Applicant Submission

QUANTUMPLACE DEVELOPMENTS LTD.
SUITE 203, 1026 16 AVENUE NW
CALGARY, ALBERTA T2M 0K6

May 10, 2022

Angie Dean
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Re: Future Energy Park Applicant Submission

Project Description

The "Future Energy Park" project will be a renewable energy biofuels facility that will produce bioethanol and biogas from low-grade wheat sourced from Alberta and western Canada farmers for delivery into the Alberta fuel market (both gasoline and natural gas). The facility is located at 4920 68 St SE Calgary or SE1/4 1-24-29-4 (hereafter known as the subject site). The plant will utilize high efficiency cogeneration technology to produce steam and electricity for use at the facility, with excess power sold into the Alberta Interconnected Electric System (AIES). The plant will also be equipped with an onsite water treatment facility, and a future carbon capture facility.

The site has access to Stoney Trail, reasonable proximity to a CN rail line with an intermodal trans-loading facility, as well as numerous grain terminals within a 100 km radius. It's location within Calgary offers the advantage of a large labor pool, plus all the amenities needed to service the Future Energy Park during construction and ongoing operations.

The facility will be owned and operated by Future Energy Park Inc., a wholly owned subsidiary of Green Impact Partners, a publicly traded Canadian clean technology and energy transition company, that develops, owns and operates sustainable and green energy facilities. Green Impact Partners is based in Calgary, Alberta.

Context

The subject site is located to the east of Stoney Trail and to the south of Peigan Trail within the City of Calgary boundary. It is also adjacent to Rocky View County to the east. The current land use district is Special Purpose – Future Urban District (S-FUD). Land to the west is designated as Special Purpose - Transportation and Utility Corridor (S-TUC) with other areas of S-FUD to the north and south. Industrial districts within Rocky View County are located to the east of the subject site.

We understand that The City of Calgary recently approved an Outline Plan application from Real Estate and Development Services (REDS) that calls for industrial uses at the subject site and surrounding lands. This proposal generally aligns with the intent of the REDS application, and

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ongoing discussions between the applicant and REDS will ensure that this application is consistent with the general intent of the Outline Plan.

Policy

Municipal Development Plan (MDP)

The subject site is identified as Industrial Greenfield in the MDP intended for future industrial uses. The Future Energy Park will be a heavy industrial use which aligns with the intent of the MDP.

Shepard Industrial Area Structure Plan (ASP)

The subject site is identified within an Industrial/Business Area on Map 3: Land Use Concept of the Shepard Industrial ASP. The purpose of the Industrial/Business area is to provide a wide variety of general industrial and business uses within the context of a fully-serviced industrial/business park. As this subject site is proposed to be predominantly heavy industrial with supporting uses as identified previously, this land use redesignation aligns with the ASP.

The applicant recognizes that interface policies may apply to the subject site related to the proposed regional pathway and other considerations. This will be addressed at the development permit stage.

Rocky View County/City of Calgary Intermunicipal Development Plan

The subject site is considered part of an Intermunicipal Entranceway, consideration of entranceway requirements for both The City of Calgary and Rocky View County will occur during the development permit stage. The applicant also recognizes that this application will be circulated to Rocky View County for review.

Improving Calgary's Entranceways: A Guide for Development Adjacent to Entranceways

Peigan Trail SE is identified as an Entranceway and Stoney Trail SE is identified as an Entranceway Route within the policy. Therefore, a variety of screening and landscaping opportunities will be explored at the development permit stage.

Operational Description

Produced ethanol will be stored on site and shipped to Alberta fuel blending facilities for blending with gasoline for distribution across North America. The ethanol will be loaded onto railcars via a <1km pipeline to a nearby rail loading facility located on the northeast edge of Calgary.

Production Process

Grain Handling System

A redundant leg and bin style grain handling facility has been designed to handle the wheat with approximately 20 days total storage. Grain trucks will enter and exit the facility egressing two

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weigh scales, one for incoming truck traffic and the other for outbound truck traffic. The grain will then be stored in multiple silos. There will be four silos and two legs with a maximum height of approximately 37m.

Ethanol Plant Process

After weighing and storing the wheat, the conversion from wheat to starch and then to ethanol is ready to begin. The wheat is first milled by a dry grinder into a coarse grained texture and fed into a soaking tank. The soaking tank contains water which softens the fiber component of the coarse grind to free any additional starch bound to the fiber. This homogeneous wet slurry product is then fed into a pre-liquefaction tank which is at the optimum temperature for a special enzyme to be added specifically for wheat fermentation. This enzyme starts the breakdown process converting the wheat starch to sugar and prevents the slurry from becoming too viscous. The pre-liquefaction mash is then heated and fed into the liquefaction tank where a second enzyme is added. At this point the wheat has now been processed into starch, and ready for the starch to ethanol conversion process.

The starch slurry is then pumped through a pressurized heat system to denature the first two enzymes once the enzymes have initiated the reaction. The mixture is then cooled by an atmospheric or vacuum flash condenser. After the condenser has cooled the mash to the optimal temperature, the third enzyme is added, and the mixture is held for 1-2 hours at this temperature to allow the third enzyme further time to break down the starch. This mixture is then pumped into the fermentation tanks.

Once inside the fermentation tanks, the mixture is referred to as mash. The glucoamylase enzyme breaks down the dextrins to form simple sugars. Yeast is added to convert the sugar to ethanol and carbon dioxide. The mash is then allowed to ferment for 50–60 hours, resulting in a mixture that contains 13.3 percent ethanol as well as the solids from the grain and added yeast. The fermented mash is pumped into a multi-column distillation system where additional heat is added. The columns utilize the differences in the boiling points of ethanol and water to boil off and separate the ethanol. By the time the product stream is ready to leave the distillation columns, it contains about 95 percent ethanol by volume. The residue from this process, called whole stillage, contains non-fermentable solids and water and is pumped out from the bottom of the columns. From here, the whole stillage can proceed down two different paths: (i) the primary path, directly into the digester to make biogas or (ii) the secondary path into decanters which will separate whole stillage into thin stillage and Wet Distillers Grain (WDGs). This optionality adds a redundant system in case one or the other systems goes down.

The final step strips away the final 5 percent of water from the ethanol. The 90-proof ethanol is passed through a molecular sieve to physically separate the remaining water. This step produces

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200-proof anhydrous ethanol which is then splashed with denaturant to ensure it is distasteful for human consumption.

Wet Distillers Grain (WDGs)

Most ethanol facilities produce WDGs which is sold as cattle feed; however, in this project, the WDGs is pumped into the biodigestor to be further processed into biogas; a high value product in the Alberta fuel market. Notwithstanding the ability to convert WDGs into biogas, the Facility has maintained the option to produce WDGs which is accounted for in the DC Rationale below.

Biodigester Plant Process Description

Whole stillage will exit the ethanol facility where there is a buffer tank for flow regulation. The buffer tank is being used to equalize flow from the ethanol facility and ensure the digester runs 365 days per year. The tank is sized so it would normally be 30% full. After being stored in the buffer tank, the whole stillage is fed into one of the eight biodigestor groups. Each group includes two biodigestors and a technical container for control and maintenance. The retention time in the digesters is approximately twenty (20) days to ensure maximum conversion into biogas. The produced biogas has a 60.0% methane content. No additional material is added to the biodigestors.

After exiting the digester, the biogas is upgraded and prepared for sale into the local natural gas distribution network. Biogas is produced at a rate of 4 million gigajoules (GJ) per year.

Through this process, all water entering the biodigestor will be removed through centrifugal decanters and evaporators to be recycled back through the system; thereby substantially reducing the overall water needs of the biofuels facility.

A by-product of the biodigestion process is nutrient rich biomass or "wet cake" that will be sold as cattle feed, compost or fertilizer. Decanters and evaporators will dewater the mixture. The dewatered fertilizer will be stored on a concrete apron before being sent to nearby farms and spread over land as fertilizer or a soil enhancement for crop production. Any excess water will be recovered and recycled for use back into the facility. There is a liquid fertilizer stream that is also produced through the evaporators that will be sold to nearby farms for crop irrigation through land spread.

CO2 Capture

As part of the fermentation process, carbon dioxide (CO2) is produced from both the ethanol and renewable natural gas production facilities. The project intends to capture the CO2 from the ethanol and renewable natural gas production processes by installing a CO2 capture facility. This facility will capture gaseous CO2, and then liquify and compress it for transportation, either by truck or pipeline, for permanent storage in a CO2 sequestration reservoir. The Project is

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evaluating both transportation options. There will also be a need for temporary CO2 storage onsite.

Feedstock Transportation

The Province of Alberta produces approximately 12.8 million tonnes of wheat; of which, 9.8 million tonnes are exported without any further value added processing (approximtely 80% of Alberta's annual production). Alberta is one of three western Canada wheat producing Provinces which combined, produce approximately 29.0 million tonnes of wheat annually, of which 24.0 million tonnes are exported annually. The facility will require approximately 890,000 metric tonnes of wheat annually that will be trucked in from local producers. This will result in approximately 65 trucks per day (during normal business hours, 6 days per week), entering and leaving the site. Each truck will be given a scheduled unload time to assist in managing on-site truck traffic and prevent line-ups at the plant gate.

Cogeneration

The Project will have an onsite cogeneration facility using natural gas to produce both electricity and steam for use throughout the site. The cogeneration plant will generate approximately 28.8MW of electricity, of which approximately 24MW will be used by the Project and the remainder supplied to the local electrical grid.

DC Rationale

The main purpose of the Future Energy Park is to produce ethanol (biofuel) and renewable natural gas (biogas) from low-grade wheat which lends itself to the Industrial – Heavy (I-H) District. However, there are a number of unique and innovative uses proposed for this site that will require a Direct Control (DC) District based on the I-H District and include a Fertilizer Plant and a Power Generation Facility – Large.

Fertilizer Plant

Some of the byproducts of the Future Energy Park will be digestate and stillage (WDGs) which may be used as cattle feed, fertilizer, and/or a soil amendment. These byproducts willbe sold to local farmers.

Power Generation Facility – Large

A cogeneration facility, producing power and steam will be located on the subject site with a total generation capacity of approximately 28.8MW (two x 14.4MW.gas fired turbines)

Waste Disposal and Treatment Facility

If the stillage byproduct from the Future Energy Park is not used as fertilizer, it will be considered waste and therefore this use will be necessary.

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Utility Building
A utility building greater than 10.0 sqm will be required on the subject site.

Sewage Treatment Plant
The applicant is still determining how the site will be serviced however, it is possible that onsite treatment will be used to treat sanitary wastewater.

Proposed Changes to I-H District Rules
In addition to the uses identified above, due to the nature and context (adjacent to S-TUC district) of the subject site, the following setback changes are proposed for the DC district:

Rear Setback Area
Change from a minimum depth of 50.0 metres (due to adjacency the S-TUC district) to a minimum depth of 10.0 metres.

Side Setback Area
Change from a minimum depth of 50.0 metres (due to adjacency the S-TUC district) to a minimum depth of 10.0 metres.

General Industrial – Heavy Use
The definition for the "General Industrial – Heavy" use has been amended to allow for carbon capture and storage, and to allow for the crushing, dismantling, sorting or processing of goods including with chemicals or the application of heat.

Provincial Approvals
Provincial approvals including Environmental Protection and Enhancement Act (EPEA) (January 2023), Water Act (December 2022), Rule 007 Application for the construction and operation of a cogeneration facility (December 2022) are proceeding in a parallel process. The Historical Resources Impact Assessment (HRIA) was approved in February 2021. Further information can be found in Attachment N.

Next Steps
While a concurrent development permit application is not being pursued, the applicant will be preparing the development permit application.

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Sincerely,

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QuantumPlace