relies on natural gas from SaskEnergy to heat City facilities. Natural gas is a non-renewable energy source. For the City to become a Renewable City, it would need to find alternative ways of heating City facilities.

Consumption

Considering the above challenges, the second and preferred approach is to focus on how the City consumes energy. While the City has limited ability to affect the renewability of energy sources, it does have a greater ability to affect how much energy it consumes and how efficiently energy is consumed. The City is becoming more sustainable, decreasing its carbon dioxide (CO₂)/greenhouse gas (GHG) emissions, while accessing the non-renewable energy supplied by SaskPower and SaskEnergy.

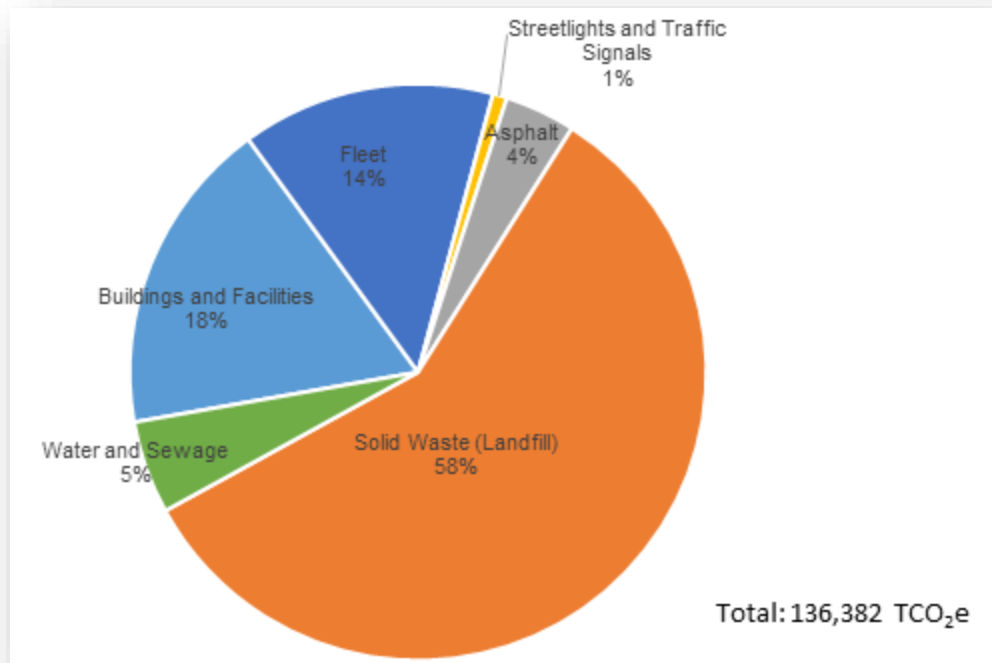


Figure 2: 2019 City of Regina Green House Gas Emissions (excludes Buffalo Pound and Wastewater Treatment Plants)

The City of Regina produces roughly 136,000 tonnes of CO₂ equivalent. The majority of the City of Regina's GHG emissions come from the Landfill, followed by City buildings and facilities, as well as the City fleet. By pursuing ways of increasing efficiency and reducing energy consumption, it is possible for the City to reduce its production of carbon dioxide equivalent – even without switching to renewable energy sources.