DIRECTION GÉNÉRALE DE L'ÉVALUATION ENVIRONNEMENTALE ET STRATÉGIQUE

Guidelines for the Backup Generating Station Project
on the Nordic Village of Inukjuak Territory

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I. FOREWORD

The proposed Northern Village of Inukjuak Backup Generating Station Project involves the construction of a backup thermal generating station in Inukjuak on Class I lands. The proposed plant will be located approximately 1.5 kilometres from the northern boundary of the Northern Village, between the airstrip and the access road to the future Innavik hydroelectric generating station. The installed capacity of the new Inukjuak backup generating station will be roughly 6 MW to begin with and could be increased to 9 MW if needed.

The proponent has entered into an electricity supply agreement with Innavik Hydro Ltd. Partnership for the supply of electricity to the Northern Village of Inukjuak from the new Innavik hydroelectric generating station. Electricity generated by the hydroelectric generating station will be delivered by power line to near the village by a 25-kV power line owned by Innavik Hydro Ltd., then distributed from a new substation and two new 25-kV lines belonging to Hydro-Québec (commissioning scheduled for 2022) that will connect to the existing distribution system at the village's northern edge. The purpose of this project is therefore to build a power plant to provide backup in the event of a failure or planned interruption of the Innavik station.

Under section 188 and Schedule A of the EQA, any fossil-fuel-fired thermal generating station with a heating capacity of 3,000 kW or more is subject to the environmental and social impact assessment and review procedure. The backup generating station on the territory of the Northern Village of Inukjuak is therefore automatically subject to this procedure.

This document constitutes the project guidelines. It outlines the nature, scope and extent of the environmental and social impact assessment the proponent must carry out. It presents a procedure for providing the information required for the project's environmental and social assessment. These guidelines should not be considered exhaustive, and the proponent is required to include in its impact study any other element(s) relevant to the analysis of the project.

II. INTRODUCTION

This introduction lays out the basic elements under environmental and social assessment and the requirements for preparing the environmental and social impact assessment.

Environmental and social assessment
Environmental and social assessment is a key instrument in planning the development and use of resources and land. Its aim is to ensure that environmental concerns are taken into account at all stages of a project's development, including in its design, operation and decommissioning. It helps the proponent design a project that is sensitive to the receiving environment without jeopardizing the project's technical and economic feasibility.

The environmental and social assessment takes all components of the biophysical and human environments likely to be affected by the project into account. It makes it possible to analyze and interpret the relationships and interactions between the factors that influence ecosystems, resources and the quality of life of individuals and communities. The comparison and the selection of alternatives for the project's implementation are intrinsic to the environmental and social assessment process. The impact study therefore clearly presents the objectives and the selection criteria for the proponent's preferred alternative.

The environmental and social assessment takes into consideration the opinions, reactions and primary concerns of individuals, groups and communities. In this regard, it reports on how the various relevant parties were involved in the project planning process and considers the results of the consultations and negotiations carried out.

The environmental and social assessment aims to highlight any issues associated with the project and the environmental and social components that will be significantly affected. The relative importance of an impact helps determine the issues on which choices and decisions will be based and, if applicable, under what conditions.

Impact study
The impact study is the document presenting the proponent's environmental and social assessment approach. It must use scientific methods and meet the requirements of the Ministère as well as the Kativik Environmental Quality Commission (KEQC) regarding the analysis of the project and the consultation of the public and the Indigenous communities concerned. It provides an overall understanding of the project development process. More specifically, it:

- Presents the project's characteristics and explains its purpose, taking into account the context in which the project will be carried out;
- Provides the most accurate picture possible of the environment in which the project will be carried out and the evolution of this environment during and after project implementation;

- Demonstrates how the project fits into the environment by presenting a comparative analysis of the impacts of the various implementation variants;
- Defines the measures designed to minimize or eliminate negative impacts on the environment and to maximize those likely to improve it; when the impacts cannot be sufficiently mitigated, it proposes compensation measures;
- Suggests monitoring and follow-up programs to ensure compliance with government requirements and fulfilment of the proponent's commitments, to monitor the evolution of certain components of the environment affected by the project and to verify the effectiveness of the planned mitigation measures.

III. BASIC PRINCIPLES

The following sections describe four main basic principles that must guide the proponent in conducting its impact study.

Integration of sustainable development objectives

Sustainable development aims to meet the needs of the present without compromising the ability of future generations to meet their own needs. Its three objectives are to maintain the integrity and characteristics of the environment, to improve social equity and to enhance economic efficiency. A project design must therefore integrate and balance these three aims.

It is the proponent's responsibility to take sustainable development objectives into account when developing its project and to determine how the actions to be implemented must be adapted to the specific environmental and social context north of the 55th parallel. These objectives can be included as much in the planning and management of the project as in the proposed mitigation and compensation measures. The impact study must summarize the sustainable development approach followed by the proponent and explain how the project design takes these measures into account. The proponent is strongly encouraged to implement responsible management programs that include concrete and measurable environmental protection, economic efficiency and social equity objectives.

Taking climate change into account during project development and impact assessment

For the KEQC, and particularly in the northern context, the fight against climate change is a priority and fundamental issue. To reduce greenhouse gas (GHG) emissions and adapt to climate change, the proponent must take climate change into account from the very start of the project development and when conducting the impact study. The analysis of alternatives, the various implementation variants and the impacts of the project must therefore be carried out in the context of climate change. In particular, the proponent must assess the project's contribution to Quebec's overall GHG emissions. The proponent must also assess the potential effects of climate change on the project and the environment in which it is to be implemented, particularly if they are likely to change the nature and significance of the project's impacts on the environment, human safety or the stability and sustainability of infrastructure (see suggested methodology in the appendix).

To ensure that the project's GHGs are properly considered for each of the project phases, the proponent must draw different perimeters when delineating the study area. These boundaries must make it possible to consider direct and indirect GHG emissions, which are modulated by the choice of project implementation variants.

Integration of traditional knowledge

The knowledge of the communities affected by the project in regards to their biophysical and human environment is key to adequate assessment of the impacts of a project of this nature. Each cultural group has its own system for perceiving itself, its neighbouring communities and environment, as well as its past and future. Since it partly determines the group's reaction to change, this system of representation and the communities' knowledge of their environment must be both known and integrated into the impact study. This includes their understanding of the temporal and spatial boundaries of the project and its area of influence.

The integration of traditional knowledge into the impact study is necessary and requires the collection of information from the communities concerned and the land users. The analysis of this data also requires the participation of the latter at various levels. As a whole, this exercise promotes the involvement of the communities concerned and their knowledge of the project.

Consultations and communications

The proponent must take advantage of the capacity of the communities concerned and of citizens to express their views and concerns about the project. To this end, it is recommended that a public information and consultation process be implemented as early as possible, involving the parties concerned (individuals, groups and communities, etc.), in order to consider the opinions of interested parties when making choices and decisions. The earlier in the process leading up to a decision that a consultation takes place, the greater the influence of citizens on the project as a whole and, necessarily, the more likely the project is to be socially acceptable.

A section of the impact study should be devoted to presenting and analysing the public consultations. The proponent must describe its consultation program, the public meetings it has organized and those planned at each stage of the project. The proponent must indicate the dates, locations and duration of the information and consultation sessions. It must have to produce minutes for these meetings, which will include the methodology used, the list of participants, the comments, concerns, opinions and reactions of individuals, groups, organizations north of the 55th parallel and users of the territory. It should be noted that the final version of minutes must be validated by the participants, a third party or an independent observer. The proponent is invited to consult the documents related to public information and consultation published on the MELCC website.[1]

On this subject, the proponent must ensure that any information that is confidential or could harm the environment or persons is excluded; it must submit this information in a separate document, requesting that it not be made public. It is recommended that the proponent place this information and data in a document separate from the impact study and clearly marked as being of a confidential nature.

[1] http://www.environnement.gouv.qc.ca/evaluations/documents/guide-initiateur-projet.pdf

The proponent should indicate how the views of interested parties have influenced the issues to be considered, choices, decision making and changes to the project. The proponent must explain how it will take into account the concerns raised by the project and the economic aspects addressed, and how this may influence a potential Impact Benefit Agreement (IBA) with the communities involved.

Moreover, holding information and consultation processes as early on as possible will also allow the proponent to gauge individuals' interest in sitting on one or more monitoring committees, which should be considered from the outset of project planning.

Finally, the proponent must:

- Implement the necessary means to ensure that the documents essential to the project are understood by the communities concerned;
- Make these documents public;
- Mnsure the dissemination of information to interested persons and groups using the appropriate media, and;
- Keep this information up to date.

IV. IMPACT STUDY CONTENT

The following sections describe the elements to be presented in the impact study.

1. BACKGROUND

This section of the impact study should set out the elements motivating the project. It includes a short presentation of the proponent, the context in which the project will be carried out and the rationale for the project. The presentation of the context and purpose of the project must identify the environmental, social, economic and technical issues at the local and regional levels, as well as at the national and international levels, if applicable.

1.1 Presentation of the proponent

The impact study must introduce the project proponent and, if applicable, its consultants. This presentation must include general information on the proponent's history in relation to the proposed project and the sector of activity in which the project is located.

In addition, the study must clearly present the company's administrative structure that will make it possible to provide the required financial guarantees when environmental restoration, decontamination, infrastructure dismantling or other measures must be taken.

1.2 Project context

The proponent is required to provide a description of the project including its geographical coordinates and primary technical and economic characteristics. It must emphasize the general context in which the project is to be carried out, the goals of the project, the related components, the project's construction and operating schedule, its cost and the possibility of an expansion, if planned. The proponent must also detail the main environmental constraints to the project's implementation. The proponent must discuss the events that could cause a slowdown or temporary halt in operations or the abandonment of the project.

The history of the project and business opportunities in the project's sector of activity must also be described in the presentation of the project context and rationale.

The proponent must then provide background information, by stating the main steps that led to the definition of the proposed project and discussing the related exploration work. It must indicate the physical structures that were put in place and any environmental or social problems encountered at this stage. It must also mention any agreements already established for the use of certain services or partnership efforts with local communities. Where applicable, it must discuss similar projects currently under evaluation, construction or operation in the sector, and discuss the possibilities for coordination between these projects, among other considerations.

The legal framework within which the project will be inserted should be described, specifying the relevant conventions, laws and regulations at all levels of legislation. In addition, the proponent must not only list the laws, regulations, policies and directives applicable to its project, it must also refer to them in the appropriate sections of its impact study and describe how it plans to comply with them. The project must therefore reflect the main guidelines for the protection of receiving environments and favour the at-source elimination rather than post-project treatment of contaminants.

The proponent and its consultant must ensure and demonstrate the significant participation of Indigenous communities in the development and operation of its project.

1.3 Rationale for the project

The rationale for the project should provide understanding of the need for the project and identify the environmental, social, economic and technical issues involved.

The proponent must situate the project among its business activities and discuss the incentive leading it to go ahead with the project.

The proponent must explain the project's environmental and socioeconomic context in the region and present its local and regional economic benefits, drawing a parallel with the project's lifespan and the presence of other similar projects in the area.

2. SELECTION OF LOCATION AND TECHNOLOGY ALTERNATIVES

2.1 Location variants

The proponent must describe the various locations considered for the implementation of the infrastructure required for its project. This description must be sufficiently detailed and use illustrations to allow a comparison of the various locations under consideration and an assessment of their respective biophysical, social, technical and economic advantages. In all cases, the proponent must demonstrate its concern for reducing the project's environmental footprint. In the event that there is only one physically possible site, the proponent must justify its reasoning.

In addition, the proponent must present the reasoning and criteria that led to the choice of the sites selected, indicating precisely how the criteria were considered. The choices should take into account, among other considerations:

- Land-use planning constraints (municipal, regional or government policies, land tenure, zoning, constraint zones, characteristics of the human and built environment)
- Biological, physical, hydrographic and hydrogeological constraints (presence of wildlife habitat or wetland/water environment, topography, level of soil and groundwater contamination, geotechnical capacity, potential for soil movement, potential for subsurface infiltration, etc.)
- The environment's vulnerability to the impacts of climate change
- Technical, operational and financial constraints or opportunities (carrying capacity, presence of buildings or equipment, availability of services or labour, network connection arrangements, possibility of facility layout or expansion, construction schedule, costs, etc.)
- The extent of certain apprehended impacts, particularly on valued ecosystem or human components (threatened species, sensitive environments, proximity of residences, sites of interest to Indigenous communities, traditional and current community use of the territory, health and safety risks, etc.)
- Social and economic conditions (major concerns, economic spin-offs, sources of employment, etc.)

The proponent must present relevant geographic information to locate these components, as well as variants and temporary infrastructure, if any, including the names of water bodies and their geographic location.

2.2 Technological variants

The choice of elements to be considered depends largely on the size and nature of the project. All these considerations must be made taking into account the particularity and evolution of the northern environment in a context of climate change. In this regard, the proponent must indicate how it intends to adapt its project to climate change to ensure the integrity and long-term stability of its facilities.

The proponent must identify and describe the variants likely to modulate greenhouse gas (GHG) emissions. For example, the proponent may consider the use of best available technology, alternative energy sources with a low carbon footprint, fuel substitution, and the choice of routes that reduce the distances required for the supply and transportation of materials. The comparison of alternatives should, in particular, be carried out with a view to avoiding, reducing or limiting GHG emissions.

With regard to energy supply and the technologies used, the proponent must present its preferred technologies, demonstrating its rationale and the technical, economic, environmental and social criteria justifying these choices. The method used to select the technologies must be clearly explained and include the following elements:

- The effectiveness of the technologies in relation to the most recent technologies for the activity sector
- The ability to meet the demand (objectives, needs, opportunities)
- Availability and technical feasibility
- Completion at costs that do not compromise the project's economic viability
- The technology's evolutionary potential (technical and economic ability to upgrade or improve)
- A quantification report of annual GHG emissions attributable to energy supply and technology variants
- The ability to reduce GHG emissions, either from the start of operations or as technologies evolve
- The ability to limit the extent of negative impacts on the biophysical and human environments and maximize positive benefits

3. PROJECT DESCRIPTION

In this section, the proponent must describe the various infrastructures and technologies selected from among those presented in the previous section. It must also make the required links with its energy supply and use of road, airport and/or port transportation infrastructure, when applicable. It must provide sufficient details so that the issues at stake can be fully understood, in particular by specifying whether certain infrastructure development is expected to affect the water environment or wetlands. The conservation of atmospheric quality and the conservation and protection of water resources must also be considered during project implementation.

The proponent must demonstrate the project's ability to meet legal and regulatory standards, criteria and requirements.

The proponent must specify the project's timetable and indicate the dates or periods planned for carrying out the work and the anticipated duration of the work.

3.1 General project description

The proponent must provide a cost estimate and schedule for its project's various phases, as well as the plant's expected commissioning date, lifespan and, if applicable, future development phases.

3.1.1 Construction phase

The proponent must describe the permanent facilities and infrastructure, including:

- Location, area, tenure and ownership of the land used to build the infrastructure
- Power lines, transformer substations and other equipment required to connect to the power grid
- Access roads to the various structures

The proponent must describe the temporary facilities and infrastructure, particularly:

- Areas for receiving, handling and storing materials
- Machinery and fuel storage yards
- Waste management and domestic waste disposal and construction sites
- Sewage treatment facilities
- Workers' housing

The proponent must discuss development and construction activities and planned operations, including

- development and construction activities and planned operations, including land blasting, location and surface area of borrow pits and materials and equipment used (characteristics, transportation, etc.).

Finally, the proponent must indicate whether the site has been the subject of a geotechnical study. It must also discuss the decommissioning and rehabilitation of all temporary and permanent facilities.

3.1.2 Operating phase

The proponent must describe:

- Activities and modes of operation
- Its commitment to provide, a few years prior to the cessation of activities, decommissioning plans for the works and facilities

3.2 Developments and related projects

3.2.1 Access infrastructure

The proponent must discuss the road accesses to be built and existing road accesses in the project area, and specify the use it intends to make of them. The proponent must describe all activities or works required for the construction and operation of a site access road and other roads, including temporary roads. It must specify whether, and to what extent, it must be responsible for their maintenance. It must also indicate how it intends to upgrade and maintain existing roads and roads related to the project. This description should include, but not be limited to, the installation of watercourse crossings and any planned works or activities below the natural highwater mark.

3.2.2 Borrow pits

In this section, the proponent must precisely explain its intentions for the operation of the borrow pits required for the project in the various stages of construction, road accesses or any other aspect of the project.

The proponent must locate and map all existing and planned operations (borrow pits, sand pits, quarries) for the purposes of the project, specifying their proximity to the location of roads, watercourses and proposed protected areas in order to take into account the regulations, characteristics and possibilities of the environment. It must evaluate the areas and volumes required and, if necessary, will submit sounding reports describing the stratigraphy and provide grading curves. The proponent shall indicate how the evaluation of the required borrow material was optimized. Finally, an overview of the redevelopment and decommissioning measures for these sites must also be provided.

3.2.3 Decommissioning of the former plant

The proponent must describe all works and structures related to the decommissioning of the old plant, including the transfer of equipment to the new plant and the disposal of scrap from the old plant.

3.3 Hazardous residual materials

The proponent must apply the 3RV principle to the management of its residual materials, i.e., in order of priority, any reuse, recycling (including by biological treatment or land application) and other recovery operation in which residual materials substitute for raw materials, energy recovery and, as a last resort, disposal.

Construction and demolition debris, in particular concrete or asphalt waste, must be recovered in compliance with the criteria contained in the guidelines for the management of concrete, brick and asphalt from construction and demolition work and residues from the dimension stone sector.[2] For non-hazardous inorganic residual materials from industrial sources, the proponent must refer to the guidelines for the recovery of non-hazardous inorganic residual materials from industrial sources for construction use.[3] Other non-hazardous residual materials from construction and demolition activities must be sent to an authorized recovery or disposal site.

A list of residual materials generated during the construction and operation of the project must be provided along with a management plan for these materials. This list must include all generated materials (metals, plastics, fibres, glass, wood, tires, electronic products, etc.) as well as the foreseen management methods and the quantities for each of the residual materials produced. In addition, the mode of transportation of the residual materials, the distance to be covered and the number of shipments of materials to the south must be specified.

The proponent must assess the potential for treating putrescible organic matter contained in residual materials assimilated to household waste to obtain compost. To this end, the proponent could use small thermophilic equipment.

In addition, for each phase of the project, the proponent must describe the use it intends to make of the various hazardous materials used and produced on the site, list them exhaustively and provide their storage methods prior to transportation to southern Quebec. The proponent must also indicate the frequency at which shipments to the south will be made. The proponent must also provide details on the hazardous materials that will be used during operations, such as fuels and lubricants. It must identify them and describe their storage and handling methods. Finally, the proponent must indicate how residual hazardous materials will be managed and disposed of.

[2] http://www.environnement.gouv.qc.ca/matieres/valorisation/lignesdirectrices/beton-brique-asphalte.pdf
[3] http://www.environnement.gouv.qc.ca/matieres/mat_res/inorganique/matiere-residuelle-inorganique.pdf

3.4 Surface water

The proponent must provide the surface water flow profile to validate that drainage of the site, and particularly of the fuel farm, with a direction other than northward, can be carried out to avoid the risk of contaminant transport to Tasiq Tullipaaq Lake.

3.5 Air quality

The proponent is required to provide an assessment of air emissions to the nearby airport for both regulatory parameters and odours.

3.6 Jobs and training

The proponent must make available the corporate policy on the hiring, on-the-job training and integration into the labour pool of Inuit workers. In particular, it must deal with possible measures (transportation, information, work schedules, frequency, etc.) to promote local workers' access to the project-generated employment and business opportunities and the retention of these workers. It must take into account similar experiences, including those related to recent projects carried out on the territory. It must also demonstrate regional hiring targets, particularly for Inuit workers, in a context of collaboration with the communities concerned.

3.7 GHG emissions

The proponent is required to produce a detailed identification and quantification report of annual GHG emissions that can be attributed to all sources of emissions at the project's different phases. The proponent must also develop an impact-mitigation measures plan and a GHG emissions monitoring plan.

To facilitate the proponent's work, the procedure to be followed to assess the project's impacts on GHG emissions is presented in Appendix A. This procedure includes the general methodology for quantifying and the formula for calculating GHG emissions. Quantification must be carried out by a person competent in the field. A "qualified person" is defined as any natural or legal person who has demonstrated knowledge and expertise in the quantification or reduction of GHG emissions. This person may be an organization employee or an external resource and is not required to be certified.

Finally, the proponent must discuss the impacts of climate change on its project. The proponent is invited to consult Appendix B on this subject.

4. DESCRIPTION OF THE ENVIRONMENT

In this section, the proponent must describe the environmental, cultural and socio-economic context of the project in this region and sector, in a way that takes traditional Indigenous knowledge and cultural values into account. The proponent must delineate its study area to describe the components of the biophysical and human environments relevant to the project.

4.1 Delimitation of the study area

The proponent must determine a study area and justify the boundaries thereof, by taking into account the scope of the anticipated impacts and the appropriate ecological boundaries for the various components of the environment. This area may be composed, if necessary, of various subareas delimited according to the impacts under study. The proponent will situate its project in relation to current territory use patterns. The portion of the territory encompassed by this area shall be large enough to cover all of the planned activities and studied alternatives, as well as the related activities associated with implementing the project, and to delimit all of the project's direct and indirect effects on the biophysical and human environments.

4.2 Description of the relevant components

The proponent must describe the state of the environment as it exists in the study area prior to the project. Wherever possible, the description should present relations and interactions between the various components of the environment so that the ecosystems having a high interest potential or being of special interest are delimited. This description should make it possible to understand the presence and abundance of animal species, most notably according to their life cycle, migratory habits and dietary behaviour. If required, the surveys should also reflect the social, cultural and economic values related to the described components. The proponent must provide all information facilitating the comprehension or the interpretation of the data (methods, survey days, location of sampling stations, etc.).

4.3 Biophysical environment

The description of the biophysical environment should be made for the entire project, including the related components. Using maps on which the existing or required infrastructures will be indicated, the proponent must identify the characteristics described in the following sections.

4.3.1 Geology, geomorphology and soils

The proponent must identify, using maps to the appropriate scales, the main geological formations and describe the general topography of the terrain and the presence of permafrost. The proponent must locate the zones that are sensitive to erosion and ground movements, as well as the sectors likely to be used for borrow materials.

The proponent must also carry out a physicochemical characterization of the initial state of the soil before the project is implemented, in accordance with the guidelines for the physicochemical characterization of the initial state of soils prior to the implementation of an industrial project. [4]

[4] *Guide de caractérisation physicochimique de l'état initial des sols avant l'implantation d'un projet industriel*http://www.environnement.gouv.qc.ca/sol/terrains/guide/caracterisation-avant-projet-industriel.pdf

4.3.2 Water and wetlands

The proponent must provide a general description of the wetlands and water environments in the study area.

4.3.3 Vegetation

The proponent must provide in-depth descriptions, illustrated with maps, of the plant cover of the aquatic, riparian and land environments. This description must indicate the presence of fragile or exceptional stands in the study area. It will indicate the rare or threatened species likely to be found in this sector and will provide a description of their habitats.

4.3.4 Wildlife

The proponent must provide a map of the aquatic and land habitats observed on the territory under study (spawning grounds, dens, confinement areas, nesting areas, etc.) and specify the value thereof.

The proponent must identify, if necessary, the rare or threatened species and take into account the protection statuses currently granted to or considered for these species.

4.4 Social environment

The description of the human environment must be carried out for the entire project and consider the related components and various project phases. The human environment regards both the Inuit and non-Indigenous communities in the area under study. The main components of the human environment are: socioeconomic aspects, quality of life, cultural context, heritage and archaeology, occupation of the territory. If necessary, the proponent can study other subjects deemed relevant for the project's impact assessment.

4.4.1 Occupation of the territory

The proponent must indicate the tenure and boundaries of the Category I, II and III lands. It must describe the location of the dwellings, constructions and various buildings situated near the project.

The proponent must address the occupation and current use of the territory, including the location of water supply sources, hunting, fishing and trapping territories in the study area, including any associated infrastructures (road, trails, camps, etc.), traditional travel ways and their periods of use and navigation in the study area (type, density, trips, etc.).

The proponent must also present the territories with confirmed protection and conservation status and other sectors, for which various statuses as protected areas have been foreseen.

4.4.2 Socioeconomic aspects

The proponent must present the demographic profile of the communities in the aarea under study, as well as its perspectives and economic situations (jobs, activity sectors, sources of income, etc.). The proponent must also describe the pool of Inuit workers and enterprises who are qualified to hold positions or carry out contracts in the construction or operation activities ofthe backup generating station.

4.4.3 Quality of life and cultural context

The proponent must document various elements related to the quality of life of the communities in the area under study. These encompass community life (including social relations), social cohesion (including sense of belonging), and biophysical environmental elements. In addition, the proponent must describe the cultural context specific to these communities. Culture refers notably to knowledge, beliefs, values, norms, roles, ways of life and behaviours acquired by individuals as members of a specific group, community or society.

4.4.4 Heritage and archaeology

The proponent must describe the prehistoric, historical and spiritual sites present in the area under study, the sites of special interest (such as burial grounds, sacred or preferred sites).

5. PROJECT IMPACT ANALYSIS

The proponent must identify the impacts and evaluate the importance of these impacts using appropriate methods and criteria. It must consider the positive and negative, the direct and indirect impacts and, as the case may be, the cumulative synergistic and irreversible impacts related to carrying out the project.

5.1 Impact identification and assessment

While determination of the impacts is based on anticipated facts, their evaluation entails a value judgment. This may not only help establish acceptability thresholds or levels, but also make it possible to determine the impact mitigation criteria or needs in the monitoring or follow-up field.

The evaluation of the importance of the impact depends first on the component affected, namely its intrinsic value for the ecosystem and the social, cultural, economic and aesthetic values the public attributes to it. The more an ecosystem component is valued by the public, the more its impact is likely to be important. Fundamental public concerns, notably potential dangers for health or safety or threats to archaeological sites, also influence this evaluation.

The evaluation of the importance of an impact also depends on the intensity of the change undergone by the affected environmental components. The more an impact is widespread, frequent, lasting or intense, the more important it will be. In this case, the importance of the impact must be pinpointed to the appropriate scale, namely the area under study, the region or province.

The proponent must describe the chosen method, as well as its uncertainties or biases. The techniques and methods used will have to be objective, concrete and reproducible. The reader must be able to easily follow the reasoning the proponent used to determine the impacts. The proponent must associate the project activities and works with the environmental components using synoptic tables, checklists or impact sheets.

The proponent must define the criteria and terms used to determine the anticipated impacts and to classify them according to various levels of importance. The following criteria may help determine and evaluate the impacts:

- Intensity or scope of the impact (degree of disturbance of the environment influenced by the degree of sensitivity or vulnerability of the component)
- Extent of the impact (spatial dimensions, such as length and surface area)
- Duration of the impact (temporal aspect, irreversible nature)
- Frequency of the impact (intermittent nature)
- Probability of the impact;
- Domino effect (link between the affected and other components)
- Ssensitivity or rarity of the component;
- Sustainability of the component and the ecosystems (durability)
- Value of the component for the public
- Formal recognition of the component by law, policy, regulation or official decision (park, ecological reserve, threatened or vulnerable species, wildlife habitats, plant habitat, known archaeological sites, etc.);
- Risks for public health, safety and well-being

The proponent must describe the impacts of all phases of the project on:

- Wetlands (the loss or modification of wetlands during the construction and operation phases)
- Survival and movement of terrestrial and avian fauna as well as the destruction or modification of their habitats or the destruction and possible modification of habitats for other at-risk species
- Plant species, particularly those of special status or special interest to the Inuit
- Surface water runoff from the site
- Air contaminants emitted
- Odour pollution
- The risk of nuisances (noise[5], dust) and their effects on land users
- Soil quality following the construction phase
- Visual environment, due to the addition of new visual elements and changes in the aesthetic quality of the landscape
- Diesel power supply to the plant
- Quebec's ability to meet its GHG reduction targets
- Analysis of the anticipated impacts of climate change on the project and on the environmental components likely to be affected by the project
- Potential conflicts for competitiveness for jobs
- Safety of land users
- Training, hiring or contract opportunities for Inuit individuals or businesses
- Environment in the case of an accidental spill of petroleum products or any other chemical product
- Public health, taking into account contaminant levels in the soil
- Impacts on Inuit access, use and occupancy of the land (traditional activities)
- Sites and areas of special value to the public for historical, cultural and spiritual reasons
- Sites of historical or archaeological interest or with archaeological potential

[5] For construction and operation phases, the proponent may refer to the following guidelines to document the nuisances caused by noise: http://www.environnement.gouv.qc.ca/publications/note-instructions/98-01/lignes-directrices-construction.pdf and http://www.environnement.gouv.qc.ca/publications/note-instructions/98-01/note-bruit.pdf

5.2 Cumulative effects

Cumulative effects are broadly defined as changes to the environment caused by an action in combination with other past, present and future actions. The concept of cumulative effects is based on the idea that each impact, individually and independent of its own magnitude, can represent a high marginal cost to the environment.

The proponent must submit a justification regarding the geographic and temporal delineation of the cumulative impact study. It should be noted that these boundaries may vary depending on the components selected to assess cumulative impacts, depending on their distribution and specific characteristics. The proponent must propose and justify the choice of projects and activities selected for the cumulative impact analysis, which must include past, current and future activities or projects (with a high probability of occurrence). The methods used to predict cumulative environmental impacts must be clearly described in order to better understand the reasoning of the conclusions presented and how the analysis was carried out. The traditional knowledge of the communities concerned has to be integrated into the assessment of the cumulative environmental effects. The assessment of cumulative environmental impacts must:

- Consider the actions and effects in combination with other past actions (including development work that has taken place), present and future actions
- Take natural disturbances into account
- List the valued components[6]
- Determine spatial delimitations based on the characteristics of the valued components
- Identify or map out features, impacts and other land uses in reference conditions
- Establish trends or changes in the condition of valued components across time

Thus, the proponent must identify the valued components to be addressed in the cumulative effects assessment. The environmental components for this analysis must be those related to project issues, including Inuit use of the land, the socio-economic context of the region, community use of the area for cultural purposes, recreational and tourism activities, wildlife and plant species at risk, wildlife and its habitat, and climate change. In addition, it must consider the impact of the presence of workers on the wildlife resource and the future repercussions this presence could have on hunting and fishing by Inuit and non-Indigenous peoples.

[6] Valued components are the environment's aspects or characteristics identified as important to Indigenous people, government agencies, the proponent or the public, and that may be affected directly or indirectly by a project.

6. MITIGATION MEASURES, RESIDUAL IMPACT AND COMPENSATION MEASURES

6.1 Mitigation

The proponent must describe the measures it will put in place to maximize the positive effects on the environment and the social milieu as well as the corrective measures it intends to implement to reduce the project's negative impacts (including cumulative effects). The proponent must give priority to measure that make it possible to avoid negative impacts and reduce the significance of the negative impacts. For residual negative impacts that cannot be mitigated, the proponent must propose compensation or restoration measures.

For all biophysical and social environments, the proponent must present the mitigation measures it plans to implement. In addition, it must describe the requirements that will be imposed on contractors and their subcontractors to ensure that all comply with these commitments and policies.

Particular attention must be paid to include the following measures:

- Terms and conditions for the redesign of the borrow pit
- Terms and conditions for site remediation at the end of the project
- Transportation and storage of diesel fuel
- Monitoring of noise pollution levels
- Monitoring of air pollution, odours and air contaminant levels

6.2 Residual impacts and compensation measures

Residual impacts are those that remain after mitigation measures have been applied. The proponent must take into account the estimated costs of each impact (and compensation possibilities for unavoidable residual impacts) for the biological and human environments, without compromising the project's technical and economic feasibility. The loss of habitats in an aquatic environment should notably be compensated by the creation or improvement of equivalent habitats.

Finally, the proponent must provide a summary list of all mitigation measures, specific compensation measures and commitments proposed in connection with its project.

7. RISK MANAGEMENT

Some projects may cause accidents, the consequences of which may extend beyond the boundaries of the project. The project impact study therefore requires a risk analysis for major technological accidents. In all cases, the study must describe the planned safety measures and present a preliminary emergency preparedness plan for the construction and operation phases.

Accidents or damage affecting the project's infrastructure, other components or operations, and that are caused by natural disasters or extreme weather events must be assessed. This assessment will also take climate change into account. The proponent must explain how the remoteness of the project will guide the design of emergency measures.

7.1 Technological accident hazards

The risks analysis of major technological accidents is based on identifying hazards (the hazardous nature of products, system failures, sources of breakdowns, etc.) from which accident scenarios are developed. A review of the accidents that have occurred (over approximately the past five years) in similar projects (or, failing this review, of projects using similar processes) further informs these scenarios. All project-related activities (handling, operation, etc.) must be considered. Attention will have to be paid to any event likely to adversely affect the quality of the environment, its use and users.

If the analysis shows that the project is not likely to result in major technological accidents, the proponent may simply use the previously gathered information in its contingency planning. To demonstrate the absence of a risk of major technological accident, the proponent may use the concept of a "normalized scenario."[7]

If the proponent cannot demonstrate that there is an absence of a risk of major technological accident, it must pursue the risk analysis with in-depth consideration of the resulting hazards and accident scenarios in order to identify the consequences and associated risks.

Analysis identifies the environmentally sensitive elements that could be affected in an accident and the consequences of which could be significant or increased (for the community, natural sites of special interest, territory, zoning, etc.).

The risk analysis must therefore include an evaluation of the consequences related to the accident scenarios. The purpose of this step is to identify the areas within which the neighbouring population's safety and the biophysical and social environment's integrity could be affected. It is also intended to indicate the previously identified sensitive elements. This information is retained for contingency planning.

[7] Ministère de l'Environnement, 2002. (Ref. Guide – *Analyse de risques d'accidents technologiques majeurs* – June 2002 – MDDEP). [http://www.mddelcc.gouv.qc.ca/evaluations/documents/guide-risque-techno.pdf].

When the sensitive elements are located in areas likely to be affected, the analysis also includes an estimate of the frequency of occurrence to establish the risks associated with the project. The risks are then indicated according to their geographical position in relation to the location of the plant and are illustrated with maps showing the sensitive elements and the various results of the risk analysis. Wherever possible, the proponent will provide the geo-referenced data from this analysis. A discussion of the results of the risk analysis is presented.

Safety measures (distances, etc.) that influence the potential consequences or risks associated with the selected accident scenarios must be presented and discussed along with the scenario analysis.

The impact study must also present a summary analysis of external events likely to cause technological accidents on the project. All elements or events, whether of natural (flood, earthquake, etc.) or of human (neighbouring project, plane crash, etc.) origin must be considered. This information must be integrated into the emergency preparedness planning.

The proponent must conduct the technological risk analysis according to the rules of the trade. The proponent must justify the use of data, formula and calculation assumptions, explain the limitations of the chosen method and the uncertainties surrounding the results, and indicate all references. The analysis takes into account the laws, regulations and codes of practice to which the proposed facility must conform.

7.2 Safety measures

The impact study will describe the security measures planned for the operating sites, including related facilities located outside the main site. Among other things, it must describe the following elements:

- Site access limitations
- Security installations and preventive measures (monitoring systems, emergency shutdown, firefighting systems, sprinklers, emergency generators, leak detectors, high level alarms, safety distances, etc.)
- Storage of products according to their dangerousness

7.3 Preliminary emergency preparedness plan

The impact study must present a preliminary emergency preparedness plan, covering both the construction and operating periods, in order to demonstrate adequate response in the event of an accident. This plan must lay out the main actions planned in response to an incident or accident situations, as well as the transmission mechanisms for alerting the authorities, workers and the public. It must describe the link with the municipal authorities or the Northern Village concerned, the other regional entities involved and, if applicable, the way in which the various emergency measures plans are connected. In this regard, the proponent must list the consultations it has held with partners outside its project.

The proponent is invited to consult the various publications on the preparation of emergency measures plans, including the information document on public safety risk management,[8] the risk management guidelines for major industrial accidents[9] and the *Emergency Preparedness and Response Standard.*[10] A final emergency preparedness plan, including scenarios for each type of major potential accident, must be completed by the proponent before the launch of operations.

As part of its emergency response plan, the proponent must include:

- A list of risk analyses to support the development of the emergency preparedness plans submitted for the construction and operation phases
- A map of risks in the project vicinity (e.g., flood zone, erosion zone, hazardous materials transportation or storage area, permafrost melting zone, etc.)
- A work schedule adapted periods of risk
- An alert system, including the notification of municipal stakeholders and organizations involved in emergency preparedness in the vicinity of the power plant (e.g., airport, other nearby projects, etc.)
- Information relevant in the event of an emergency (contact information for the persons in charge, available equipment, plans or maps of preferred routes, access roads in all seasons, etc.)
- The emergency response structure and methods of communication with the external civil protection organization
- The procedures for updating and reassessing emergency measures
- References to other existing emergency preparedness plans (e.g. airport, fire plan, etc.)

Given the project's remoteness, the proponent must be the first to apply emergency measures in the event of a technological accident, spill, etc. In particular, the proponent must provide information on its response capability and handling methods in the following cases:

- Transportation of chemical products (tankers, explosives, etc.) or products deemed potentially dangerous
- Petroleum and/or hazardous product spills at the project site, with emphasis on methods for prompt on-site response
- Storage of chemical, petroleum and hazardous products
- Fire hazards at the project site
- Coordination with relevant regional entities in the event of evacuations or incidents involving a high number of victims

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[8] Ministère de la Sécurité publique, 2009. *Gestion des risques en sécurité civile.* [https://www.securitepublique.gouv.qc.ca/index.php?id=1265].

[9] Conseil pour la réduction des accidents industriels majeurs, 2017. *Guide de gestion des risques d'accidents industriels majeurs*. [http://www.craim.ca/produit/guide-de-gestion-risques-daccidents-industriels-majeurs-2017/].

[10] Standard *CSA-Z731-03 (R2014) Emergency Preparedness and Response* [https://www.scc.ca/en/standardsdb/standards/18899].

8. MONITORING AND FOLLOW-UP PROGRAMMES

The following sections are intended to lay out how the monitoring and follow-up programs related to the project will be designed and carried out. The programs will need to be designed with sufficient flexibility to allow for changes to be made in response to new information and unforeseen events.

8.1 Monitoring program

The aim of the environmental monitoring program carried out by the project proponent is to ensure this latter's compliance with:

- Requirements in the relevant laws and regulations
- Measures proposed in the impact study, including the mitigation or compensation measures
- Its commitments foreseen in the Ministerial authorizations
- Conditions set out in the certificate of authorization

Environmental monitoring must cover the project's construction, operation, closure or decommissioning phases. The proponent must propose a preliminary environmental monitoring program in its impact study. This preliminary program will be improved once all the project's components are better defined. It must be completed, if necessary, following authorization of the project. The program will describe the means and mechanisms put in place to ensure compliance with the legal and environmental requirements. The program will make it possible to verify the smooth operation of the works, the equipment and the facilities, and to supervise any disturbance of the environment caused by the project's implementation, operation, closure or dismantling. The monitoring program may make it possible, if necessary, to redirect the work and possibly improve the progress of construction and implementation of its various components.

In particular, the environmental monitoring program must include:

- A list of elements requiring environmental monitoring
- All of the measures and means foreseen to protect the environment
- The characteristics of the monitoring program (for each environment: surface water, atmosphere, soil, etc.), when these are foreseeable (e.g., location of interventions, planned protocols, list of measured parameters, analytical methods used, implementation schedule, human and financial resources allocated to the program, participation of the Inuit and other target communities, if applicable);
- An intervention mechanism in case of the observation of non-compliance with the legal and environmental requirements or the proponent's commitments
- The proponent's commitments to file monitoring reports (number, frequency, content and distribution)
- The proponent's commitments regarding the dissemination of environmental monitoring results to the population concerned

The monitoring program must also include the project's GHG emissions. In general, the program will cover the elements required in the project design stage to quantify the GHG emissions the project generates and monitor their evolution over time. Given the large number of possible scenarios, there is no model (as each case is unique) for tracking and monitoring GHG emissions. An example of the data to be included is presented in the appendix. The GHG follow-up and monitoring plan is generally very succinct and is primarily intended to facilitate the proponent's work in quantifying GHG emissions. This plan may evolve over the life of the project.

8.2 Environmental and social monitoring program

The purpose of the environmental monitoring carried out by the proponent is to verify in the field the accuracy of the evaluation of certain impacts and the effectiveness of certain mitigation or compensation measures in the impact study and for which some uncertainty remains.

The knowledge gained from environmental and social monitoring programs can be utilized not only to improve predictions and assessments of the impacts of new projects of a similar nature, but also to develop mitigation measures and possibly revise environmental protection standards, guidelines or principles.

The proponent must propose a preliminary environmental and social monitoring program in its impact study. This preliminary program, if necessary, must be completed following authorization of the project. The program must include:

- The reasons for the follow-up, including a list of the elements requiring environmental monitoring (including valued components)
- The minimum duration of the monitoring program, its objectives and targeted components (e.g., validate the impact assessment, evaluate the effectiveness of mitigation measures for water, air, soil, etc.)
- The number and main characteristics of the follow-up studies planned (list of parameters to be measured, projected completion schedule, participation of the Inuit and other target communities in the monitoring, if applicable)
- The terms and conditions for the production of follow-up reports (number, frequency, format and distribution)
- The response mechanism that will be implemented in the event of unexpected environmental degradation
- The response mechanism that will be implemented in the event of an unforeseen impact on the human environment
- The program for communicating monitoring results to the populations concerned, in an appropriate format

9. PRESENTATION OF THE IMPACT STATEMENT

The impact study must be written in clear and concise language and be limited to the ideas that are necessary to a solid understanding of the project and its impacts. To ensure general comprehension, a glossary defining technical terms, acronyms and abbreviations should be included. More technical information should not be included in the main document, unless key to the reader's understanding. Information that can be diagrammed or mapped must be presented in that format and at the appropriate scale. Project components must be displayed in thematic as well as composite maps.

The proponent must illustrate the highlights of the study using graphs, maps and photographs. Maps must be presented using common scales and reference data to allow for comparison and superimposition of the mapped elements. The availability and quality of the data used must be evaluated by the proponent. All sources of information must be referenced. In addition, the methods used in conducting the impact study (inventories, surveys, interviews, comparative analyses, etc.) must be presented, explained and scientifically validated.

The proponent must also prepare a summary of the impact study. This summary must be intended for the general public and include illustrations and maps to provide quick understanding of the work being planned as part of the project. The summary must be sufficiently detailed so that readers may become familiar with the project. They must be able to understand the issues at stake, the main anticipated impacts, the proposed mitigation measures, the residual impacts and any conclusions on the significance of these impacts. It should be noted that other initiatives by the proponent to encourage public participation, such as the production of videos, radio clips, models, information sheets, etc., are also strongly encouraged. It is suggested that the proponent translate the summary into English in order to increase accessibility to the information by the community(ies) concerned by the project.

Annexe A

Protocol for the assessment of the project's greenhouse gas emissions (GES)

Afin d'évaluer les émissions de GES tout au long du projet, l'initiateur devra identifier et quantifier toutes les sources d'émission de GES reliées à ce dernier, pour ses différentes phases, ainsi que ses impacts potentiels sur les réservoirs de carbone (ex. : le déboisement).

L'annexe comporte les deux sections suivantes : la méthodologie générale pour la quantification des émissions de GES ainsi que le plan des mesures d'atténuation, et le plan de surveillance des émissions de GES (section A) avec les formules de calcul des émissions de GES (section B).

A. Méthodologie générale pour la quantification des émissions de GES

A.1. Sources d'émission de GES à considérer (non limitatives)

À titre indicatif, des sources spécifiques d'émission de GES à considérer dans l'étude d'impact sont présentées ci-dessous. Il est à noter que cette liste est non exhaustive et qu'il est de la responsabilité de l'initiateur du projet d'établir la liste complète des sources potentielles d'émission de GES.

Toutes les sources jugées non pertinentes ainsi que toutes les sources qui, cumulativement, représentent moins de 3 % des émissions totales de GES du projet peuvent être considérées comme négligeables. Pour ces dernières, une quantification sommaire devra être effectuée, à titre de justification. Dans tous les cas, le retrait d'une source doit être justifié.

Construction phase

- système de combustion fixe, si applicable (ex. : génératrices) ;
- systèmes de combustion mobiles (ex. : niveleuses et chargeuses-pelleteuses) ;
- transport des matériaux de construction, ainsi que transport des matériaux d'excavation et de remblai ;
- activités de déboisement, valorisation du bois marchand et reboisement ;
- utilisation d'explosifs ;
- émissions indirectes reliées à la consommation d'électricité, si applicable.

Operating phase

- système de combustion fixe (ex. génératrices, systèmes de chauffage, etc.) ;
- systèmes de combustion mobiles (tels que les véhicules et la machinerie utilisés) ;
- émissions fugitives ;
- émissions indirectes reliées à la consommation d'électricité, si applicable ;

Les GES à considérer

Tableau 1. Gaz à effet de serre à considérer		
Type de GES	Potentiel de réchauffement planétaire (PRP-100)	Référence
Dioxyde de carbone (CO_2)	1	4e rapport du Groupe d'experts intergouvernemental sur l'évolution du climat (GIEC)
Méthane (CH_4)	25	
Oxyde nitreux (N_2O)	298	
Hexafluorure de soufre (SF_6)	22 800	
Trifluorure d'azote (NF_3)	17 200	
Hydrofluorocarbures (HFC)	Variable, selon les molécules considérées	Environnement et changement climatique Canada[11]
Perfluorocarbures (PFC)	Variable, selon les molécules considérées	

A.2. Définition des types d'émissions de GES

A.2.1. Émissions de GES de combustion

Les émissions de GES de combustion sont les émissions liées à une réaction exothermique liée au brûlage d'un combustible. Les émissions de combustion peuvent être de source fixe (ex. : une chaudière pour le chauffage) ou mobile (ex. : un camion de transport des matériaux).

A.2.2. Émissions de GES attribuables aux procédés industriels

Cette catégorie englobe les émissions provenant de l'utilisation non énergétique des combustibles ainsi que les GES émis comme sous-produit dérivant directement des procédés industriels. Elle comprend les émissions mettant en jeu des réactions chimiques autres que la combustion et dont le but premier n'est pas la production d'énergie. Par exemple, des émissions de GES attribuables aux procédés industriels peuvent être générées dans la fabrication de plusieurs produits comme le ciment, le fer, l'acier, l'aluminium ou l'acide nitrique.

[11] Environnement et Changement climatique Canada : https://www.canada.ca/fr/environnement-changement-climatique/services/changements-climatiques/emissions-gaz-effet-serre/orientation-quantification/potentiels-rechauffement-planetaire.html.

Cette catégorie comprend également les émissions de GES produites à différentes fins telles que la réfrigération et la fabrication des mousses plastiques ainsi que les émissions de GES produites par l'utilisation de solvants et d'agents propulseurs et anesthésiques.

Lorsque les émissions des procédés industriels sont produites en même temps que celles du combustible brûlé à des fins énergétiques, elles doivent être séparées et catégorisées en conséquence.

A.2.3. Émissions de GES autres

Les « émissions de GES autres » sont toutes celles non attribuables à la combustion ni aux procédés industriels. En voici quelques exemples :

- les émissions liées à l'utilisation d'explosifs ;
- les pertes de réservoirs de carbone liées à la déforestation ou au changement d'affectation des terres.

A.3.4. Le cas particulier des émissions biogéniques de CO_2

Les émissions de CO_2 provenant de la biomasse sont nommées « émissions biogéniques ». Elles sont associées au cycle court du carbone, à la décomposition ou à la combustion des matières organiques en présence d'oxygène. Ces émissions sont considérées comme carboneutres et doivent être prises en compte distinctement des émissions de GES non biogéniques. À noter cependant que les émissions de CH_4 et de N_2O issues de la biomasse ne sont pas carboneutres. Des exemples de combustibles carboneutres sont la biomasse résiduelle, le biogaz, les granules de bois, la liqueur mixte, l'éthanol et le biodiesel. Ces émissions doivent être présentées à part dans les résultats de la quantification.

A.3. Plan des mesures d'atténuation des émissions de GES

Atténuer les émissions de GES est une action incontournable pour le développement d'un projet durable et fait partie de la démarche de quantification. Les mesures visant à réduire les émissions de GES peuvent être physiques, organisationnelles ou comportementales. Le tableau 32 présente les caractéristiques principales de chacun de ces types. Le choix des mesures de réduction d'émissions de GES optimales pour chaque projet doit être guidé par :

- La réduction d'émissions de GES obtenue par la mise en œuvre de la mesure ;
- L'applicabilité au contexte québécois ;
- L'aspect financier.

Le plan de réduction des émissions de GES présenté par l'initiateur doit décrire comment les possibilités de réduction des émissions de GES sont incorporées dans la conception ou dans les opérations subséquentes du projet, et il peut inclure aussi des mesures applicables aux puits de carbone associés ou affectés par le projet. Ces réductions doivent être quantifiées. La Direction de l'expertise climatique (DEC) considère nécessaire que l'initiateur présente les mesures d'atténuation des émissions de GES envisagées pour son projet.

Table 32: Exemples de mesures de réduction des émissions de GES (liste non exhaustive)

MESURES PHYSIQUES	MODIFICATION DES ÉQUIPEMENTS OU DES SYSTÈMES. CE TYPE DE MESURES EST GÉNÉRALEMENT LIÉ À UN INVESTISSEMENT.	
	TECHNOLOGIE	Utiliser des équipements ou des technologies qui permettent de réduire la consommation énergétique ou recourir à des énergies renouvelables à faible émission de GES. Examples: • Recourir à la meilleure technologie disponible dans une perspective de faisabilité technico-économique ; • Utiliser des sources d'énergie de remplacement à faible empreinte carbone ; • Utiliser des équipements plus performants ; • Remplacer des équipements à combustion par des équipements électriques ; • Remplacer des chaudières au mazout par des chaudières à biomasse résiduelle ; • Utiliser des équipements branchés au réseau électrique plutôt qu'alimentés par des génératrices lorsque les conditions le permettent ; • Pour les bâtiments, adopter les pratiques des certifications vertes qui permettent de réduire la consommation d'énergie et les émissions de GES. Recourir à la géothermie, lorsque cela est possible ; • Profiter des programmes de financement existants pour réduire les émissions de GES ; • Examiner la faisabilité du captage et de la séquestration pérenne des GES.
	PROCÉDÉ	Optimiser les procédés de production industrielle afin de minimiser les émissions de GES. Examples: • Réduire le plus possible ou éliminer les sources d'émission de GES dans les procédés industriels ; • Mettre sur pied des mesures d'efficacité énergétique pérennes dans le temps et un processus d'amélioration continue ; • Optimiser la récupération de chaleur (ou de froid) et réduire les rejets thermiques ; • Implanter l'intégration de procédés (*Pinch*) [12];

[12]Selon Canmet Énergie (RNCan), l'intégration de procédés est une approche systématique permettant d'identifier et de corriger les inefficacités dans les procédés industriels en analysant les interactions des opérations dans leur ensemble plutôt qu'individuellement. L'IP tient compte des contraintes techniques et financières avant la conception détaillée (analyse *Pinch*). http://www.rncan.gc.ca/sites/www.nrcan.gc.ca/files/canmetenergy/files/pubs/2004042_fr.pdf.

Table 32: Exemples de mesures de réduction des émissions de GES (liste non exhaustive)

		• Remplacer les HFC des équipements de réfrigération industrielle par d'autres fluides frigorigènes moins émissifs ou ayant un faible PRP ; • Minimiser les pertes de SF_6 dans le cadre des opérations ; • Profiter des programmes de financement existants pour réduire les émissions de GES ; • Pratiquer l'économie circulaire, c'est-à-dire utiliser les matières résiduelles d'une entreprise comme matières premières (ex. : vente de la vapeur générée par un incinérateur de matières résiduelles à une industrie à proximité).
MESURES ORGANISATIONNELLES	CHANGEMENTS DANS LES PROCESSUS ORGANISATIONNELS	
	POLITIQUE D'ACHAT RESPONSABLE	Intégrer des critères de développement durable dans les politiques d'achat de l'organisation. Examples: • Établir des exigences spécifiques en matière de GES dans les achats des matières premières de l'entreprise, dans les cahiers des charges ou dans les conditions d'exécution ; • Acheter localement ; • Connaître l'empreinte carbone des produits.
	OPTIMISATION DES FLUX	Optimiser les flux de matières, de personnes et de marchandises, en vue de diminuer les émissions de GES qui y sont liées. Examples: • Optimiser la logistique du transport de marchandises et des personnes par l'intermodalité (train, bateau, camion) ; • Utiliser des matières premières situées plus près (ex. : matériaux de bancs d'emprunt) ; • Réduire les retours à vide dans le camionnage ; • Utiliser des moyens de transport émettant moins de GES.
	RECHERCHE ET DÉVELOPPEMENT	Mener des activités de recherche et développement pour la conception de produits, matériaux, pratiques ou technologies dont le mode de production ou l'utilisation permet de réduire les émissions de GES. Examples: • Écoconception ; • Conception de procédés moins émetteurs de GES.
MES	CHANGEMENT DANS LES COMPORTEMENTS QUOTIDIENS	

Table 32: Exemples de mesures de réduction des émissions de GES (liste non exhaustive)

	INFORMATION ET SENSIBILISATION	Informer et sensibiliser les employés, les fournisseurs, les clients et les usagers quant aux façons de réduire les émissions de GES. Examples: • Réaliser des campagnes d'information ou de sensibilisation ; • Faire la promotion des bonnes pratiques de réduction des émissions de GES.
	FORMATION	Permettre aux différents acteurs de s'approprier les bonnes pratiques qui favorisent les économies d'énergie ou la réduction des émissions de GES. Examples: • Formation sur la gestion responsable des matières résiduelles ; • Formation sur l'intégration de procédés, l'efficacité énergétique, les énergies renouvelables, etc. ; • Formation sur l'économie circulaire ; • Formation à l'écoconduite du personnel.
	ENGAGEMENTS OU ACCORDS VOLONTAIRES	S'engager à viser des objectifs de réduction volontaire des émissions de GES. Examples: • Se fixer des objectifs annuels de réduction de l'intensité des émissions de GES par unité produite ; • Établir une procédure pour limiter les émissions de HFC des systèmes de réfrigération ; • Établir une politique de consommation responsable d'énergies ; • Contribuer à des mesures de réduction auprès de tiers (ex. : installation de bornes électriques) ; • Favoriser l'économie circulaire et la symbiose industrielle.

A.4. Plan de surveillance des émissions de GES

Le plan de surveillance permet de quantifier les émissions de GES engendrées par le projet et de suivre leur évolution à travers le temps. Il vise surtout à faciliter le travail d'un initiateur dans la mise en place de bonnes pratiques en matière de quantification des émissions de GES. Typiquement, un plan de surveillance inclut notamment le type de données à recueillir (ex. : la consommation de carburant, le processus et les méthodes pour recueillir ces données, la fréquence, etc.). Il vise à faciliter la quantification des émissions de GES et peut évoluer sur la durée de vie du projet.

Lorsqu'un projet en cours est soumis au RDOCECA, la déclaration des émissions de GES constitue un excellent outil de suivi. Or, tous les projets ne sont pas assujettis au RDOCECA, et ce règlement ne vise pas les émissions de construction ni les émissions de post-fermeture. Dans ce contexte, la norme ISO 14064 et le document « Mitigation Goal Standard du GHG Protocol » (World Ressources Institute, 2018) peuvent être utilisés à titre de références. Étant donné le grand nombre de cas de figure possibles, chaque cas étant unique, un exemple de plan de surveillance et de suivi des émissions de GES est présenté ci-après.

Category	Types de données	Unités	Source des données	Fréquence
Équipements motorisés	Consommation de carburant de chacun des véhicules	Litres	Factures	Mensuelle/ annuelle
	Kilométrage de chacun des véhicules	Kilomètres	Odomètres	Mensuelle/ annuelle
	Heures d'utilisation des véhicules hors route	heures	Registre des opérations	Mensuelle/ annuelle
Bâtiments	Consommation de combustibles	Litres	Factures	Mensuelle
	Consommation d'électricité	Kilowattheures	Factures	Mensuelle
Groupes électrogènes	Consommation de carburant	Litres	Factures	Mensuelle
	Heures de fonctionnement	heures	Registre des opérations	Mensuelle
Émissions fugitives	Émissions de SF6 ou PFC, ou autres	m3	Registre des opérations	Mensuelle

B. Formules de calcul des émissions de GES

B.1. Calcul des émissions des systèmes de combustion fixes

Les émissions de GES attribuables à la production d'énergie, sous la forme d'électricité, de chaleur ou de vapeur par des systèmes de combustion fixes (ex. four ou appareil de combustion, chaudière, génératrice, etc.), doivent être calculées conformément à l'équation 1. Les facteurs d'émission à utiliser sont ceux des tableaux 1-1 à 1-8 de l'annexe A.2 du Règlement sur la déclaration obligatoire de certaines émissions de contaminants dans l'atmosphère (RDOCECA).

Les émissions de GES des systèmes de combustion fixes se calculent à l'aide de l'estimation de la quantité de divers types de combustibles consommés et des facteurs d'émission de GES correspondant à chaque type de combustible (i), tel que présenté à l'équation 1.

Équation 1. Émissions de GES attribuables à des sources de combustion fixes

$$\text{Émissions de gaz à effet de serre} = \sum_{i=1}^{i=n} \text{Quantité de combustible } i \text{ consommée} \times \text{Facteur d'émission}_i$$

Cette équation peut être utilisée pour tous les types de combustibles, y compris les combustibles dont la source est la biomasse.

B.2. Calcul des émissions des systèmes de combustion mobiles

Les sources visées, incluant leur utilisation par des sous-traitants, sont :

a. Tout équipement mobile typiquement utilisé sur le site d'une installation ou d'un établissement pour le transport ou le déplacement de substances, de matériaux ou de produits ;
b. Tout équipement mobile (ex. : tracteur, grue, niveleuse, chargeuse-pelleteuse et bouteur) utilisé pour réaliser les activités de construction, d'exploitation (ex. : activités de transbordement et transport du minerai) ou de fermeture du projet ;
c. Les émissions attribuables au transport des matériaux entrants nécessaires à la construction et à l'exploitation ;
d. Les émissions attribuables au transport des matériaux d'excavation et de remblai sortants générées par la construction et l'exploitation ;
e. Les émissions attribuables aux équipements mobiles utilisés directement ou indirectement par certaines activités comme le transport des travailleurs, des matières premières ou des produits finis.

Les émissions des systèmes de combustion mobiles sont estimées à partir de l'équation 2 pour chaque type de combustible (i). À noter que l'équation 2 est la même que l'équation 1, mais que les facteurs d'émission diffèrent.

Équation 2. Émissions de GES attribuables à l'utilisation d'équipements mobiles

$$\text{Émissions de gaz à effet de serre} = \sum_{i=1}^{i=n} \text{Quantité de carburant } i \text{ consommée} \times \text{Facteur d'émission}_i$$

Pour ce qui est des facteurs d'émission de GES des carburants, référer aux tableaux ci-après.

Tableau 3. Facteurs d'émission des carburants ou des combustibles, en équivalents CO_2

Carburants et combustibles liquides	gCO_2/litre	gCH_4/litre	gN_2O/litre	gCO_2e/litre	Référence
Essence pour automobile	2 307	0,14	0.022	2 317	*
Carburants diesel	2 681	0,11	0.151	2 729	*
Propane	1 515	0,64	0.028	1 539	*
Véhicules hors route à essence	2 307	10,61	0.013	2 576	*
Véhicules hors route au diesel	2 681	0,073	0.022	2 689	*
Véhicules au gaz naturel	1,9	0.009	0,000 06	2 143	*, ***
Essence d'aviation	2 365	2,2	0.23	2 489	*
Carburéacteur	2 560	0,029	0.071	2 582	*
Trains alimentés au diesel	2 681	0,15	1	2 983	*
Bateaux à essence	2 307	0,22	0.063	2 331	*
Navires à moteur diesel	2 681	0,25	0.072	2 709	*
Navires au mazout léger	2 753	0,26	0.073	2 781	*
Navires au mazout lourd	3 156	0,29	0.082	3 188	*

Tableau 4. Facteurs d'émission des biocarburants, en équivalents CO_2

Biocarburants liquides	Émissions biogéniques	Émissions non biogéniques		Référence
	Facteur d'émission (gCO_2/litre)	Facteur d'émission (gCH_4/litre)	Facteur d'émission (gN_2O/litre)	
Éthanol (100 %)	1508	0.14	0.022	*

Tableau 4. Facteurs d'émission des biocarburants, en équivalents CO_2				
Biodiesel (100 %)	2 472	0,11	0.151	*
Biocarburants gazeux	Émissions biogéniques	Émissions non biogéniques		Référence
	Facteur d'émission (gCO_2/m^3)	Facteur d'émission (gCH_4/m^3)	Facteur d'émission (gN_2O/m^3)	
Biogaz	1 887	0,037	0.033	**

* *Rapport d'inventaire national* (RIN) 1990-2017. Partie II. Tableau A6-13 – *Emission Factors for Energy Mobile Combustion Sources*.

** RIN 1990-2017. Partie II. Tableaux A6-1 et A6-2.

*** Aux conditions standards de température et pression.

Pour ce qui est des émissions de GES attribuables à l'utilisation d'équipements mobiles hors route, il est aussi possible d'estimer la consommation de combustible à partir du facteur BSFC (Brake Specific Fuel Comsumption) qui représente la consommation de diesel des équipements par puissance (HP) et par heure d'utilisation. Ce facteur est exprimé en livres de diesel par HP et par heure et peut être déterminé à partir des tableaux A4, C1 et C2 du document « Exhaust and Crankcase Emission Factors for Nonroad Engine Modeling-Compression-Ignition in MOVES201X », publié par l'United States Environmental Protection Agency (USEPA)[13].

B.3. Émissions de GES indirectes attribuables à la consommation d'énergie électrique

Les émissions annuelles de GES indirectes attribuables à la consommation électrique (en réseau) peuvent être déterminées à partir de la consommation annuelle d'électricité et du facteur d'émission de GES associé à la production d'électricité au Québec. Le tableau A13-6 du Rapport d'inventaire national d'Environnement et changement climatique Canada[14] indique les grammes d'équivalent CO_2 émis par kilowattheure d'électricité générée au Québec. Comme les rapports d'inventaire sont annuels, les facteurs à utiliser doivent être les plus récents.

Si l'électricité provient d'une centrale thermique, les émissions de GES peuvent aussi être calculées à partir de la consommation annuelle d'électricité prévue et de l'intensité des émissions de GES (en grammes d'équivalent CO_2 par kilowattheure) de la centrale.

[13] https://nepis.epa.gov/Exe/ZyPDF.cgi/P10005BI.PDF?Dockey=P10005BI.PDF
https://cfpub.epa.gov/si/si_public_file_download.cfm?p_download_id=534575.
https://nepis.epa.gov/EPA/html/DLwait.htm?url=/Exe/ZyPDF.cgi/P10005BI.PDF?Dockey=P10005BI.PDF

[14] Canada-national Inventory Report 1990-2017- Partie 3, tableau A13-6 Electricity Generation and GHG Emission Details for Quebec (non disponible en français au moment de rédiger ce guide).

B.4. Émissions de GES attribuables aux procédés industriels

Le RDOCECA est la principale référence pour la quantification des émissions de GES du secteur industriel. Si aucun des protocoles du RDOCECA n'est applicable au type de procédé ou à l'équipement utilisé, d'autres méthodes de quantification des émissions de GES doivent être utilisées. Le cas échéant, il faut préciser la méthodologie et les calculs détaillés et fournir les références à l'appui. Les méthodes de quantification doivent être fiables, reconnues et vérifiables.

B.5 Émissions fugitives de GES attribuables aux émissions fugitives d'hexafluorure de soufre et de perfluorocarbures

Les émissions d'hexafluorure de soufre (SF_6) et de perfluorocarbures (PFC) dont il est question ici sont associées au transport et à la distribution d'électricité. L'impact de ces émissions est principalement dû au fait que les émissions sont fugitives (donc difficiles à contrôler) et aux potentiels de réchauffement planétaire élevés de ces substances. Le potentiel de réchauffement du SF_6 est près de 23 000 fois supérieur à celui du CO_2 et celui des PFC peut être près de 18 000 fois supérieur à celui du CO_2. L'autre enjeu est le fait que ces gaz ont remplacé des substances délétères (telles que les biphényles polychlorés, c'est-à-dire les BPC) et qu'il n'y a pas encore, à ce jour, de solution de remplacement moins émissive. Dans l'optique où la sécurité énergétique est essentielle, la connaissance des impacts de ces substances, l'application de bonnes pratiques, la recherche et le développement s'avèrent des options souhaitables.

Lors de l'opération des équipements de transport et de distribution d'électricité, des émissions fugitives de SF_6 ou de PFC peuvent survenir en relation avec :

- les opérations de manutention et de transfert de gaz ;
- l'exploitation des équipements ;
- une panne mécanique des équipements.

Pour calculer les émissions fugitives de SF_6 ou de PFC attribuables à la distribution d'électricité, il est possible d'utiliser la méthodologie de l'Association canadienne de l'électricité[15] basée sur les facteurs d'émission, conformément aux équations ci-après.

[15] Environnement Canada. Association canadienne de l'électricité. *Appendix A Protocole d'estimation et de déclaration des émissions de SF_6 pour les services d'électricité* (version finale). Page 32. http://publications.gc.ca/collections/collection_2013/ec/En4-229-2008-fra.pdf.

Équation 3. Estimation des émissions de GES attribuables aux équipements contenant du SF6 utilisés pour le transport et la distribution d'électricité

$$E_{SF6} = (0{,}01 \times Cht_{SF6} + 0{,}7 \times ChiSF6_{EMR}) \times PRP_{SF6} \times 0{,}001$$

Où :

E_{SF6} = Émissions de GES attribuables à l'utilisation de SF_6, exprimées en tonnes d'équivalent CO_2 par année ;

Cht_{SF6} = Charge totale de SF_6 dans les équipements existants pendant l'année t, exprimée en kilogrammes de SF_6 par année ;

$ChiSF6_{EMR}$ = Charge initiale de SF_6 dans les équipements mis au rebut, exprimée en kilogrammes de SF_6 par année ;

PRP_{SF6} = Potentiel de réchauffement planétaire du SF_6 ;

0,001 = Facteur de conversion de kilogrammes à tonnes.

Équation 4. Estimation des émissions de GES attribuables aux équipements contenant des PFC utilisés pour le transport et la distribution d'électricité

$$E_{PFC} = (0{,}01 \times Cht_{PFC} + 0{,}7 \times ChiPFC_{EMR}) \times PRP_{PFC} \times 0{,}001$$

Où :

E_{PFC} = Émissions de GES attribuables à l'utilisation de PFC, exprimées en tonnes d'équivalent CO_2 par année ;

Cht_{PFC} = Charge totale de PFC dans les équipements existants pendant l'année t, exprimée en kilogrammes de PFC par année ;

$ChiPFC_{EMR}$ = Charge initiale de PFC dans les équipements mis au rebut, exprimée en kilogrammes de PFC par année ;

PRP_{PFc} = Potentiel de réchauffement planétaire du PFC ;

0,001 = Facteur de conversion de kilogrammes à tonnes.

Comme la méthodologie décrite précédemment pourrait s'avérer difficilement applicable dans le cadre d'un avant-projet, il est possible d'utiliser toute autre méthodologie de calcul des émissions fugitives de SF_6 et de PFC, pourvu qu'elle soit présentée au Ministère avec le niveau de détails nécessaire et qu'elle repose sur des références et des hypothèses crédibles et vérifiables.

B.5. Émissions de GES attribuables aux activités de déboisement

Les activités de déboisement peuvent avoir des impacts importants sur les changements climatiques, lesquels sont documentés notamment par le GIEC sous l'appellation « changement d'affectation des terres ». Le secteur forestier a la capacité de séquestrer le carbone atmosphérique dans la biomasse et, par conséquent, de réduire sa concentration dans l'atmosphère. Selon la documentation scientifique, les écosystèmes forestiers constituent des réservoirs de carbone, et certains projets de grande envergure spatiale (ex. : construction de routes, exploitation d'une mine, construction d'un lieu d'enfouissement technique ou exploitation des hydrocarbures) peuvent affecter ces réservoirs.

Si des activités de déboisement sont réalisées (généralement en phase de construction), un calcul des émissions de GES qui leur sont attribuables doit être effectué. Si des activités de déboisement sont prévues à d'autres phases du projet, elles devront aussi être considérées.

Pour calculer les émissions de GES attribuables au déboisement, il est recommandé de se référer au document du GIEC « Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories Volume 4 : Agriculture, Forestry and Other Land Use » (2019)[16]. Ces émissions peuvent être calculées en réalisant un bilan de la quantité de carbone présente dans un réservoir de carbone avant et après le projet, à partir de l'équation suivante.

Équation 5. Émissions de CO_2 attribuables au déboisement

$$\text{Émissions de GES } (tonnes_{CO2}) = N_H \times t_{Msh} \times (1 + T_x) \times CC \times \frac{44}{12}$$

Où :

$tonnesCO_2$ = Émissions de CO_2 attribuables au déboisement, exprimées en tonnes ;

N_H = Nombre d'hectares déboisés ;

t_{MSh} = Tonnes de matières sèches par hectare ;

T_x = Taux de biomasse souterraine par rapport à la biomasse aérienne ;

CC = *Contenu en carbone du bois, en tonnes de carbone par tonne de matières sèches ;*

44/12 = Ratio masse moléculaire de CO_2 par rapport à la masse moléculaire de C.

16 https://www.ipcc-nggip.iges.or.jp/public/2019rf/index.html.

Tableau 6. Paramètres de l'équation pour déterminer les émissions de CO_2 reliées aux activités de déboisement	
Paramètre	Références du GIEC
t_{MSh}	Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories Volume 4 : Agriculture, Forestry and Other Land Use. Tableau 4.7
Tx	Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories Volume 4 : Agriculture, Forestry and Other Land Use. Tableau 4.4
CC	Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories Volume 4 : Agriculture, Forestry and Other Land Use. Valeur par défaut = 0,47.

Les émissions de GES dues à la consommation de combustibles ou de carburants des équipements fixes ou mobiles, utilisés lors des activités de déboisement, doivent être calculées à l'aide des méthodologies présentées aux sections sur les systèmes de combustion fixes et mobiles.

De plus, le cas échéant, les émissions (ou réductions d'émissions) de GES dues à la valorisation du bois coupé ou à la décomposition des résidus de coupe laissés sur place doivent être calculées. Toute méthodologie reconnue, basée sur des hypothèses crédibles et vérifiables, peut être utilisée pour faire l'estimation de ces émissions (ou réductions d'émissions).

B.6. Autres calculs potentiels

Si l'initiateur détermine d'autres sources d'émission, il est de sa responsabilité d'évaluer les émissions de GES qui pourraient en découler, le cas échéant. Le ministère est disponible pour toute question et pourra fournir les équations de calcul des émissions de GES, au besoin.