

# Wind Power Background Information

## What Are Wind Turbines?

Wind turbines are **structures capable of converting the energy of the wind into a usable form of energy**. In the past this may have meant the pumping of water or the turning of a mill stone; however, wind energy is generally now associated with electrical power generation.

The Municipality of Kings currently classifies wind turbines based on their rated power output.

**Small-scale wind turbines = less than 100 kilowatts (kW).**

**Large-scale, or commercial-scale = greater than 100 kilowatts (kW).**

This review process is for large-scale turbines.

### What is a Watt?

A watt is a unit of power. It typically takes 60 to 100 watts of power to run a common incandescent light bulb and around 1000 watts to run a microwave

1000 watts (W) = 1 kilowatt (kW)

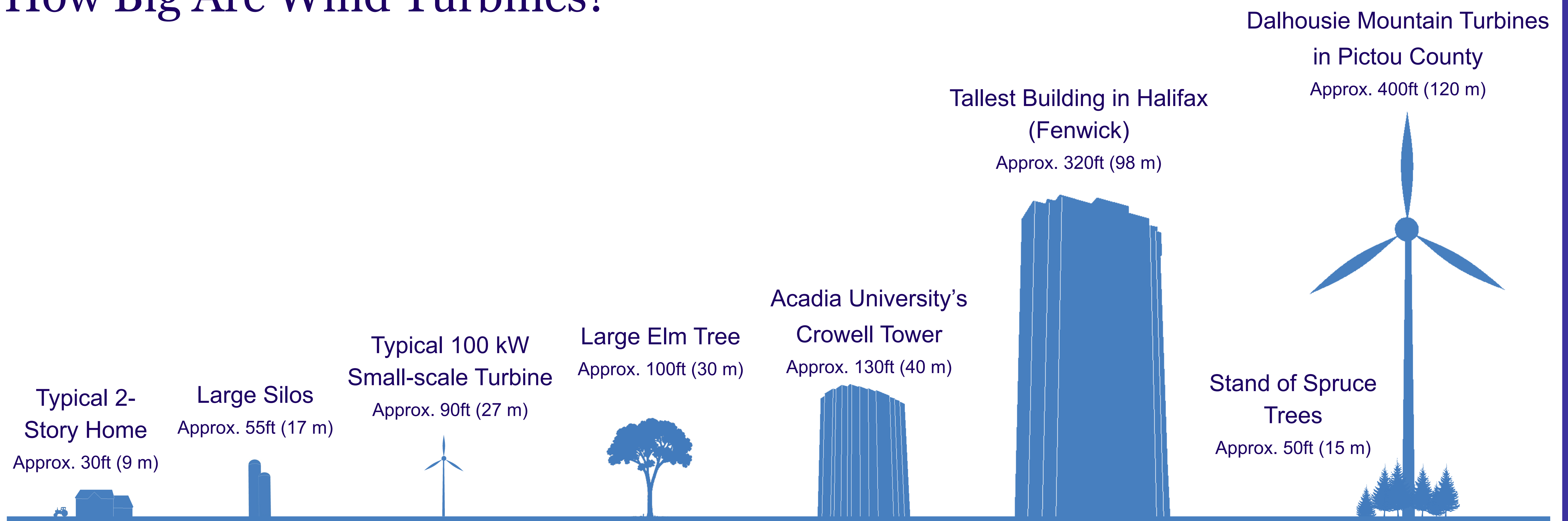
1000 kilowatts (kW) = 1 megawatt (MW)



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| <b>Blade</b><br>Converts linear motion of wind into rotational motion. Basically the opposite of an airplane propeller. |
| <b>Nacelle</b><br>Contains mechanical equipment, including the gear box and the generator.                              |
| <b>Tower</b><br>Supports nacelle and blades at a height appropriate for desired wind speeds.                            |

Pubnico Point wind turbines located in Yarmouth County — 1.8 MW, 389 ft (118 m)  
Image released under the Creative Commons Attribution-Noncommercial 2.0 license by Flickr user rjzii

## How Big Are Wind Turbines?



## How Much Power?

The amount of power a single turbine produces varies with the wind speed and the size of the turbine's blades. Rough terrain, vegetation, and buildings can slow wind speeds. Taller turbines are able to access faster winds and generate more power.

The size of a turbine is limited by the logistics of moving its components to the installation site, as well as the strength of materials used in the turbine. The economics of a development also come into play. Modern land-based wind turbines exist that generate up to 3.4 megawatts of power; however, Nova Scotia's current turbines are smaller than 2.3 megawatts.

Although wind power output varies as the wind blows, the average 1 megawatt turbine will produce enough power in a year to supply 250–300 households.

If more power is needed than is available from a single large turbine a collection of turbines, often called a "wind farm", may be built. Turbines in wind farms are typically separated by great distances in order to prevent one turbine from "stealing" the wind of another turbine.

# Current Regulations in Kings County

## Objectives

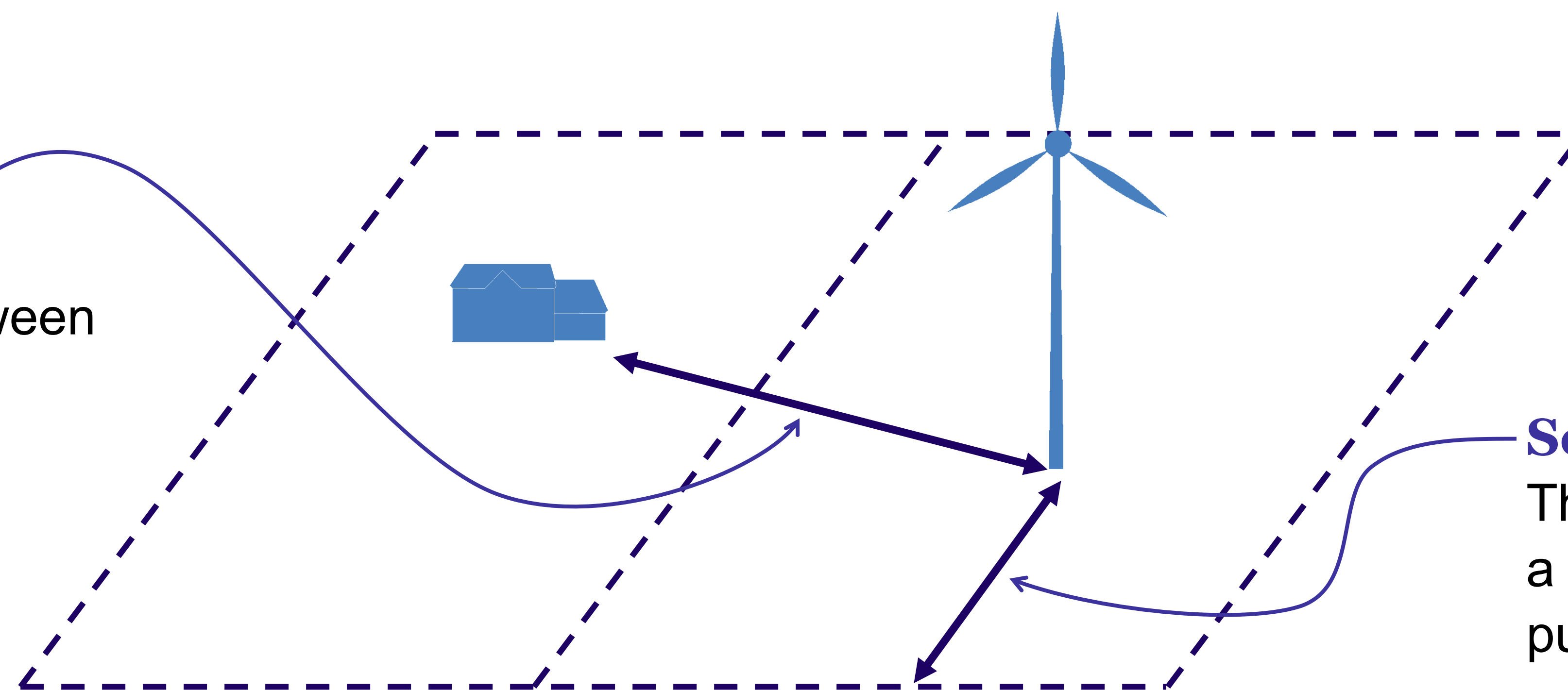
Section 5.5 of the Municipal Planning Strategy (MPS) for the Municipality of Kings currently lists four objectives in regard to large-scale wind turbines:

1. To promote the development of large-scale wind turbines in an effort to reduce the Municipality's dependence on non-renewable energy.
2. To respond to the Provincial call for increased sources of renewable energy.
3. To minimize the potential negative impacts of large-scale wind turbines on neighbouring land uses and to ensure an acceptable standard of safety and compatibility.
4. To maintain consistency with and support for the rural goals of the Strategy.

## Terminology

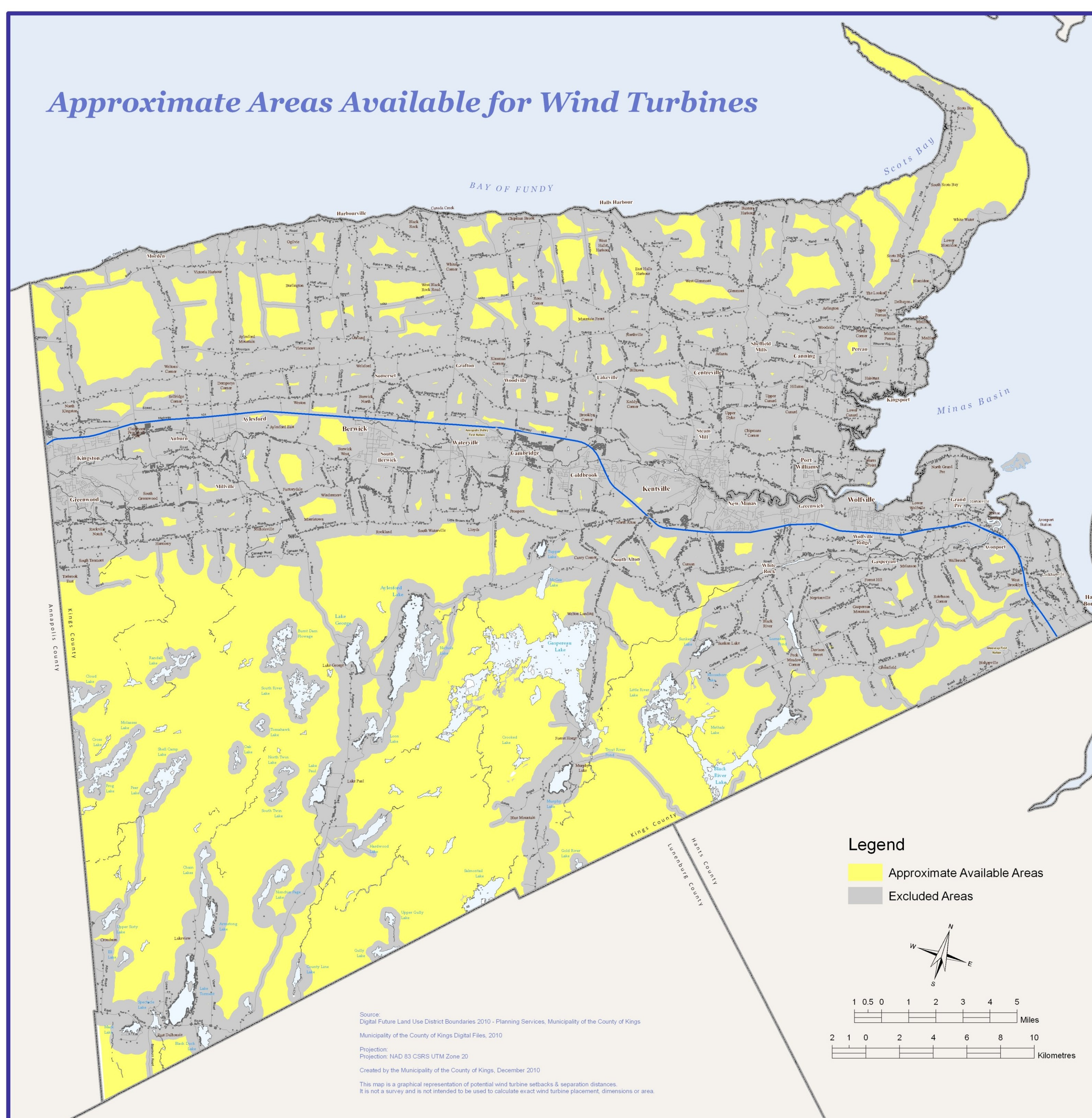
### Separation distance

The minimum distance between a turbine and a dwelling



### Setback

The minimum distance between a turbine and a property line or public right-of-way



## Regulations

The objectives of the MPS are translated into regulations in section 10.1.6 of the Land Use Bylaw (LUB):

- As-of-right permitting. An applicant applies for a development permit. If the application complies with the regulations a permit is issued.
- 700m (2300ft) minimum separation distance between turbines and dwellings. New dwellings may be built within this distance around established turbines.
- One times (1x) turbine height setback from property lines, roads, and other public rights-of-way.
- Exemptions from separation distance and setback for properties and dwellings that are part of a project
- Provisions for clearance, distance between turbines, access, surface finishes, lighting, and signage.
- Requirement for a decommissioning plan.
- Required documents, including project details, emergency plans, and approvals from federal and provincial departments.

# Potential Concerns and Benefits

## Noise and Health

Sound produced by wind turbines arises from three main sources: the mechanical noise of the drive shaft and gears, the noise caused by blades passing the tower, and the aerodynamic noise coming from the blades moving through the air.

Perhaps the most hotly debated topic in regards to wind turbines is the link between turbine noise and human health. Most of this discussion has focused on “infrasound”, or sound that is too low to hear with the human ear. There is a wide body of literature, of varying levels of credibility and thoroughness, with a range of conclusions on the impact of infrasound. Some sources find no impacts from infrasound. Some find that it can cause minor annoyance. Others find that it can cause stress-related health impacts in some individuals. An investigation into the risks of health impacts is a major part of this review.

## Safety

Like all human-made structures, wind turbines are at risk of fire or structural failure. The movement of turbine blades also means that there is a small risk broken blade pieces or ice that builds up on the blades could be thrown from the turbine. The risks associated with such safety concerns are reduced at farther distances from the turbine.



A single turbine on Higgins Mountain, Cumberland  
Image courtesy of Len Wagg, Communications Nova Scotia

## Negative/Positive Appearance

The visual impact of wind turbines varies with the size, number, and location of turbines, as well as the landscape. The images to the left and right illustrate two levels of visual impact.

How the visual impacts of wind turbines are perceived is very subjective. Some observers may view wind turbines as pleasing sculptures or symbols of a “green” future, while others may view them as an industrial blight on the landscape.



Dalhousie Mountain Wind Farm, Pictou County  
Image courtesy of Len Wagg, Communications Nova Scotia

## Reduced Reliance on Fossil Fuels

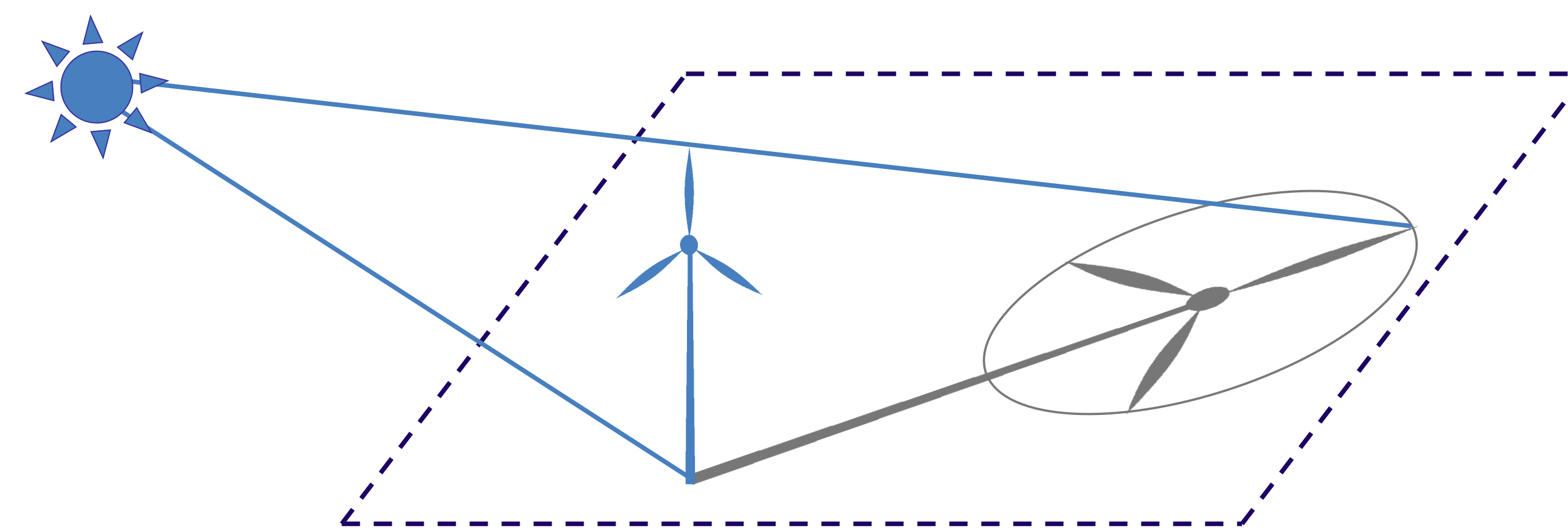
The Province of Nova Scotia has committed in law, a target for 25 percent of the province’s electricity to come from renewable sources by 2015. This is based on a desire to reduce pollution and insulate the province from rising fossil fuel prices. Wind energy is seen as the primary means to reach this target because the technology is mature and the industry is well-developed

## Taxes From Turbines

Wind turbines in Nova Scotia are exempt from paying municipal taxes based on assessed value, although the land and other buildings on the property are taxed as normal. Instead, large-scale turbine owners (not the land owner) are taxed annually at a base rate of \$5,500 per megawatt of generating capacity. This rate is adjusted each year to account for inflation.

## Shadow Flicker

Shadow flicker is a pulsating light effect caused when a turbine’s blades pass between an observer and the sun, creating a moving shadow. The severity of shadow flicker is very much affected by the time of day and season; when the sun is low in the sky the shadow reaches a farther distance.



## Wildlife Impacts

The impacts of wind turbines on bat and bird populations are a common concern. Collisions with the blades and tower structure can kill birds, and low pressure areas surrounding turbine blades can injure bat lungs. Secondary impacts on birds, such as habitat destruction from access roads, are also of concern. The impact that wind turbines have on wildlife is highly dependent on location. Areas near bird migration routes and bat roosts are areas of high risk, while other areas may not have such a risk.

## Diversified Local Economy

The Nova Scotia *Renewable Electricity Plan* highlights the concern that much of the money spent on electricity in Nova Scotia leaves the province in the form of foreign fuel purchases. Wind energy can potentially provide for a diversified local economy through construction and operation jobs, as well as opportunities for local investors through vehicles such as Community Economic Development Investment Funds (CEDIF).

## Economic Benefit to Land Owners

Many wind projects in Canada occur on leased land. Through this approach a land owner and the wind turbine proponent enter into a lease contract for the use of the land. The land owner is then provided financial compensation for the lease. The amount of that compensation and the details of the lease vary from project to project.