PREPARED FOR: MUNICIPALITY OF THE DISTRICT OF SHELBURNE & MUNICIPALITY OF THE DISTRICT OF CLARE

PREPARED BY: STANTEC CONSULTING LTD

Municipality of the District of Shelburne & Municipality of the District of Clare

RENEWABLE ENERGY:
BEST PRACTICE REVIEW

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PROJECT NUMBER: 160401883

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RENEWABLE ENERGY

September 19, 2024

Prepared for:
Municipality of the District of Shelburne &
Municipality of the District of Clare

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Project Number:
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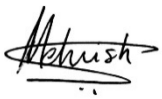

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1 Introduction

The Municipality of the District of Shelburne and the Municipality of the District of Clare are undertaking a comprehensive review of their Municipal Planning Strategy and Land Use By-law. As part of the review process, renewable energy has been suggested as a specific topic in which the municipalities want to explore in an effort to support the transition to cleaner energy sources, make a reasonable effort to ensure they are appropriately located to reduce impacts and concerns from residents, and to increase revenue for the municipality. The intent of this report is to determine the role of the municipalities in regulating renewable energy facilities and to determine the best approaches for regulating these facilities within the municipality.

For the purpose of this report, green hydrogen, wind energy, solar energy, and battery storage have been the focus of the research and best practices. Furthermore, large or industrial scale installations have been the primary consideration given that local land use planning requirements for small and micro-scale establishments for self consumption and net-metering are not the immediate concern for the municipalities. Lastly, this report uses the following thresholds to determine industrial scale facilities:

- **Wind Energy** - Power output is more than 50kW
- **Solar Energy** - Power output is more than 27kW
- **Green Hydrogen Facility** - Should be assessed as Class 1 or 2 based on the Nova Scotia Environmental Assessment Act
- **Battery Storage** - Capacity of an industrial scale facility should be larger than 20kWh

2 Environmental Assessment of Renewable Energy

In Canada, renewable energy projects are subject to environmental assessment legislation at both the provincial/territorial and federal level. The following sections describe the Nova Scotia and federal processes and requirements.

2.1 Nova Scotia Environmental Assessment Act

Environmental Assessments (EA) have been formally administered in Nova Scotia since 1989, when the *Environmental Assessment Act* (EAA) came into effect. Since 1995, EAs have been governed by Part IV of the *Environment Act*, into which the EAA was consolidated. The provincial EA is a tool for the planning of large-scale undertakings, intended to help predict and evaluate the impacts of these undertakings. The EA process was developed to promote sustainability and innovation in development by proactively identifying potential adverse effects, and considering the potential implications for Indigenous

communities, government and non-government agencies, and the public. The EA process is administered by the Environmental Assessment Branch of the Government of Nova Scotia.

The EA process in Nova Scotia is sub-divided into two classes. Class 1 undertakings are typically smaller projects that would be anticipated to have fewer or lesser impacts on the environment. Examples of Class 1 projects are mines, quarries, smaller highway or transportation projects, and most industrial facilities. Class 1 projects require the submission of a registration document which is available for public viewing and is subject to expert review from multiple government agencies. Class 2 projects are usually larger in scale and would be expected to have relatively greater impacts on the environment. Examples of these projects are petrochemical facilities, pulp mills, and waste incinerators. Class 2 projects also require the submission of a registration document but require formal public review. In addition, for Class 2 registrations the EA Branch of Nova Scotia Department of Environment and Climate Change (NSECC) releases a terms of reference that guide the EA registration document scope.

Regardless of the registration class, proponents must consider a broad series of factors when submitting a EA registration document. Table 1 provides a list of considerations and the information required to demonstrate due diligence with respect to those considerations. These factors are assessed and evaluated by the Minister, and subject matter experts, in consideration of EA approval.

Table 1. Considerations for Proponents When Compiling an EA registration Document

Consideration	Information Required
The purpose, need, construction schedule, and operation schedule of the undertaking	Proponents must demonstrate that the project is necessary, and that alternatives that would have lesser impacts on the environment have been considered. Proponents must also provide the length of anticipated disturbance through both construction and operation of the project.
Concerns of Indigenous communities and the public	Proponents must demonstrate engagement and awareness of the project with Indigenous Nations and the public, particularly those in proximity to the project. An Mi'kmaq Ecological Knowledge Study (MEKS) is often recommended in order to support Indigenous engagement.
The location of the project and the nature and sensitivity of the surrounding area	The proponent should identify a specific location for the project, and must have demonstrated consideration for the location with respect to the surrounding environment.
The baseline environmental conditions of the project location	Proponents must demonstrate an understanding of the pre-project conditions present in an area. This typically involves a variety of field programs designed to characterize the existing environment. This consideration, and the associated mitigation, monitoring, and assessments, often forms the bulk of EA registration documents. Typical considerations usually include the terrestrial (flora, fauna, wetlands), aquatic, geologic and hydrogeologic, atmospheric, and socioeconomic environments, and may include additional areas of study depending on project size, scope, and location.
Potential positive and negative environmental effects related to the undertaking	The proponent must demonstrate an understanding of, and plan for effects stemming from the project. This may involve modelling, or predictive work based on data or information gained during baseline studies described above.
The potential adverse effects project on the environment, specifically effects on species at risk, species of conservation concern and their habitats	Specific attention should be paid to species at risk (SAR), and species of conservation concern (SOCC) and their habitats. Proponents must demonstrate that they understand the potential impacts of the project on SAR and SOCC, and that these impacts have been considered in mitigation and monitoring plans.
Land use and applicable zoning, including historical uses	Proponents should identify applicable zoning and land use policies at the location of the project. An understanding of the processes required to change or modify land use restrictions should also be demonstrated if applicable.
Other undertakings in the area which may or may not impact the project, or compound potential environmental effects	Proponents should demonstrate an understanding of development in the general area of the project. Information relating to how the project fits into the overall developmental landscape in an area, and how impacts of other activities in the area may interact with the project or its impacts should be included.

A key aspect of the EA process is public engagement and the solicitation of public comment. Upon registration of a Class 1 EA, the NSECC EA Branch makes the registration document publicly available

for comment, including on their website. The proponent must also make hard copies of the registration document available for public viewing in accessible locations in proximity to the project location and must advertise in two newspapers. The public viewing window for a Class 1 EA lasts 30 calendar days. For Class 2 EA registrations there are two public review periods. The first lasts 30 days and is a review of the government published terms of reference. The second public viewing window lasts 48 days and provides the public an opportunity to comment on the registration document after it has been submitted.

2.2 Renewable Energy Production

In Nova Scotia, many renewable energy projects would be considered a Class 1 undertaking. Table 2 outlines the general classification of energy projects, including renewable energy projects. A full list is available in Schedule A of the Environmental Assessment Regulations, made under the *Environment Act*.

Table 2. Classification of Energy Projects for EA registration

	Class 1	**Class 2**
Energy	1. A corridor for 1 or more electric power transmission lines that have a cumulative voltage rating equal to or greater than 345 kVA. 2. An energy generating facility, other than an emergency generator, that meets any one of the following: a. it has a production rating of at least 2 MW derived from wind, tides or waves, b. it has a production rating of at least 2 MW and no more than 25 MW derived from hydroelectricity, other than run-of-the-river facilities under 10 MW, c. it has a daily fuel input rating of at least 11 000 GJ and no more than 31 000 GJ derived from natural gas, d. it has a daily fuel input rating of at least 250 GJ, and no more than2500 GJ derived from fossil fuels other than natural gas, e. it has a daily fuel input rating of at least 4000 GJ and no more than 10 000 GJ derived from fuels other than fossil fuels, but excluding solar power.	1. An energy generating facility, other than an emergency generator, that meets any one of the following: a. it has a production rating of more than 25 MW derived from hydroelectricity; b. it has a daily fuel input rating of more than 31,000 GJ derived from natural gas; c. it has a daily fuel input rating of more than 2,500 GJ derived from fossil fuels other than natural gas; d. it has a daily fuel input rating of more than 10,000 GJ from fuels other than fossil fuels, but excluding solar power. 2. A water reservoir that has a storage capacity of 10 000 000 m^3 or more than the mean volume of the natural water body source for which it is a reservoir.

To aid in the registration of projects, detailed guidance is provided by the Government of Nova Scotia both for the general EA process (NSE 2001) and for sector specific EA registrations (NSECC 2024). At this time, the only renewable energy sector with specific guidance is wind (NSECC 2007).

The sector specific guidance for wind projects provides detailed information to help proponents consider potential risks and impacts. The guide provides information on the EA requirements for projects, considering the size and scope of potential projects. In particular, the wind guidance lays out increased expectations for information to be collected about the biophysical environment, particularly about birds and their habitats. The wind sector guidance also lays out expectations for detailed requirements about project specific components, schedules, and decommissioning plans.

2.3 Canadian Impact Assessment Act

The *Impact Assessment Act* (IAA) is federal legislation the governs federal impact assessments (IA) in Canada and is administered by the Impact Assessment Agency of Canada. Impact assessments serve to provide a rigorous review of projects and to promote innovative economic development while protecting important environmental considerations. IAs incorporate Indigenous, scientific, and public knowledge and perspectives into project evaluation.

The IAA applies to *Designated Projects* (listed in the Physical Activities Regulations of the IAA) which include major projects with potential to result in non-negligible adverse effects in federal jurisdiction. An IA considers the overall benefits of a project, and weighs that against the potential risks. Specific considerations include, but are not limited to:

- the purpose of, need for, and alternatives to, the project,
- potential positive and / or negative changes to the environment, health, social, and economic conditions
- mitigation measures to lessen the impact of adverse effects
- impacts on Indigenous groups, including Indigenous knowledge, culture and rights
- impacts on the general public, and surrounding communities
- the alignment of the project with Canada’s climate and sustainability goals
- general project / environment interactions
- monitoring and / or follow-up programs proposed

The IAA may apply to renewable energy production projects, depending on scope, size and location. In particular, the IAA applies to projects on federal lands, or that impact areas of federal jurisdiction. Examples of projects that fall under the IAA's jurisdiction are some power generating facilities, marine terminals, and mining projects. Table 3 provides further examples of projects subject to the IAA that are related to renewable energy production, however the list is not exhaustive, and the Minister has the authority to designate projects not listed in the Physical Activities Regulations.

Table 3. Renewable Energy Related Projects on the Designated Projects List

Policy Area	Designated Projects
Electrical Transmission Lines and Pipelines	1. The construction, operation, decommissioning and abandonment of either of the following: a. a new international electrical transmission line with a voltage of 345 kV or more that requires a total of 75 km or more of new right of way; b. a new interprovincial power line designated by an order under section 261 of the *Canadian Energy Regulator Act*.
Renewable Energy	1. The construction, operation, decommissioning and abandonment of one of the following: a. a new hydroelectric generating facility with a production capacity of 200 MW or more; b. a new in-stream tidal power generating facility with a production capacity of 15 MW or more; c. a new tidal power generating facility that is not an in-stream tidal power generating facility. 2. The expansion of one of the following: a. an existing hydroelectric generating facility if the expansion would result in an increase in production capacity of 50% or more and a total production capacity of 200 MW or more; b. an existing in-stream tidal power generating facility, if the expansion would result in an increase in production capacity of 50% or more and a total production capacity of 15 MW or more; c. an existing tidal power generating facility that is not an in-stream tidal power generating facility, if the expansion would result in an increase in production capacity of 50% or more. 3. The construction, operation, decommissioning and abandonment in an offshore area or in boundary water of a new wind power generating facility that has 10 or more wind turbines. 4. The expansion in an offshore area or in boundary water of an existing wind power generating facility, if the expansion would result in an increase in production capacity of 50% or more and a total number of wind turbines of 10 or more.
Note: This list is not exhaustive. Additional projects are listed as designated projects and the full list is available as Schedule A of the Physical Activities Regulations.	

3 Current and Potential Future Renewable Energy Technologies

3.1 Solar Energy

Solar energy, a byproduct of nuclear fusion in the sun, is harnessed using an array of technologies. These include solar power for electricity generation, solar thermal energy for water heating, and solar architecture. At the heart of a solar energy system lies the photovoltaic (PV) array. This array is composed of individual PV cells connected in series and/or parallel. Each solar cell contains a semiconductor, typically silicon-based. When sunlight is absorbed, the semiconductor releases electrons. An electrical field then directs these free electrons into a unidirectional electric current. Metal contacts located at the top and bottom of a solar cell guide this current to an external circuit.

A solar photovoltaic panel, or module, is made up of multiple solar cells combined and oriented in one plane. Photovoltaic modules often have a sheet of glass on the sun-facing side, allowing light to pass through while protecting the semiconductor wafers. Solar cells are generally connected in series, leading to additive voltage. The integration of photovoltaic (PV) solar energy systems with the national electric grid calls for the swift development of foundational codes and standards that regulate solar deployment. Technological advancements, emerging business opportunities, and legislative and regulatory mandates are all driving factors that necessitate up-to-date interconnection and interoperability standards. These standards make a reasonable effort to cross-technology compatibility of jurisdictional requirements, thus facilitating the safe and reliable installation of PV solar energy systems.

The harnessing of solar energy and its integration into the grid is a complex process that demands careful consideration of various factors. As the field continues to evolve, it is crucial to stay updated with the latest technological advancements and regulatory standards to attempt to maintain the safe and efficient operation of solar energy systems.

Solar installations in Nova Scotia typically serve individual residential or business properties, frequently for specialized purposes such as heating of domestic hot water. The Province of Nova Scotia has provided funding support for municipalities, First Nations, not-for-profits, and universities and community colleges to install solar up to 75 kW on their buildings and sell surplus power to the Nova Scotia grid; and rebates to homeowners for solar installations up to 10 kW and sell surplus in a similar manner. Halifax Regional Municipality also implemented the Solar City Program through which the Municipality provides financing assistance that can be accessed along with Provincial and federal government subsidies to facilitate solar development by homeowners, not-for-profits, churches, and charities.

Regulation of solar installations through land use bylaws is not uncommon. According to research papers published in MDPI, such as “Solar Energy in Urban Planning: Lessons Learned and Recommendations from Six Italian Case Studies(Photovoltaic Village in Alessandria, SINFONIA in Bolzano, Le Albere in Trento, Violino District in Brescia, Casanova District in Bolzano and Agrovoltaico in Monticelli d’Ongina)” and municipal regulations from Starland County, Alberta, and Cumberland County in Nova Scotia, suggested regulations include enforcement of height limits (e.g., solar installations must fit within height

maximums in an applicable zone), specification of mounting (e.g., installations must be on a roof parallel to the roofline), and typical setback and coverage standards for ground-mounted solar units similar to standards for accessory buildings. Solar installations can also be encouraged through site plan approval or development agreements where there are viewed as a positive contribution to the community. Few Nova Scotia municipalities, however, have addressed solar infrastructure in land use bylaws.

3.2 Wind Energy

Wind energy is created using a wind turbine, a device that channels the power of the wind to generate electricity. The wind turns the blades of the turbine, which are attached to a rotor. The rotor then spins a generator to create electricity. There are two types of wind turbines: the horizontal-axis wind turbines (HAWTs) and vertical-axis wind turbines (VAWTs), of which HAWTs are much more common

Wind turbines are now widespread in Nova Scotia, particularly through the northern mainland counties stretching from Cumberland to Antigonish where the wind regime is particularly favourable. There are no current offshore wind turbines but plans have been developed to install 20 to 25 floating wind turbines 25 kilometers off Goldboro in Guysborough County. Turbines are less common on the South Shore and in Southwest Nova Scotia. Shelburne has only one 0.05 MW turbine, while the last two turbines in the Clare community are on the campus of Université Sainte-Anne and neither are currently operational.

The installation and operation of wind turbines are subject to various regulations to make reasonable effort safety, protect the environment, and minimize potential disturbances to nearby communities. These regulations may include:

- Zoning and Permitting: Wind turbines must comply with local zoning laws, which may restrict their height, noise levels, and distance from other structures or property lines.
- Environmental Impact: Potential impacts on wildlife, particularly birds and bats, must be assessed. Measures should be taken to minimize harm, such as siting turbines away from major migration routes.
- Safety Standards: Turbines must meet specific safety standards to try to attain structural integrity and safe operation. This includes regular inspections and maintenance.

While wind energy presents a promising solution to our growing energy needs, it is crucial that we continue to develop and enforce regulations so that turbine installations are safe and responsibly implemented. Most Nova Scotia municipalities have adopted regulations to control wind turbine development. Regulations typically restrict turbine height, separation, setbacks from property lines, and distance from sensitive land uses, particularly residential uses.

Of all of the renewable energy technologies, wind energy has attracted the most attention from opposition groups. The setbacks or placement of the facilities is also often the main objection expressed by residents and the local community.

Wind energy setbacks, particularly for utility scale turbines, can generally be categorized as noise-based (according to a decibel measurement) or separation based (keeping the machines away from residential and other land uses, sensitive natural features, road, utility infrastructure, etc.). Setbacks also differ in cases for participating and non-participating landowners.

From a development perspective, proponents often prefer predictability in setback requirements and other regulations. This allows them to approach a project scoping exercise with a greater level of confidence and certainty. Table 3.0 provides a comparison of setbacks imposed by the municipalities included in the jurisdictional scan.

It is worth noting that opposition groups often propose up to 2 km setbacks from receptors as a safe distance for industrial sized turbines. However, such setbacks are arbitrary. Research has shown that these distances are based more on the fact that it would keep turbines out of most areas where people live than any scientific evidence. Health Canada completed a study (2012) that found no confirmed health effects from wind turbines.

Many locations defer setbacks to government guidelines for siting of turbines, such as Ontario, which focuses on setbacks from sensitive features (wetlands, watercourses, wildlife habitat), receptors (dwellings, daycares, hospitals, hotels, etc., and potential receptors (i.e., possible future dwellings, etc. on vacant lots), and infrastructure (roads, property lines). Furthermore, some setbacks are subjective, with minimums prescribed, plus additional distances that may be subject to further study (i.e., minimum 550 m or greater if predicted noise is above 40 dB).

Ultimately, there are multiple ways of determining setbacks and the community must determine if they will be limited to scientific evidence, be guided by a technical document, be driven by community acceptance or consensus, or find a combination of multiple options. Based on the geography of the community and where wind energy facilities or overlay zones are identified, the requirements for wind energy facilities can also vary, which can be presented to local residents as part of a planning exercise in order to obtain their input.

3.3 Green Hydrogen

Green hydrogen is produced by the electrolysis of water using renewable electricity; its production results in significantly lower greenhouse gas emissions compared to grey hydrogen, which is derived from fossil fuels without carbon capture. To generate sufficient energy for hydrogen production, facilities rely on large amounts of green energy, which can be generated from wind turbines or solar panels. A green hydrogen plant consists of multiple components, each subject to individual regulations. These regulations incorporate wind energy, solar energy, and industrial standards to govern the operation of the plant.

Key Components of a Green Hydrogen Production Facility

- Electrolyzer: This is the core component where the electrolysis process takes place. It uses electricity to split water into hydrogen and oxygen.
- Hydrogen Compressor: After the hydrogen is produced, it needs to be compressed for storage and transportation.
- Storage Facility: Hydrogen is stored in compressed gas form. The storage facility must be designed to safely contain the high-pressure hydrogen.
- Renewable Energy Source: The electricity used in the electrolysis process should come from renewable sources, such as solar or wind power, make reasonable effort that the hydrogen produced is truly green.
- Transportation Systems: Infrastructure for transporting the produced hydrogen to its point of use is also necessary.

Examples of Green Hydrogen Production Facilities

- SoHyCal Plant: Located in Fresno, California, this plant is North America's largest operational green hydrogen production facility. It uses proton exchange membrane electrolysis technology and is powered by renewable energy from a photovoltaic plant.
- Arizona Hydrogen: This facility, located in Buckeye, Arizona, is expected to produce up to 11,000 tons of liquid green hydrogen annually.
- Green Hydrogen Systems Facility: This facility in Denmark combines manufacturing, R&D, and office facilities. It is a leading provider of efficient electrolysers used in on-site production of hydrogen based on renewable energy.

Green hydrogen production facilities are a critical part of the transition towards a sustainable energy future. They require a range of supporting structures, from electrolyzers to storage facilities, all designed to work together to produce, store, and transport green hydrogen efficiently and safely.

As technology advances and the demand for green hydrogen grows, we can expect to see more of these facilities being developed worldwide, presumably in the context of regulations designed in order to attempt to maintain their safe and sustainable operation. We are not, however, aware of any Nova Scotia municipality that currently addresses green hydrogen facilities in its land use bylaw.

4 Jurisdictional Scan

4.1 Village of Belledune (Green Hydrogen Plant)

The Green Energy Hub at the Port of Belledune Zoned IND-1 (Industrial Type 1) is a specialized development district on port lands in northeastern New Brunswick. Its purpose is to welcome green energy projects and complementary, low-carbon industries.

The Port of Belledune is transitioning to become Canada's port of choice for green hydrogen and other renewable energy sources. The hub offers opportunities for various green energy initiatives, including:

- Advanced Energy Storage Systems
- Small Modular Reactors
- Solar and Wind Energy
- Biomass
- Green Hydrogen Production

The Port works closely with local communities, Indigenous rights holders, the Government of New Brunswick, and the provincial electric utility NB Power to align, develop, and market opportunities for private sector green development. As a Canadian Federal Port Authority, the Port of Belledune is uniquely positioned to serve emerging markets in Canada and around the world as a Green Energy Hub.

4.1.1 Land Use By-Law Regulations

The IND-1 Zone regulations outline the permitted uses, provincial standards, lot size yard requirements, lot coverage, outside storage, and accessory building or structure guidelines for any development in the zone.

The regulations specify a wide range of industrial, commercial, and public utility uses allowed within the IND-1 Zone. These include manufacturing, storage, distribution, waste management, power generation, and various service provisions. However, all these uses must comply with the specific conditions outlined in the regulations. All permitted uses must conform to provincial environmental performance standards related to air and water pollution, fire and explosion hazards, radiation hazards, electromagnetic radiation and interference hazards, liquid and solid wastes hazards, and water consumption.

In addition, the regulations also permit the development of one Small Wind Energy Systems (SWES) per property as an accessory structure to a main use existing on the same property in the Industrial Zone (IND Zone) and in a Rural Zone (RU Zone). The SWES must be painted a non-reflective, non-obtrusive color, be artificially lighted to the extent required by Transport Canada and NAV Canada, and not be used for displaying any advertising except for reasonable identification of the manufacturer of the installation.

The placement, erection, or alteration of any main building or structure on a lot is subject to the lot meeting the minimum size requirements specified in the regulations. No SWES shall be developed on a lot having an area less than 6,000 square metres. The height of the overall structure shall not exceed 12 metres where the lot is between 6,000 and 15,000 square metres; 15 metres where the lot is between 15,001 and 25,000 square metres; and 20 metres where the lot exceeds 25,000 square metres.

Regulations also stipulate that no main building or structure may be placed, erected, or altered so that it is within 10 metres of a street line or within 5 metres of a side or rear lot line. No SWES shall be developed within less than 150 metres of a dwelling existing at the time of the development, unless such dwelling is occupied by the owner of the SWES; two times the total height of the structure from any side or rear lot line; 30 metres from any public street; and 30 metres from any public utility lines or structures, unless otherwise approved in writing by the utility company.

Buildings and structures on a lot are not allowed to occupy more than 50% of the lot area. Any material not stored inside an enclosed building, structure, or container must be stored inside a storage yard screened from any public street by a wall and/or a solid fence. The regulations limit the height and placement of any accessory building or structure within the IND-1 Zone to 30 meters in height, except for wind turbines and telecommunication towers. Additionally, they should be positioned within 15 metres of the street line, 3 metres of an alley, and 10 metres of a side or rear lot line.

The blade of any wind turbine shall, at its lowest point, have ground clearance of no less than 10 metres. Small Wind Energy System shall not exceed 45 dBA, as measured at any point situated along the property lines. In the event the ambient noise level (exclusive of the development in question) exceeds the applicable standards set in Subsection (9), the applicable standard shall be adjusted so as to equal the ambient noise level. The ambient noise level shall be expressed in terms of the highest whole number sound pressure level in dBA, which is succeeded for more than five (5) minutes per hour. No SWES shall cause any interference with electromagnetic communications, such as radio, telephone or television signals.

The construction plans of the overall structure, including the tower, the base and the footings, shall be approved and stamped by a licensed professional engineer. Wind turbine must have been approved by a national standard association such as CSA or NRC. The installation shall conform to the Provincial Electrical Code of New Brunswick. All wiring between the wind turbine and the receptor or substation shall be underground. Wind turbine towers shall not be climbable up to 3 metres above ground level. All access doors to electrical equipment shall be lockable.

These regulations aim to attempt that any development within the IND-1 Zone, including the development of Small Wind Energy Systems, is carried out in a manner that is safe, environmentally friendly, and in harmony with the surrounding areas.

4.2 Arizona Hydrogen (Green Hydrogen Plant)

For large wind energy systems, structures and facilities associated with the system must not be used for advertising. An applicant must obtain all necessary approvals from the Alberta Utilities Commission (AUC) before applying for a development permit. The application must include project-related approval(s) from the AUC, public engagement invitations, noise generation report, detailed site plan, drawings of structures, plans for future phases of development, post-construction reclamation plans, and decommissioning plans. The Development Authority may require the applicant to enter into a development agreement, a road use agreement, and provide a means of security.

The same rules and requirements apply to commercial solar energy systems. Structures and facilities associated with the system must not be used for advertising. An applicant must obtain all necessary approvals from the AUC before applying for a development permit. The application must include project-related approval(s) from the AUC, public engagement invitations, noise generation report, detailed site plan, drawings of structures, plans for future phases of development, post-construction reclamation plans, and decommissioning plans. The Development Authority may require the applicant to enter into a development agreement, a road use agreement, and provide a means of security.

4.2.1 Land Use By-law Regulations

The Arizona Hydrogen Power Plant was constructed in the A-2 Industrial District, which is designed to accommodate intensive uses of property, open uses and storage, and industrial processes. The district permits a variety of uses, including manufacturing, wholesaling, warehousing, and extensive outside uses, among others.

The plant adheres to the district's regulations, which include compliance with Maricopa County Air Pollution Control Rules and Regulations for smoke, gas, and odor emissions, and the Arizona Health Department's Hazardous Waste Regulations for waste disposal. The average noise level at the property line does not exceed 55 dB, as measured on an "A weighted" sound level meter.

The building height of the plant falls within the district's maximum limit of 56 feet. However, with a use permit and a specific plan of development, the height can be extended up to 80 feet. For warehouses, the height can be increased up to 110 feet on recommendation from the Planning Commission and approval by the City Council.

The plant also complies with the yard requirements of the district. For side and rear yards adjacent to a residential district, there is a 30-foot setback for closed buildings and a one hundred 50-foot setback for open buildings or uses. No outdoor uses, outdoor storage, or open buildings are within 75 feet of a public street.

Screening is also in place for parking or loading and unloading areas within 150 feet of a residential district. For employee and customer parking, a 4- to 6-foot wall or landscaped berm is required. In areas used for truck parking, loading, or unloading, an 8-foot-high wall is required. Any outside storage or use

within 100 feet of a residential district or any public street is screened by a 6-foot-high solid fence or wall. Open storage is no higher than 6 feet plus one foot in height for every additional 3 feet of setback from a property line. If the storage area is within 150 feet of a public street, additional screening includes 15-gallon trees spaced no more than 25 feet apart with an adequate watering system.

4.3 County of Forty Mile, Alberta

The County of Fort Mile houses the largest wind facility in Alberta called Whitla Wind. It features 98 Vestas V136 wind turbines, each with a hub height of 105 meters and a rotor diameter of 136 meters and has the capacity of 353 MW and was completed in December 2021. Zoning regulations of the County allow Small Wind Energy Facilities (SWEFs) in several districts, including the Reservoir Vicinity District (RV), Urban Fringe District (UF), Industrial District (I), and Airport Protection District (AP). A designated Wind Energy Facility (WEF) District promotes wind power generators that supply electricity to the Provincial grid. This district overlays existing Land Use District requirements, except for Wind Energy Facilities and related activities.

4.3.1 Small Wind Energy Facility Guidelines:

A Small Wind Energy Facility must be recognized as a Permitted or Discretionary Use in the relevant Land Use District for the proposed site. The tower heights for small to medium wind turbines should be between 24 and 50 metres (80 to 164 feet) for efficient energy generation. For properties ranging from 0.1 ha (0.25 acre) to 0.2 ha (0.5 acre), the wind turbine tower height is capped at 80 feet (25 metres). However, for properties of 0.2 ha (0.5 acre) or larger, wind turbine tower height is not restricted.

The base of the turbine should be at least 1.1 times the height of the wind turbine tower away from the property line. The Development Authority can relax setback requirements from neighbouring properties if the adjacent property owner consents to grant an easement. The sound pressure level from small wind energy facilities shouldn’t exceed 6 decibels (dBA) above the background sound. These facilities must also adhere to applicable air traffic safety regulations.

Development Applications for small wind energy facilities should include a detailed line drawing of the electrical components to ensure compliance with all relevant Provincial electrical safety requirements. No grid-tied Small Wind Energy System can be installed until the County receives evidence of approval from the Wire Service Provider (WSP) for Mini Micro Generators.

4.3.2 Wind Energy Facility (WEF) District Guidelines:

Permitted uses include accessory buildings and uses. Class 1 Discretionary Uses encompass Wind Energy Facilities, Transformers and Transmission Towers, and Sub-station facilities. Class II Discretionary Uses include other uses consistent with the Definition or General Purpose of the Land Use District as approved by the Municipal Planning Commission.

The minimum lot area is the existing title or an undivided quarter section. The minimum setbacks related to undeveloped or developed municipal roadways should be the total height plus ten (10) per cent. The

minimum vertical blade clearance from grade should be 7.5 metres (24.6 feet) for a employing a Horizontal Axis Rotor unless otherwise required by the Development Authority.

One Application for a Development Permit should be submitted for each WEF or separate construction phase of a WEF. All Development Applications for a WEF should be accompanied by a Site Plan of the Application parcel showing and labeling the exact location of each existing tower and the proposed location of each proposed tower.

To ensure public safety, the Development Authority may require that a security fence with a lockable gate surrounds a WEF tower not less than 1.8 metres (5.9 feet) in height. Unless otherwise required by the Development Authority, a WEF should be finished in a non-reflective matte and in a colour which minimizes the obtrusive impact of a WEF to the satisfaction of the Development Authority.

If a developer of an existing mature wind facility proposes an equipment change varying significantly from the original approval, the developer should apply for a new Development Permit. If a WEF discontinues producing power for two years or more, the WEF operator should provide a status report to the Development Authority.

The Development Authority may apply any standards that are provided for the underlying district. Construction should commence within three years of the issuance of the permit. The developer is responsible for providing the County with copies of the appropriate reports and/or approvals, if required, from the following: Transport Canada, Navigation Canada, Alberta Culture and Community Spirit, Alberta Environment, Alberta Transportation and Infrastructure, Alberta Sustainable Resource Development (Fish and Wildlife Division), Alberta Tourism, Parks and Recreation, Alberta Electric System Operator, Alberta Utilities Commission, and any other statutory requirement.

4.4 Starland County, Alberta

The Hand Hills Wind Facility is located on 12,000 acres of privately owned land near Delia in Starland County, approximately 28 km northeast of Drumheller, Alberta. It generates enough clean, renewable energy for approximately 68,000 homes annually. The project consists of 29 turbines, a substation, and associated infrastructure, representing an investment of over $250 million in Alberta. Additionally, there’s a proposed Hand Hills Hybrid Project nearby, which combines wind and solar power facilities.

In the Hamlet Industrial (HI) zone, both large and small wind energy systems are permitted. For small wind energy systems, the Development Authority circulates a proposal notification to adjacent parcels before deciding on an application. The maximum tower height is set at 25.0 m for parcels between 0.2 ha and 0.4 ha, while there is no maximum height for parcels larger than 0.4 ha. The tower base must be at least as far from the property line and any dwelling unit or public building on an adjacent parcel as the total system height. The Development Authority may relax setback requirements with an easement from adjacent parcel owner(s) or require a greater setback due to shadow flicker. Noise from the system must not increase ambient background noise. If electricity production is discontinued for two years or more, the system must be removed, and the site restored to a natural state.

4.5 Pictou County, Nova Scotia

4.5.1 Policy Overview

The policies outlined in the Municipal Planning Strategy of the County of Pictou aim to regulate and facilitate the development and operation of wind turbines, while balancing the rights of developers and homeowners. They include:

Policy WE-1: Turbine Regulation
Small and Mini Scale Turbines are regulated per Land Use Bylaw (LUB), requiring a development permit. Large Scale Turbines are considered by Development Agreement (DA) and are subject to section 26.4 of the LUB.

Policy WE-2: Adjacent Leases
This policy addresses situations where wind turbine development is proposed on a lot immediately adjacent to a property subject to a long-term lease for that use. In such cases, the Setback requirement from a property line does not apply.

Policy WE-3: Expansion Post Residential Development
If a residence is constructed within the Setback requirements of an existing utility-scale wind turbine, the wind turbine development may expand. However, the expansion must not be located closer to the residence than the initial wind turbine development.

Policy WE-4: Non-Conforming
Existing Wind Turbines that do not meet setback requirements as of the effective date of this Strategy are permitted to continue as non-conforming structures. However, expansions of these structures are not permitted.

Policy WE-5: Wind Turbine Decommissioning
The decommissioning of Large Scale Wind Turbines is regulated by the LUB.

Implementation Policies
The Strategy also outlines how policy and by-law changes are implemented, including procedures and public participation. Unless specifically noted, this section applies to the Inter-Municipal Planning Strategy (IPS) and all Secondary Planning Strategies (SPSs).

These policies provide a comprehensive framework for the regulation of wind turbines, taking into account their scale, location, and potential impact on surrounding properties. They strike a balance between promoting renewable energy sources and protecting the interests of residents and property owners.

4.5.2 Land Use By-Law Regulations

Purpose: The purpose of Section 26 of the Land Use By-law is designed to regulate the development of wind turbines in accordance with the Nova Scotia Municipal Government Act (Chapter 18, Acts of 1998).

Interpretation and Zones The entire Municipality of the County of Pictou is placed in the General Development Zone (GD).

Standards of Measurement: The by-law uses the Metric System of Measurement as the required standard. Imperial measurements are approximate and for convenience only.

Variance from Minimum Requirements:
The Development Officer may not grant a variance for the size of yards (setback requirements) if the variance violates the intent of the Land-Use By-law, the difficulty experienced is general to properties in the area, or the difficulty experienced results from an intentional disregard for the requirements of this Land-Use By-law.

Utility Scale Wind Turbines

- Minimum setback from residences, except those on the same lot as the wind turbine, is 1000 metres.
- There is no setback requirement from residences located on the same lot.
- Minimum setback from all property lines is two times the height of the turbine.
- Minimum setback from the boundary of a public road is 300 metres.
- Permitted in specific zones (RR and WS) subject to additional policies.
- Detailed site plans required.
- Setback requirements are 2.5 times the turbine height.
- Minimum blade clearance 7.6 metre (25 foot).
- Signage cannot exceed 5% of the total surface area od the Wind Turbine.
- Underground utility lines and Operator status report for decommissioning and site restoration should account for a scenario where power production discontinues for a minimum of one year.

Small Wind Turbines

- Minimum setback from residences, except those on the same lot as the wind turbine, is 1000 metres.
- There is no setback requirement from the residence on the same lot.
- Minimum setback from all property lines is two times the height of the turbine.
- Maximum height of the turbine is 60 metres.
- Permitted in specific zones.
- Maximum power output: 100 kW.
- Limited to one SWT per property.
- Setback from adjoining property lines: 1.5 times turbine height.
- Additional requirements for fencing and climbing apparatus.

Micro Wind Turbines

- Minimum setback from residences, except those on the same lot as the wind turbine, is 60 metres.
- There is no setback requirement from the residence on the same lot.
- Minimum setback from all property lines is two times the height of the turbine.
- Permitted in specific zones.
- Maximum power output: 10 kW.
- Setback from adjoining property lines: 1.25 times turbine height.
- Maximum turbine height: 22.9 meters.

Expansion of Wind Turbine Development If a residence is constructed within the setback distance of utility scale wind turbine development erected after the effective date of this Strategy, the wind turbine

development may expand. The setback requirement for any expansion shall be the distance from the wind turbine development established after the effective date of this By-law to any residence constructed subsequent to the wind turbine development.

Setback on Land Leased for Wind Turbine Development: The setback requirement from a property line is waived where wind turbine development occurs on land where the adjacent property is subject to a lease for that purpose for a term of 19 years or greater. The setback requirement shall apply to any property which is not leased for wind turbine development.

4.6 Cumberland County, Nova Scotia

4.6.1 Policy Overview

Cumberland has played a crucial role in the development of renewable energy generation in Nova Scotia. The County has moved progressively towards a future where a significant portion of the province's electricity needs are supplied by renewable energy sources. The Renewable Energy Regulations under the Electricity Act require 80% of Nova Scotia's electricity to come from renewable sources by 2030.

Wind Energy
In 2011, the Municipality of Cumberland released its Wind Energy Development Plan. The plan identified areas suitable for wind turbines and established requirements to minimize the impact of wind turbines on surrounding communities and natural features. In 2022, the Municipality revisited its approach to regulating wind turbines to provide for more public involvement, explicit expectations in terms of setbacks and separation distances, and expectations for decommissioning at end-of-life.

The Municipality has defined four categories of wind turbines:

- Domestic-scale wind turbines
- Small-scale wind turbines
- Medium-scale wind turbines
- Large-scale wind turbines

Each category has specific regulations and requirements. The Municipality also established a Wind Turbine Restricted Overlay that identifies inappropriate areas for medium- and large-scale wind turbines.

Policy 4-52: Domestic-scale Wind Turbines Domestic-scale wind turbines are permitted as an accessory use in all zones. The Land Use By-law establishes requirements for their design and siting to minimize safety concerns and conflicts with neighboring uses.

Policy 4-53: Wind Turbine Restricted Overlay the Land Use By-law establishes a Wind Turbine Restricted Overlay that identifies inappropriate areas for medium- and large-scale wind turbines. These areas include, but are not limited to, drinking water supplies, bird conservation areas, important cultural areas, historic sites, and ecologically-significant lands.

Policy 4-54: Tourism Plan Considerations Council may consider amending the Wind Turbine Restricted Overlay to add locations where a local tourism plan endorsed by Council concludes that medium- and large-scale wind turbines are not compatible with the goals of the tourism plan.

Policy 4-55A: Small-scale Wind Turbines Council permits small-scale wind turbines in all zones through the Land Use By-law. It establishes requirements for their design and siting to minimize safety concerns and conflicts with neighboring uses.

Policy 4-56A: Development Agreement for Medium- and Large-scale Wind Turbines Council considers entering into a development agreement to permit proposals for medium- and large-scale wind turbines in specific zones subject to several requirements.

Policy 4-56B: Development Agreement Provisions Development agreements for medium- and large-scale wind turbines include provisions related to the ongoing operation and maintenance of the development and a requirement for the posting of a decommissioning bond.

Policy 4-57: Waiver of Separation Distances Council allows for the waiver of separation distances between wind turbines and existing dwellings and permits new dwellings to be built within the separation distance from existing wind turbines through the Land Use By-law.

Policy 4-58: Wind Turbine Permitting, Maintenance, and Decommissioning Council establishes requirements for the information to be provided and process to be followed for permitting, maintenance, and decommissioning of wind turbines through the Land Use By-law.

Solar Energy

Cumberland County receives a significant amount of sunlight annually, making it a viable location for solar energy generation. Solar collectors can be installed at various scales, from small-scale panels on homes and businesses to commercial-scale solar farms. The Municipality permits solar collectors as an accessory use in all zones and as a main use in specific zones.

Policy 4-59: Solar Collectors as Accessory Use Council permits solar collectors as an accessory use in all zones through the Land Use By-law.

Policy 4-60: Solar Collectors as Main Use Council permits solar collectors as a main use in specific zones through the Land Use By-law.

Policy 4-61: Siting and Design of Solar Collectors Council establishes requirements for the siting and design of solar collectors, including requirements for reversible installations on lands in the Agriculture Zone through the Land Use By-law.

Tidal Energy

The Bay of Fundy, with the highest tides in the world, presents a unique opportunity for tidal energy generation. The Fundy Ocean Research Center for Energy (FORCE) has been established to promote Nova Scotia as a hub of tidal research and development.

Policy 4-62: Tidal Energy Generation Council enables and supports facilities and operations associated with tidal energy generation through the permitted uses and placement of zones in the Land Use By-law.

Geothermal Energy
Springhill's long history of mining has created a unique opportunity for geothermal energy development. The abandoned mine workings have filled with water, which is naturally heated by the earth. This warm water provides a highly efficient space heating source at a much lower cost than many other heat sources.

Cumberland has implemented a comprehensive set of policies to promote the development and use of renewable energy. These policies cover a range of renewable energy sources, including wind, solar, tidal, and geothermal energy. The Municipality continues to review and update these policies to ensure they best reflect the needs of the local community and the renewable energy industry. The County is among the leaders in wind power development in the province.

4.6.2 Land Use By-law Regulations:

Purpose: The purpose of this by-law is to regulate the installation and operation of various types of renewable energy systems, including small-scale wind turbines, domestic-scale wind turbines, meteorological (test) towers, and solar collector systems, this by-law does not apply to utility-scale wind turbines. The by-law sets out specific requirements for each type of system, such as permitted zones, minimum separation distances, design and operation standards, and decommissioning requirements. This is done to ensure the safety, health, and well-being of the community, while also promoting the use of renewable energy. It also provides a clear process for obtaining development permits, ensuring that all installations are properly planned and executed. The by-law thus balances the need for renewable energy with the interests of the community.

Small-scale Wind Turbines:
- These are permitted in all zones with no lot frontage requirement.
- They should be at least 75 metres or 1.5 times the height of the turbine (whichever is larger) away from habitable buildings external to the wind energy project.
- The minimum separation distance from a habitable building external to the wind energy project may be reduced to as low as 1.25 times the height of the turbine with the written consent of all owners of that habitable building.
- There is no limit on the number of small-scale wind turbines in any one area, provided all turbines meet setback and separation distance requirements.
- They must also meet specific design, operation, and decommissioning requirements.
- Applications for development permits for small-scale wind turbines must be accompanied by specific information and a site plan prepared by a qualified individual.

Domestic-scale Wind Turbines:
- These are permitted in all zones and must meet specific requirements including minimum separation distances, minimum lot area, and restrictions on signs and advertisements.
- The minimum separation distance from property lines and railway rights-of-way shall be 1.1 times the height of the turbine.
- The minimum lot area for the subject property shall be 4,000 m^2. There shall be no signs, advertisements, or objects attached to or added to the turbine.
- The minimum separation distance may be reduced or waived with written consent.

Meteorological (Test) Towers:

- These are permitted in all zones subject to specific requirements.
- They require a development permit and are not required to meet zone standards.
- The property owner or developer must remove the meteorological tower within 180 days from the date testing activity ceases.
- The Municipality notifies the public through a newspaper circulating in the municipality upon issuance of a development permit of a meteorological tower.

Solar Collector Systems:

- These are permitted as an accessory use in all zones.
- They are also permitted as a main use in the Rural Resource (Rsrc) Zone, Agriculture (AG) Zone, Rural Industrial (IRur) Zone, Wellfield 3B (W3B) Zone, and Commercial Recreation (CRec) Zone.
- Solar collector systems developed as a main use shall meet the zone requirements for main buildings.
- Solar collector systems may be mounted as free-standing structures or on buildings.
- Solar collector systems mounted on buildings may exceed the maximum building height in the zone by up to 2 metres.
- Solar collector systems installed as free-standing structures in the Agriculture (AG) Zone shall be mounted on helical piles or on ballasted foundations resting on the surface of the ground.

4.7 East Kings, Prince Edward Island

4.7.1 Land Use By-Law Regulations

Wind Turbine Regulations

Wind turbine development is subject to several regulations, which vary based on the turbine's nameplate capacity. All wind turbines must be set back a minimum of 2 kilometres from the marine shoreline's ordinary high-water mark. Development is not permitted on lands covered by the Environmental Overlay Zone. A development permit may be issued for wind turbine developments on a lot that does not front on a public or private road, provided proof of access can be demonstrated. The wind turbine must be finished in a non-reflective matte and in an unobtrusive colour. The only artificial lighting permitted is that required by Federal or Provincial regulation. No signage is permitted on the wind turbine except that of the manufacturer's identification. The owner(s) of the land on which the wind turbines are located must notify the Municipality of Eastern Kings within 1 year of wind turbine inactivity and must remove the wind turbines and associated infrastructure within 2 years of wind turbine inactivity.

Regulations for Wind Turbines with a Nameplate Capacity Equal to or Less Than 100 Kilowatts

The maximum height of the turbine shall be 20 metres, and the blade clearance shall be a minimum of 4.5 metres (14.76 feet) from grade. The wind turbine shall be set back a minimum of 3 times the total height of the wind turbine from rear, front, and side lot lines. If adjacent properties are part of the same proposal, the setback requirement from a shared property line shall be zero.

Regulations for Wind Turbines with a Nameplate Capacity Greater Than 100 Kilowatts

The maximum height of the turbine shall be 150 metres, and the blade clearance shall be a minimum of 7.6 metres (25 feet) from grade. The minimum separation distance between wind turbines shall be equal to or exceed the height of the tallest turbine. The wind turbine(s) shall be set back a minimum of 1 times the turbine height from rear, front, and side lot lines. If adjacent properties are part of the same proposal, the setback requirement from a shared property line shall be zero. The wind turbine(s) shall be separated from dwellings by a minimum of 1 kilometre, except this separation distance does not apply to a dwelling on the same lot on which the wind turbine is installed or a dwelling on any other lot that is part of the same proposal.

Solar Collectors

Solar collector systems, including ground-mounted and roof-mounted systems, are permitted as an accessory use in all zones.

4.8 Sweden: Policies for Wind Power Development

A study conducted by KTH Royal Institute of Technology in Sweden on Wind power policy and planning - a comparative study of Sweden and the Netherlands by Christoffer Brokking discusses and explains how Sweden has set ambitious sustainability goals in line with the 17 Sustainable Development Goals (SDGs) and EU goals. The country aims to decrease greenhouse gas emissions by 40% by 2020 and become fully reliant on renewable energy sources by 2040.

Wind Power in Sweden
Wind power is becoming an increasingly important energy source for Sweden, making up around 11% of the total power generated in 2017. Recent innovations have increased the efficiency of wind farms in colder climates, leading to an increase in larger wind parks in northern Sweden.

- **Planning for Wind Power**
  The Swedish Energy Agency has identified eight key points to tackle when planning for wind power:

- **Good Planning**
  Good planning of wind power is needed to reach a 100% renewable energy system.

- **Municipal Comprehensive Plan**
  Integrating wind power into the municipal comprehensive plan can help municipalities better use the land and water available.

- **National Interests**
  Clear descriptions detailing how the municipality has prioritised and weighed different interests with regards to “areas of significant national interest” can simplify the planning and permissions process in wind power development.

- **Public Interests**
  The municipality must specify which and how public interests are met in the comprehensive plan.

- **Planning Area Criteria**
  Clear criteria for how areas dedicated to wind power development were chosen can streamline the process for both developers and other authorities.

- **Height Limitations**
  Due to the rapid technological advancement in the area of wind power, municipalities should avoid blanket height limitations.

- **Agency Approval**
  Avoiding unnecessary involvement of other agencies can streamline the process and shorten planning times.

- **Wind Conditions**
  Choosing areas with good existing wind conditions ensures resource-effective planning of wind power development.

4.8.1 Green Certificate Scheme

The foundation of wind power development in Sweden was laid in 2003, with the introduction of a technology-neutral green certificate scheme. The goal of the scheme was to improve the long-term certainty for investors in order to secure more investments into renewable energy sources. Certificates are awarded by the state to renewable energy producers for every MWh produced, with certificates being issued over a 15-year time period. These certificates may then be sold in an open market, where the price is generally ranges from 20-25 Euros.

4.8.2 Regulatory Framework

Location
About 2% of Sweden's land area is designated as being of national interest for wind power due to favorable wind conditions. Wind farms can also be built in other areas, but the applicant would have to explain why that location is preferred.

Permitting Process for Mid-sized Wind Farms
If the wind farm is mid-sized, or if a single wind turbine is higher than 50 metres, the local municipality must be notified of the establishment and the operator must apply for a construction permit. The construction of the wind farm cannot begin earlier than six weeks after the notification has been submitted, unless the municipality decides otherwise.

Permitting Process for Large Wind Farms
The permitting process for large wind farms can be divided into three stages: Consultation process, Preparation of the Environmental Impact Assessment (EIA), and Application process. The whole process, from starting the consultation process until obtaining the permit from the County Administrative Board

normally takes about two years but may be extended for another six to 12 months at each stage if the permit is appealed.

- Two or more wind turbines stand together and at least one of the turbines is more than 150 metres high.
- Seven or more wind turbines stand together and at least one wind turbine is higher than 120 metres.

Other Permits
Depending on the specific circumstances, other permits may also be required, which will be applied for after receiving the permit from the County Administrative Board. These include permits for the construction and use of electrical power lines, permits under the Cultural Heritage Act, and permits/exemptions for infringements of protected areas under the Environmental Code.

Securing Land Use and Other Property Rights
Land rights can normally be achieved either through freehold (ownership) or leasehold. A leasehold entitles the owner of the right to occupy for an agreed period of time a piece of land owned by another party, generally against payment of compensation in the form of rent. A leasehold usually also includes the right to construct and/or own buildings on the land. If landowners cannot agree on the right of passage and drawing of power lines, such rights can be granted through an administrative procedure. There is a special permit procedure for high-voltage transmission lines (100 kV or above), which require a separate construction permit.

4.9 Overview of Other European Countries

This section provides a comprehensive review of the renewable energy regulations, specifically focusing on the minimum distance between wind turbines and habitations, also known as setbacks, across various European countries. The data has been compiled from multiple sources including the National Wind Watch Organization.

- Belgium:
  - Draft legislation (2009) proposed a setback of 350m, but it was never officially voted on.
  - In practice, developers tend to maintain a minimum distance of 500m from habitations, with some turbines located as close as 150m.
- Czech Republic:
  - No specific regulations on setbacks exist.
  - In practice, setback distances range between 400m and 800m.
- France:
  - Setbacks are determined case-by-case, primarily based on noise legislation.
  - The French Academy of Medicine recommends a setback of 1500m, but 500m is commonly observed.
- Germany:
  According to the National Wind Watch study setback distances vary based on noise levels:
  - Quiet regions (35dB): 1000m to 1500m
  - Middle regions (40dB): 600m to 1000m
  - Standard regions (45dB): 300m to 600m

- Italy:
  Setbacks are region-specific:
  - Calabria and Molise: Five times the turbine height
  - Basilicata: 2km from urbanized areas
  - Campania and Molise: 10 and 20 times the turbine height from urbanized areas, respectively.
- Switzerland:
  - Suisse Eole documentation mentions that In Switzerland the separation between wind turbines and residential areas is primarily determined by the Noise Protection Ordinance and other stringent legal regulations. Given that noise dispersion and shadowing vary from location to location, it's not feasible to establish uniform minimum distances.
- England:
  - As per the Town and Country Planning Order any part of the stand alone wind turbine (including blades) should not be located in a position which is less than a distance equivalent to the overall height (including blades) of the stand alone wind turbine plus 10 % of its height when measured from any point along the boundary of the curtilage.
- Poland:
  - The minimum setback to residential uses is 10 x total height according to a report by Wind Concerns Ontario.
- Denmark:
  - The University of Copenhagen (2015) specifies a minimum setback to neighboring dwellings of four times the total height of the turbine.

The setback distances vary significantly across different European countries, influenced by factors such as noise levels, environmental considerations, and regional policies. This comparative analysis provides valuable insights into the diverse approaches towards renewable energy regulations across Europe.

5 Wind Energy Setbacks

Table 3.0 Comparison of Municipal Approaches to Wind Energy Setbacks

Location	Utility Scale Wind Turbines Setback (m)	Small Wind Turbines Setback (m)	Micro Wind Turbines Setback (m)	Height Restrictions (m)	Noise Limits (dB)
Pictou County, Nova Scotia	1000	1000	60	None	None
Cumberland County, Nova Scotia	1.1 times the height of the turbine.	1.1 times the height of the turbine.	75	None	None
East Kings, Prince Edward Island	1000	1000	60	None	None
Sweden	None	None	None	Mid sized - 50m ; Large Sized 2 or more - 150m; Large Sized 7 or more - 120m;	None
Belgium	developers tend to maintain a minimum distance of 500m from habitations, with some turbines located as close as 150m			None	None
Czech Republic	setback distances range between 400m and 800m			None	None
France	a setback of 1500m, but in practice, 500m seems to be the minimum observed.			None	35
Germany	1000	600	300	None	For quiet regions (35dB); standard regions (45dB),
Italy	Setbacks are determined by each region. For instance, in Calabria and Molise, the setback is five times the height of turbines. In Basilicata, it is 2km from urbanized areas, while in			None	None

	Campania and Molise, it is 10 and 20 times the turbine height from urbanized areas, respectively.				
Switzerland	300m from the tip of turbine blades of a 70m turbine.			70	None
England	None	5	None	None	None
Germany	1500			None	None
Poland	700			None	None
Denmark	4X Height	4X Height	4X Height	None	None

6 Battery Storage for Green Infrastructure

Battery storage systems for energy have the potential to facilitate and support electric vehicle (EV) deployment and provide access to electricity for all. This technology can contribute significantly to supporting the clean energy transition in a cost-effective way and enhancing energy security by storing energy during low-demand periods and releasing it during high-demand periods, they optimize energy use and reduce costs. Deliberate planning and policy interventions are required to so that a smooth transition occurs in an equitable, sustainable, and timely manner. As battery storage is an emerging technology, companies across Canada are starting to explore and develop properties for investment opportunities.

Currently, municipalities do not appear to be regulating on-site battery storage in their land use planning documents. Without clearly listing battery storage as a permitted use in specific zones(s), municipalities are left to interpret their planning regulations and determine whether the proposed use can appropriately fit in an existing zone under an existing definition. Furthermore, public opposition can also emerge, which can cloud the decision-making process. For example, in December 2023, councillors from rural areas within the City of Ottawa refused support for companies bidding to construct a battery energy storage facility, citing they needed additional assurances that the projects wouldn’t have a negative impact on residents (CBC, 2023).

Municipal planning policies could consider the infrastructure requirements for the capacity of the electricity grid, including batter storage systems. This can include simple changes to the Municipal Plans and Land Use By-laws or going insofar as identifying future locations for energy storage facilities. Ultimately, this infrastructure will require space, so planning authorities should be mindful of this growing technology as they plan for the future of their communities. By doing so, municipalities can help facilitate the integration of battery storage into the local energy infrastructure, further supporting the clean energy transition.

7 Recommendations

Based on the examples and information provided, the following suggestions on the various forms of renewable energy can be made for the Municipality of the District of Shelburne and the Municipality of the District of Clare:

Wind Energy

- Policy language and zoning provisions for wind energy should be clear. To make an effort towards certainty and transparency for the development community and the public, the Municipal Planning Strategy Policy may provide direction and the Zoning By-law should specifically list utility wind energy facilities in specific zones or apply overlay zones, instead of categorising they as generic Industrial Uses. Rural and industrial zones should be the main areas pursued, unless a wind energy overlay zone is implemented.

- Setback from non-participating dwellings and receptors (residences, hotels/motels, nursing/retirement homes, public or privately owned campsites or campgrounds that provide overnight accommodations, hospitals, etc.): A range of 500 to 1,000 metres is common in municipalities. This range has been adopted in many Nova Scotia municipalities, including Pictou County, to minimize noise and visual impacts on residents. For comparison, the Ontario siting protocols states a 550 metres setback from the turbine base, below 40dBA noise level, for non-participating receptors.

  Several municipalities have adopted a 1,000 metres separation distance for large-scale turbines. Many are shorter, or proportional to turbine dimensions or sound thresholds. By contrast, typical setbacks for small-scale turbines are often 1.5 to 2 times the turbine height (for a 30 metres turbine, 45-60 m). Some by-laws contain no specifications as to the number of turbines installed and make no distinction between large and small turbines.

- Setback from Property Lines: All wind energy facilities with a nameplate capacity of 50 kW or greater (Classes 3, 4, and 5 in O. Reg. 359/09) must be located a minimum setback distance from neighbouring property boundaries. This distance is equivalent to the height of the turbine, which is considered as the distance from the ground to the top of the turbine hub without including the blades. This distance should not apply to a landowner who is participating in the project or a person who has entered into an agreement with the proponent that permits the location of a wind turbine closer than the turbine height. If a turbine were to fall or fail, property line setbacks make it unlikely that the machine will cross property boundaries.

- Public Roads and Railways: At a minimum, the setback should be turbine blade length, plus 10 metres in one approach that is used in Ontario. Some communities simply prescribe a fixed distance, such as Pictou County at 300 metres.

- Setback from Environmental Features: The setback can vary by feature and its importance, vulnerability, etc. Many communities require turbines to avoid such features. A Minimum of 120 metres could be prescribed unless an Environmental Assessment suggests otherwise. However, some communities suggest much larger setbacks, for example as much as 2 kilometres from a marine shoreline's ordinary high-water mark.

- Noise: A post construction noise study is often required to be completed by the developer. If setbacks are based on a prescribed decibel level, additional costs will be incurred by the developer (or municipality) as part of the project approval and planning stage.

Solar Energy

- Permitted Zones: Solar collector systems, including ground-mounted and roof-mounted systems, can be permitted as an accessory use in all zones. Industrial scale technologies should be permitted in industrial and/or rural zones.

- Non-Participating Dwellings and Receptors: The distance between each solar photovoltaic collector panel must be a minimum 15 metres from the facility property boundary (Ontario. Reg. 350/12, paragraph 7 of subsection 3 (2)). In Nova Scotia, there are no specific provincial regulations that mandate a uniform distance for all installations. However, local municipalities may have their own zoning and setback requirements

- Property Lines: The minimum setback can be determined by the height of the solar panels and their supporting structures, ranging from the height of the structure up to 1.5 times that height. This requirement does not apply to landowners involved in the project or those who have agreements allowing closer placement.

- Public Roads: the minimum setback of the solar infrastructure from the road's centre line should be the height of the solar panel structure plus 10 meters. Some communities may prescribe a fixed distance, such as 100 meters, to ensure safety and accessibility.

- Environmental Features: Setbacks can vary by feature importance and vulnerability. A minimum of 50 meters is recommended unless an Environmental Assessment suggests otherwise. Larger setbacks, such as 200 meters from wetlands or watercourses, may be required to protect sensitive natural features, as well as the solar infrastructure.

- Height Restrictions: The maximum height of solar panel structures should be restricted to 10 meters to reduce visual impact and try to achieve structural stability. Exceptions can be made for specific designs or technologies that require greater height, pending additional review and approval. Solar collector systems mounted on buildings may exceed the maximum building height in the zone by up to 2 meters.

- Noise: A post-installation glare study must be required, if setbacks are based on a prescribed glare level.

Hydrogen Facilities

- As an emerging technology, these facilities may end up being developed in green fields, or where some required infrastructure already exists, such as electricity needs and transport requirements. With this in mind, the Municipal Planning Strategy should include clear policy language and direction on rezoning areas for future development.

- Hydrogen facilities should be explicitly listed as a permitted use in industrial or rural areas.

- Giving the shipping requirements associated with this industry, ideal siting locations should be identified or considered near ports or water access, major transportation corridors or near rail infrastructure.

Battery Storage

- To be proactive, the municipalities can list a Battery Storage Facility as a listed permitted use in their industrial and rural zones. The use should also be defined.

- Planning efforts should be mindful of Battery Storage Facilities, which is expected to continue to grow. This could include deliberately setting aside municipal property, acquiring private property, or managing new lands through the subdivision process to secure property for EV charging stations.

Appendix A Resources

- 2011 No. 2056 TOWN AND COUNTRY PLANNING, ENGLAND The Town and Country Planning (General Permitted Development) (Amendment) (England) Order 2011
  available at: https://www.legislation.gov.uk/uksi/2011/2056/made
- Article on Renewable energy storage projects snubbed by rural councillors
  Available at: https://www.cbc.ca/news/canada/ottawa/ottawa-battery-renewable-energy-storage-plan-construction-1.7043283
- Available at: file:///C:/Users/mesayed/Downloads/Cumberland%20LUB%20With%20Schedules%20-%202022-Final.pdf
  Available at: https://munpict.ca/assets/Uploads/Wind-Energy-MPS-Amendment2.pdf
- Battery and Secure Energy Transitions Report by International Energy Agency
  Available at: https://iea.blob.core.windows.net/assets/cb39c1bf-d2b3-446d-8c35-aae6b1f3a4a0/BatteriesandSecureEnergyTransitions.pdf
- Battery Storage in the United States: An Update on Market Trends August 2021
  Available at:
  https://www.eia.gov/analysis/studies/electricity/batterystorage/archive/2021/pdf/battery_storage_2021.pdf
- Brokking, Christoffer. "Wind power policy and planning-a comparative study of Sweden and the Netherlands." (2019).
  Available at: https://www.diva-portal.org/smash/get/diva2:1333355/FULLTEXT01.pdf

- Bylaw 1196 of Starland County
  Available at: https://www.starlandcounty.com/sections/council-and-governance/bylaws/

- COUNTY OF FORTY MILE NO. 8 LAND USE BY-LAW
  Available at: https://irp-cdn.multiscreensite.com/d4b5a8f2/files/uploaded/FINAL%20Land%20Use%20By-Law.%20102009%20Rev%20Jan2016.pdf
- Denmark: University of Copenhagen, 2015, Mapping of the legal framework for siting of wind turbines – Denmark (ku.dk)
  Available at: https://ifro.ku.dk/english/staff/?pure=files%2F143884872%2FIFRO_report_239.pdf
- East Kings, PEI development regulations
  Available at: https://www.easternkingspei.ca/wp-content/uploads/2024/04/RMEK-Development-Bylaw-Effective-2024.01.29.pdf
- East Riding Local Plan (2012 – 2019) Strategy Document Adopted 2016
  Available at: https://downloads.eastriding.org.uk/corporate/pages/east-riding-local-plan/Strategy%20Document%20-%20Adopted%20April%202016%20lo.pdf
- Energy in Urban Planning: Lesson Learned and Recommendations from Six Italian Case Studies. Appl. Sci. 2022, 12, 2950. https://doi.org/10.3390/app12062950
  Available at: https://www.mdpi.com/2076-3417/12/6/2950
- England:The Town and Country Planning Order, 2011,
  Available at: https://www.legislation.gov.uk/uksi/2011/2056/made

- Germany:Principles for Planning and Approval of Wind Turbines, 2005
  Available at:
  https://recht.nrw.de/lmi/owa/br_bes_text?anw_nr=1&gld_nr=2&ugl_nr=2310&bes_id=8325&menu=0&sg=0&aufgehoben=J&keyword=Windkraftanlage#det0
- Germany:Principles for Planning and Approval of Wind Turbines, 2005,
  https://recht.nrw.de/lmi/owa/br_bes_text?anw_nr=1&gld_nr=2&ugl_nr=2310&bes_id=8325&menu=0&sg=0&aufgehoben=J&keyword=Windkraftanlage#det0
- https://www.cbc.ca/news/canada/nova-scotia/offshore-wind-farm-unveiled-halifax-1.6945106

- International Review of Policies and Recommendations for Wind Turbine Setbacks from Residences: Setbacks, Noise, Shadow Flicker, and Other Concerns Minnesota Department of Commerce: Energy Facility Permitting
  Available at: https://puc.sd.gov/commission/dockets/electric/2016/el16-022/publicinputmeeting/waynebietz.pdf
- International Wind Energy policies
  Available at : https://mn.gov/eera/web/project-file?legacyPath=/opt/documents/International_Review_of_Wind_Policies_and_Recommendations.pdf
  Land Use By-law Available at: https://townofpictou.ca/236-land-use-by-law/file
- Municipality of the County of Cumberland
  Municipal Planning Strategy; Available at:
  https://drive.google.com/file/d/1vWZ3ApdmCmBXJUqpVveMvPhtgAFgr-q0/view
  Land Use Adopted April 4, 2018; With Amendments To By-law June 22, 2022
- Municipality of the County of Pictou
  Municipal Planning Strategy - Wind Energy Development
- National Wind Watch, 2009, European Setbacks (minimum distance between wind turbines and habitations) | Wind Energy Impacts and Issues (wind-watch.org)
  Available at: https://www.wind-watch.org/documents/european-setbacks-minimum-distance-between-wind-turbines-and-habitations/#:~:text=SWEDEN%20The%20only%20limit%20is%20the%20noise%20level,I%20am%20told%20there%20are%20regulations%20for%20shadows.
- Onshore wind power development in Sweden and Finland
  Available at: https://content.next.westlaw.com/practical-law/document/I8417d5c51cb111e38578f7ccc38dcbee/Onshore-wind-power-development-in-Sweden-and-Finland?viewType=FullText&transitionType=Default&contextData=(sc.Default)#co_anchor_a427982

- Phoenix, Arizona ordinance Available at:
  https://phoenix.municipal.codes/ZO/628
- Research Source
  Available at: https://education.nationalgeographic.org/resource/solar-energy/
- Sussie Eole Research Available at:
  https://suisse-eole.ch/fr/fakten/les-reglementations-en-matiere-de-protection-contre-le-bruit-definissent-la-distance-a-respecter-par-rapport-aux-habitations/
- Wind Energy Fact Sheets for Nova Scotian Municipalities
  Available at: https://www.nsfm.ca/documents/members-only-content/sustainability/1203-wind-energy-fact-sheets-for-nova-scotia-municipalities/file

Design with community in mind