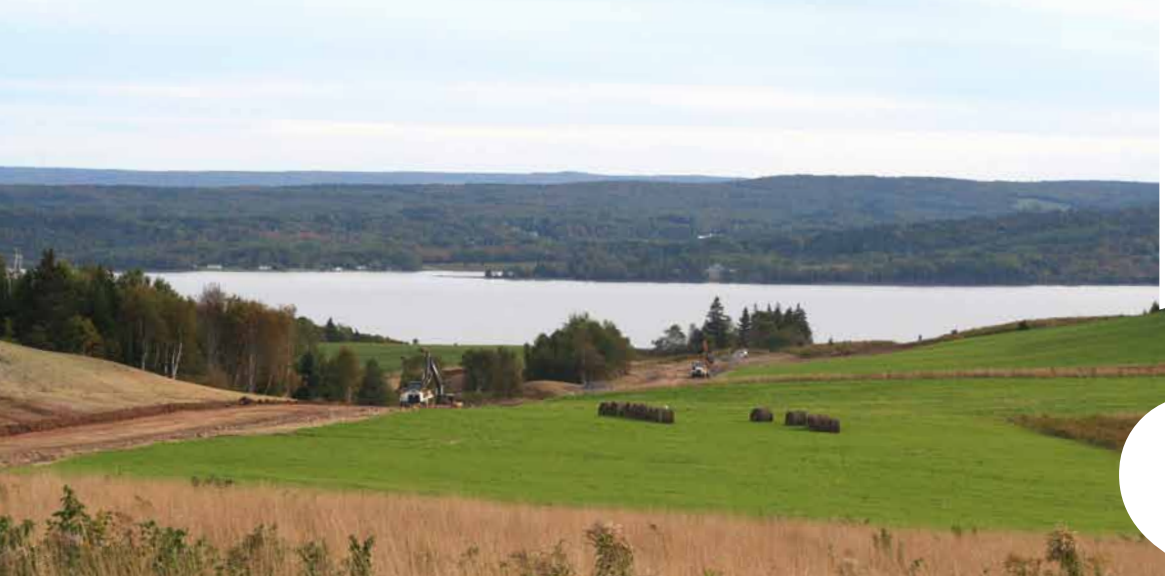


Above Photo: Boularderie, Cape Breton

SOURCE: NATURAL FORCES

Approaches to Siting Wind Turbines

What factors contribute to a good energy site?

All wind energy developers – municipalities, community groups, private sector companies, First Nations or large electricity users – start by finding a potential site. The next step is determining whether there are any ecological, social or financial "deal breakers" for the proposed site.

Siting wind turbines, large or small, is an iterative process. Each new piece of information could stop the project or justify more study of the selected site.

Key questions in considering a potential site:

Is there enough wind at the proposed turbine hub height?
The NS Wind Atlas is a good starting point, but site measurements will be needed.

How close is the site to the electrical grid or direct user of electricity?
To reduce costs, siting close to the user or the distribution or transmission lines is a priority.

How far away are homes and other sensitive land uses?
Social and ecological considerations are important constraints.

Will the site comply with municipal land use by-laws and zoning requirements?
These vary across the Province and often depend on the size of turbine.

How will the site be accessed?
For transport and maintenance of turbines, access is required, e.g., from public roadways.

Will construction be straightforward?
Constructability is crucial to project costs, and varies with site elevations, geotechnical, and structural conditions.

What are key considerations in project siting?

Beyond the technical and legal considerations, wind energy projects should be sited to maximize benefits and minimize costs associated with ecological, social and financial aspects. Integrating these three considerations – ecological, social and financial – will result in well planned wind energy projects that support true sustainability.

If the site gets a check mark in the these areas, additional study will occur to verify that this site and its proposed site design are suitable. In all cases, more study and analysis is needed before any wind energy project can go ahead.

Figure 5A: Siting Considerations

Technical & Legal

- Wind resource
- Proximity to electricity user or grid
- Capacity of the electricity user or the grid
- Constructability, e.g., existing roads, topography, etc.
- Ground conditions, i.e., geotechnical
- Land ownership or ability to lease / purchase
- Access from public roadways
- Adherence to municipal zoning and by-laws
- Requirements for municipal, provincial or federal permits and approvals

Ecological

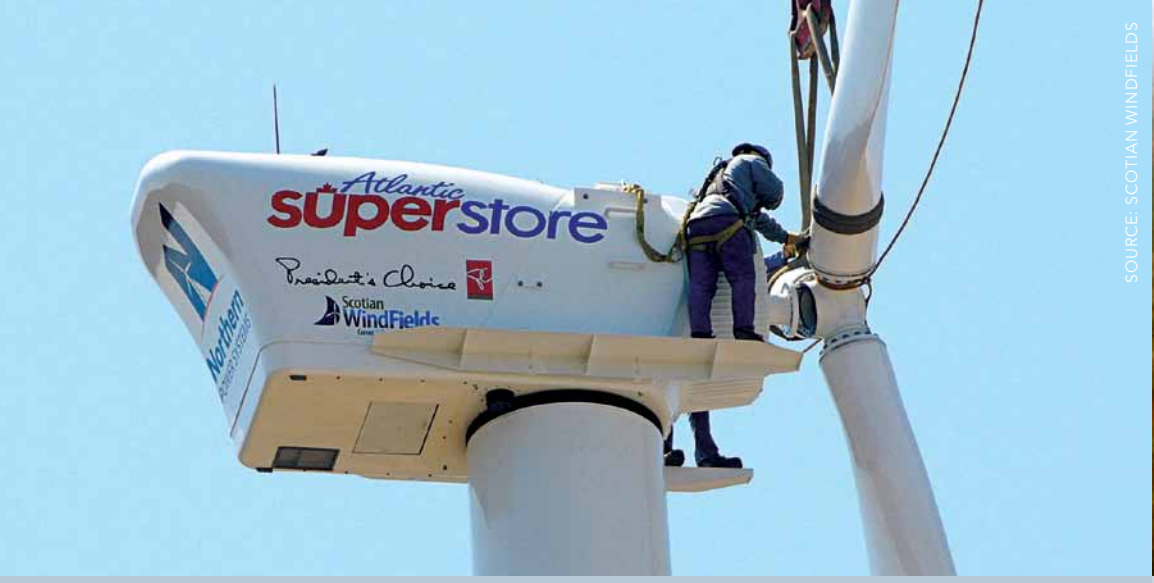
- Consideration of wetlands and streams
- Setback from bat hibernacula
- Setback from bird and raptor migration corridors and important nesting areas
- Suitable distance from provincial parks and protected areas
- Consideration of known sensitivity of site flora & fauna

Social

- Proximity to residential properties, schools, hospitals, etc.
- Aboriginal and archaeological resources and traditional uses
- Suitability with adjacent land uses
- Local attitudes and involvement in project planning
- View plane considerations

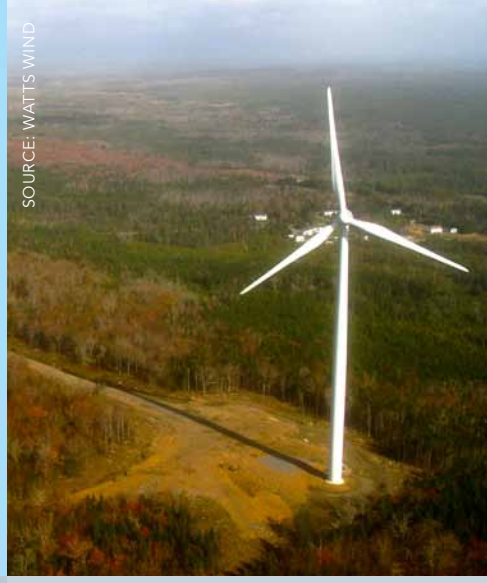
Financial

- Site specific costs for land, unique studies or construction
- Predicted electricity production based on wind resource
- Fixed power purchase agreement or feed-in-tariff
- Overall payback during turbine operation



SOURCE: SCOTIAN WINDFIELDS

Atlantic Superstore, Porters Lake, Nova Scotia



SOURCE: WATTS WIND

Watts Section, Nova Scotia

What about connecting to the grid?

Some wind turbines generate and supply electricity directly to the load customer; they are "inside the fence", like the 100 kW turbine at the Superstore in Porters Lake. Installed in 2009, it supplies about 25% of the store's power needs. Other wind turbines supply energy directly to the electrical grid for Nova Scotia homes, farms, and businesses. When turbines are not sited "inside the fence" for direct use of their generated electricity, proximity to and capacity of the grid must be considered.

The electrical grid consists of high voltage transmission and lower voltage distribution lines. Large wind energy projects, like the thirty-four 1.5 MW turbines on Dalhousie Mountain in Pictou County, connect to the transmission line. Transmission lines often run along large steel or wooden towers, to move electricity through the Province and beyond.

Electricity carried by transmission lines is sent through distribution substations and transformers that reduce it to a voltage level safe for delivery via street poles to homes and businesses. Smaller wind energy projects, like the single 1.5 MW turbine in Watt Section, Sheet Harbour, connect to the distribution line. In these cases, electricity produced by wind turbines is used locally.

The proximity, voltage and capacity of the electrical grid are vital considerations in siting a wind energy project that proposes to sell to Nova Scotia Power or other electrical utilities.

For projects that are not part of Nova Scotia's feed-in-tariff (COMFIT) or net metering programs, a power purchase agreement can be negotiated, typically a 20-year agreement for Nova Scotia Power to purchase electricity at a fixed rate.

Site-specific wind energy data is required, based on measurements from meteorological towers (often referred to as "met towers"), to estimate electricity production. Predicted production is a key element in gauging the revenue stream for a wind turbine. An inaccurate estimate of wind resource may overestimate electricity production and lead to construction of a project that is not financially viable.

For projects planned as part of the COMFIT program, proximity to distribution lines is a priority, as is sufficient capacity in the local distribution network to use the wind-generated electricity.

How and when would local residents participate?

By the time a site is proposed to the community for a possible wind energy project, it has undergone preliminary review to determine that there are no obvious "deal breakers". Community consultation usually begins with a site feasibility assessment. Local residents should be engaged before a meteorological tower is erected on the site. Early community involvement lays a foundation for communication and trust in later stages of a project's development.

The Halifax Regional Municipality's land use by-laws include meteorological towers in their definition of a "wind energy facility"; notification of nearby residents is required 60 days prior to a development permit application for a meteorological tower.

Ideally, residents will have had the opportunity to discuss local energy planning and integration of renewable energy planning in their community, either during preparation of the Integrated Community Sustainability Plans in 2010 or the Municipal Climate Change Action Plans in 2013. Understanding generation, distribution and use of electricity at a community level is an excellent foundation for local residents to discuss proposed wind energy projects, including site selection.

What additional studies may be completed?

If a site passes preliminary review, additional studies, including at least one year of meteorological data on wind speeds, will be conducted to develop a solid business case for the wind energy project. Additional studies of technical, legal, economic, ecological, social and financial factors, ranging from geotechnical assessment to bird migration surveys, will be completed.

The unique aspects of the site and size of the proposed project will determine the extent of the studies. For projects 2 MW or larger, more studies are required because the project must undergo a provincial environmental assessment (EA). As part of community engagement, the progress and outcomes of these studies should be shared with local residents.

Once a site is selected, how is it designed?

Whether the proposed wind turbines are large or small, micro-siting of the turbines will occur when the necessary information is gathered. A large wind energy project often requires a large site; specific turbine locations depend on local topography and wind resource, but must complement ecological, social and financial considerations. For example, higher elevations on a site may have the best wind resource, but may not be selected if access roads require crossing of wetlands. As in site selection, the process of site design is iterative.