APPENDIX H: Information Provided to Media and Public

In-Person Meetings

Date	Event / Audience / Subjects Discussed	SWPC Participants
2019	Meeting with Lewisporte Town Counsel to Discuss TNEC Project Concept	Todd Manual Bryan Borland Rod Black
07/2019	Full Presentation to Lewisporte Town Counsel plus MP Scott Simms, MHA Dereck Bennett. All attendees expressed support for the TNEC Project	Todd Manuel, Keith Hulbert, Bary Wilson Bryan Borland
07/2019	Full Presentation to Grand Falls Windsor Town counsel and Frank Sur. All attendees expressed support for the project.	Todd Manuel, Keith Hulbert, Bary Wilson
07/2019	Meeting with Wood Group in St. John's to discuss TNEC Project Registration	Todd Manual, Keith Hulbert, Bary Wilson,
2019	Die Track Technical College in Lewisporte to discuss support of curriculum there and help plan	Todd Manual, Keith Hulbert, Bary Wilson
2019	Meeting with Wood Group in St. Johns to discuss project registration	Keith Hulbert, Bary Wilson, Todd Manuel
09/2019	Meeting with Lewisporte, Grand Falls Windsor, and Cambellton officials to discuss Project (All approved)	Keith Hulbert, Bary Wilson, Todd Manuel
09/2019	Meeting with Nalcor and NL Hydro leadership Teams in St.Johns. All attendees supportive	Todd Manuel, Keith Hulbert, Bary Wilson
09/2019	Meeting with NL Hydro Ken Goulding	Keith Hulbert
09/2019	Meeting and tour of Central NL Waste Mgt Landfill and MRF. Waste Management team supports Project	Todd Manuel Keith Hulbert Bary Wilson
09/2019	Television Interview	Keith Hulbert
09/2019	Full project presentation to Provincial Government in St. .John's, including Dereck Bennett, Minister Derek Bragg Minister Siobhan Coady, and Dept. Ministers and Staff	Keith Hulbert, Todd Manuel Bary Wilson
09/2019	Second Meeting with NL Provincial leaders in St. John's	Keith Hulbert, Todd Manuel, Bary Wilson
2021	Lewisporte Harbor Master (supports the project)	Todd Manuel
2021	Petroleum Storage Tank Manufacturer (supports project)	Todd Manuel
2021	Lewisporte Harbor Pilot (supports project)	Todd Manuel
2021	Local Chamber of Commerce	Todd Manuel
2021	Local Media	Todd Manuel
2021	Potential Contractors	Todd Manuel
2021	Other meetings area town officials	Todd Manuel Bryan Borland

MS Teams and Zoom Video Conference Meetings

Date	Event / Audience / Subjects Discussed	SWPC Participants
4/27/21	Town of Lewisporte Citizen Video Conference Krista Freake, Betty Clark Perry Pond, Steven Hollett, Ken Tucker, Ben Hooper	Keith Hulbert, Bary Wilson, Darren Lloyd
7/12/2021	MS Teams Meeting Nancy Griffiths and Frank Ricketts of Wood Group to discuss project registration	Bary Wilson, Todd Manuel, Keith Hulbert Brandon
7/23/2021	MS Teams Meeting Nancy Griffiths and Frank Ricketts of Wood Group to discuss project registration	Bary Wilson, Todd Manuel, Keith Hulbert Brandon Wilson
8/17/2021	MS Teams Meeting Nancy Griffiths and Frank Ricketts of Wood Group and Provincial Regulators Joanne Adams, Jill Sweeney to discuss project registration	Bary Wilson, Todd Manuel, Keith Hulbert Brandon Wilson
10/08/2021	MS Teams Meeting Nancy Griffiths and Susann Hickey of Wood Group to discuss project registration	Bary Wilson, Todd Manuel, Keith Hulbert Brandon Wilson
2021	Multiple Team Meetings with suppliers for both CHP and HTL process units and components	Bary Wilson, Keith Hulbert Brandon Wilson, Barry Liss

Media Outreach (Newspaper, Radio, Television, Internet, Website)

Date	Event / Audience / Subjects Discussed	SWPC Participants
9/30/19	Call in Radio Show with Paddy Dailey to answer questions from the public	Keith Hulbert
10/07/19	Call in Radio Show with Paddy Dailey to answer questions from the public	Keith Hulbert
2019	Letter to the Editor of the Telegram in St. John's (Text of Letter Attached)	Bary Wilson Todd Manuel
2019	Posting an extensive FAQ in the Synergy World Power Website. The text of the publicly available FAQ is attached.	Bary Wilson Brandon Wilson
2019	Blog Post in Response to CBC Article on the TNEC Project (Text of Response Attached)	Bary Wilson

Terra Nova Energy Center Frequently Asked Questions with Answers

https://www.synergyworldpower.com/new-foundland/

Q1. What are the main differences between incineration and gasification?

A1. In the incineration process, waste is combusted in a single chamber. The large amount of air required for complete combustion (approximately six tons of air for every ton of waste) leads to high mass transfer rates in the combustion chamber, with entrainment of particulate matter in the exhaust gas and poor control of flame temperature.

In gasification, only about 30% of the air required for complete combustion is fed into the pre-heated gasifier chamber (in this case a rotary kiln). The fuel in this chamber is further heated through partial combustion during which the material is volatilized to form a clean fuel gas (mainly N_2, CO, CO_2, H_2, H_2O, and CH_4). This fuel gas (known as producer gas) is sent to a LoNOx gas burner for final, complete combustion. Using recycled flue gas mixed with outside air, pollutant pre-cursors are destroyed, and flame temperatures can be maintained below the temperatures at which thermal NOx forms. This method prevents pollutants from forming while increasing efficiency and reducing equipment size and cost. EPR's LoNOx gasification of solid recovered fuel (SRF), comprised mainly of dry biomass and plastic, is more reliable and cleaner than incineration, especially mass burn incineration, in which little or no sorting of the waste is done prior to the combustion process.

Q2. Why does the SWP gasification power plant use a boiler and steam turbine for electric power generation instead of directly using the fuel gas to fire piston engine generators?

A2. The first steam turbine driven dynamo was demonstrated in the 1880s and these reliable and efficient prime movers now account for more than 80% of the electrical power generated in the United States. While steam turbine generators may be less thermally efficient than piston engines as prime movers for electrical generators, at the 50 MW generating capacity scale, steam turbines are safer, cleaner, and less expensive, as well as more rugged and reliable.

The fuel gas produced in the gasifiers leaves the reactor at high temperature and would need to be cooled to near ambient before it can be used in a piston engine. As the fuel gas cools, tars condense out of the gas phase and these can cause operating problems in piston engines. Additionally, CO and NOx formation are very difficult to control in reciprocating engines. In the EPR LoNOx system, the hot fuel gas is cleanly combusted using a combination of outside air and recycled flue gas. This hot combustion product gas >900 Degrees C is cooled to an optimal temperature for boiler operation (about 760 Degrees C) by recycled flue gas and directed to heat recovery boilers that produce the steam to drive the turbine generators. This use of proven conventional steam power plant equipment results in a safe, reliable and environmentally responsible power plant.

Q3. How will the plant convert waste plastics to diesel and gasoline?

A3. Plastics are polymers made from fossil fuels such as petroleum, natural gas or coal. Polymers are long chains of tens of thousands of repeating chemical units, mostly carbon and hydrogen. When heated in the right conditions, some of the chemical bonds in the chain break in a process called cracking. From plastics such as polyethylene and polypropylene, for example, most of the resulting molecules are the same as those that are found in diesel and gasoline fuels. Smaller molecules that form such as methane, ethane, and propane remain in the gas phase and are used to fire generators that supply the plant with electricity. The solid phase by-product of the process is a carbon-rich char that is used as a fuel for the power plant gasifiers.

Q4. What are the major components of the gasses released to the atmosphere from the waste to energy gasification power plant stack?

A4. Stack gas from the WTE power plant will be comprised mainly of inert nitrogen (N_2), carbon dioxide (CO_2), water vapor (H_2O), and oxygen (O_2). The relative percentages of these components in the stack gas from the gasification power plant is shown in Table 1.

Table 1. Exhaust Flue Gas Major Constituent Flows

Product Flue Gas Major Constituents	Mass Flow (lbs/hr)	Percentage of Total Emissions
CO_2	77,668	21.5
H_2O	35,458	9.81
O_2	11,880	3.28
N_2	236,098	65.4
Total	361,105	99.99

Q5. What are the minor and trace components in the stack gas that are regulated by Newfoundland/Labrador (NL) Provincial environmental law and by the US EPA, and what are their concentrations relative to their respective regulatory limits?

A5. SWP designs, builds, and operates its plants to comply with applicable emission standards in the jurisdiction in which the plant is being built as well as those of the US EPA. Industrial air emission standards for the Province of Newfoundland and Labrador are set forth at: https://www.assembly.nl.ca/legislation/sr/regulations/rc040039.htm

Air emission standards commonly have three components. These include:

1. Limits on the concentrations of regulated components emitted from the stack. These concentrations are standardized to a specific % of oxygen in the exhaust or flue gas. In NL, concentrations are normalized to 11% oxygen.

2. Limits on the total amount, by mass, of regulated components emitted annually in units of tons per year. In NL a per ton per annum fee is charged for emission of regulated components over 50 tons p.a., for example.
3. Finally, and most importantly, limits on the overall concentrations of regulated components in ground level ambient air. These latter limits ensure that the total emissions from all sources (e.g., ships, trucks, home heating fires, and the proposed plant) do not exceed the air quality limits. Were a proposed new plant to cause an exceedance of the ambient air quality limits, that plant may not be approved by the regulatory agencies.

NL regulations specify minimum ambient air quality. NL also regulates the concentrations of mercury and dioxins for the overall plant site including the gasification and plastics conversion plants. SWP has not finalized emission estimates for these trace components for this site. However, other designed EPR plants operate at a small fraction of the emission rates required to meet these standards.

Q6. What will the calculated average and maximum ground level concentrations of particulates be to the closest residential dwelling to the stack?

A6. The nearest residence will be about 2.5 km from the onsite stacks. Based on an initial air dispersion analysis, the estimated average and maximum ground level particulate concentration, due to plant operations, at the nearest residence will be 0.5 and 3.0 µg/m3 respectively. This can be compared to the NL ambient air quality standards of 60 and 120 µg/m3 for average and maximum concentrations respectively.

Q7. What is the composition of the regulated gasses released to the atmosphere from the plastics to liquid fuels process, including heater exhaust, flare stacks and reciprocating engine exhaust?

A7. The primary pollutants of interest from the hydrothermal liquefaction portion of the plant will be NOx and CO. While detailed design of this portion of the plant is not complete, the air emissions will be very similar to the emissions from any reciprocating engine, The air pollution control systems will be designed to keep pollutant concentrations well below the NL Provincial industrial air emission guidelines.

Q8. What is the composition of the solid ash residue from the waste to energy gasification power plant?

A8. The bottom ash from the gasification system will be granular and consist of primarily silica, alumina and lime. The surface area reduction that occurs in the gasifiers reduces the leaching potential of the ash. This ash can be used in a variety of construction applications.

There will also be a smaller fraction of fly ash from the air pollution control systems. These fly ash components will contain relatively higher concentrations of salts and will be retained in a lined landfill.

Q9. How much of this ash will be produced annually and how will it be stored or used?

A9. Projected solid residue production is based on the specifications for 750,000 tons p.a. of solid fuel to be used onsite. The fuel will contain around 12% inorganic material that will leave the system as ash. This means about 92,000 tons p.a. of ash will be produced when the plant is running at full capacity. Most of this material will be inert and suitable for beneficial use, in the Newfoundland or potentially in Europe. Around 5% of the ash material will be leachable and thus unsuitable for beneficial use. This will be stored in a lined landfill.

Q10. Are there any beneficial uses for the sintered gasifier ash?

A10. Depending on fuel composition, the sintered gasifier ash should be usable as a sand like material for road traction. This material will be tested for leachability. Batches that meet the US EPA TCLP non-leachability criteria as well as any applicable Canadian Federal and Provincial standards for construction fill can be used for roadbed fill and other construction and architectural uses for sand or fine aggregate. EPR has contacted construction material companies in Europe that have expressed interest in importing this material. This material can also be used for daily cover at the local landfill and transported as backhaul when waste is delivered from the local landfill to the Lewisporte plant.

Q11. Are there any solid waste residues from the plastics to liquid fuels (PTLF) process, and if so, how will they be managed?

A11. The two solid waste streams from the hydrothermal liquefaction (HTL) plant will be plastic rejects such as PVC, the sediment from the plastics washing system, and a small amount of ash representing any inorganic material in the plastics. The sediment, ash and the rejected plastic, comprising 1-3% of the weight in the feedstock, will be landfilled.

Q12. Aside from the gasifier ash, what other solid materials from the process will be sent to the onsite inert landfill?

A12. Certain non-recyclable materials brought onsite will not be suitable for either waste to energy or hydrothermal processing, including ceramics, glass and certain plastics, such as PVC and Teflon. These materials will be sent to a landfill. SWP will enforce strict fuel specifications to minimize the quantity of these materials imported into Newfoundland

Q13. How will the project ensure that the onsite landfill will not negatively impact the environment in the future?

A13. The site will not include a landfill, but will have a storage pad for storing the inert bottom ash until it is removed for beneficial use. Local and export demand for this material may be seasonal. The storage area will accept no putrescible materials and will not support anaerobic production of methane (CH4) carbon dioxide (CO2) or other gases.

Q14. How will the supply of fresh water and management of wastewater and storm water runoff from the site be handled?

A14. The main water source for the project will be surface water from a large pond on the project property. The water management system will include a water treatment plant with associated storage tanks and distribution system. Influent water will be filtered and stored in a tank before treatment, serving as both a reservoir for all process and sanitation functions as well as the fire water reserve.

The primary process uses of water are for make-up to the steam cycle and cooling water for both the power plant and the hydrothermal liquefaction facility. Water is also used for personnel and facility sanitation. Water for make-up to the steam cycle is treated in a conventional reverse osmosis purification.

Storm run-off drainage and plastics washdown drains will be collected in a separate lined settling pond that will be monitored for contaminants and treated as necessary to comply with provincial environmental control policies prior to any effluents being discharged to local waterways. The wastewater treatment system is designed to process and reuse wastewater for multiple purposes including facility sanitation, leachate pipe flushing, site irrigation, and ash conditioning.

Q15. What is the composition of the Selected Recovered Fuel (SRF) that will be imported to be processed at the Lewisporte Plastics to Liquid Fuels (PTLF) and biomass Waste to Energy (WTE) plants?

A15. SRF is sorted, non-recyclable plastic, paper, cardboard and wood. The materials will be baled and wrapped in plastic to prevent fugitive material from leaving the ship while underway or the site while in storage. This system has been successfully used in Europe for storing and shipping SRF for more than a decade. Suppliers in Europe bale and wrap dry plastic and biomass (SRF) and load it onto bulk carrier ships. At the new dock on the south shore of Burnt Bay, bales will be unloaded and stacked outdoors. As needed, bales will be moved indoors to be further sorted prior to final processing to make liquid fuel or electrical energy.

Q16. How much energy will the plant use?

A16. The SWP plant will be a net generator of electrical energy to the grid. Fuel for the conventional steam power plant will come from mainly from the biomass portion of the SRF. There will also be some power generation from the Hydrothermal Liquefaction Plant. Excess renewable power from the plant will be available to the grid at a cost below that of current provincial power rates.

Q17. What are the assurances that the SWP plant will be built and operated in a safe and environmentally responsible manner over the long term?

A17. The Lewisporte plant will be designed, permitted, and operated in strict accordance Newfoundland Provincial Air Emission and Ambient Air Quality Standards, as well as all other Canadian Federal and Provincial environmental regulations. Prior to construction, the project will go through a thorough permitting process, which will include an environmental impact statement and baseline environmental study performed by a highly qualified independent engineering company with offices in St. John's.

Environmental monitoring of air emissions and ambient air quality, as well as monitoring of ground and surface water quality will be carried out as required by law. Material to be placed in the onsite landfill will be tested prior to placement and fuel products will also be analyzed to ensure quality before shipment.

Q18. Will there be any sources of thermal energy at the plant that could be economically used to heat nearby greenhouses for growing food crops?

A18. There are several potential sources of thermal energy that could be provided to nearby facilities. The largest potential source is a combined heat and power system fueled by the biomass gasifier. This would be delivered as hot water to nearby users. There has been local interest in using this heat source for greenhouse farming and a recreational facility. These facilities would not be owned or controlled by SWP.

Q19. What about electrical power to the greenhouses?

A19. The Lewisporte plant will also be able to provide renewable electrical power directly to local greenhouses, or any other industry in the area, at a very competitive rate. The fact that the power will be from a CHP system may also allow the granting of carbon credits.

Letters

Date: 10/22/2021
To: Department of Industry Energy and Technology
Attn: Christine Boland

Dear Ms. Boland,

This letter is in response to the invitation for engagement in Renewable Energy Plan Consultations. We have reviewed the Presentation for Engagement PDF and wish to bring to your attention a Newfoundland renewable energy project that is currently being registered.

The Terra Nova Energy Centre (TNEC) in Lewisporte will be one of the largest and most comprehensive facilities in the hemisphere for the sustainable conversion of biomass and plastic solid waste to renewable energy and clean liquid and gas phase fuels. TNEC will eventually convert approximately 300,000 metric tons per year of non-recyclable plastics into a clean ultra-low sulphur fuel oil using proprietary hydrothermal liquefaction.

Approximately 450,000 metric tons of biomass solid waste diverted from landfill will be gasified to generate to low-cost renewable electrical baseload power, improving grid resiliency. TNEC will also offer low-cost thermal energy, in the form of hot water for greenhouse heating, as well as renewable power and irrigation water through a public private partnership arrangement to newly constructed agricultural greenhouses.

A new deep water bulk cargo port facility with a 280 meter berthing quay, dock, roll-on roll-off ramp, and cranes for the unloading and loading of wrapped or bagged bulk cargo will be constructed on Burnt Bay. This port facility will be owned by TNEC and used for the receiving of some feedstock for the TNEC, as well as export of TNEC produced liquid fuels, recyclable metal, and aggregate. The port facility will be made available for use by other industrial and commercial concerns in the area for export of locally produced commodities such as timber and mining products.

The developer and owner of the project will be Synergy World Power Canada (SWPC), a subsidiary of EnviroPower Renewable, Inc. (EPR). EPR and its subsidiaries are developing a portfolio of plastics to fuel and renewable energy (waste to energy) plants in

the UK, Canada, and the US. When operating at full capacity, the Phase I TNEC plant will generate approximately 200 full time equivalent jobs in the Lewisporte area.

Contributions of the TNEC project to reductions in greenhouse gas equivalent (GHGe) emissions and production of low carbon intensity fuels

Net reductions in greenhouse gas equivalent emissions compared to landfill: Reduction in GHGe emissions of more than 70% are achieved when recyclable materials are removed from solid waste and the non-recyclable residue is thermally converted to electrical power instead of being placed into a landfill. The USEPA WARM model indicates that one short ton of municipal solid waste diverted from landfill reduces GHGe by just under three metric tons.

Production of low carbon intensity liquid fuels in accordance with the Canadian Clean Fuel Standard: A life cycle assessment study by Argonne National Laboratory in the US has shown that the production of diesel fuel from non-recyclable waste plastic requires 96% less energy than the production of the same amount of diesel fuel from crude petroleum, making diesel from plastic a low carbon intensity fuel.

Benefits from the Public Private Partnership components of the TNEC project:

The greenhouse development project will build greenhouses with up to 60 hectares, or more, under glass for year-round growing of fresh produce. The greenhouse project will be administered by the Town of Lewisporte. TNEC will provide greenhouse properties, complete with access and egress, space heating, irrigation water, renewable electrical power, and security. The Lewisporte- TNEC Public Private Partnership will offer these greenhouses for lease at competitive rates to agriculturalists who wish to produce fresh fruits and vegetables or other cash crops.

Dedicated property adjacent to the port facility for industrial development will be developed including availability of locally generated power and thermal energy in the form of process steam or hot water, and access to the port facility for export of forestry or mining products. The TNEC deep-water port will be available for use by Industries located on the property and will obviate the need to upgrade or replace the present deteriorating dock facility at Lewisporte.

Support of the Die Track Technical College will come from TNEC for development of curricula as needed for workforce skills training. TNEC will provide relevant curriculum and instructor support. TNEC will offer apprenticeship or internship programs at the TNEC facility for students and paid tuition for qualified workers desiring to update their skills.

Indoor public swimming pool and recreational centre using heated water and electricity from the TNEC: Lewisporte has requested that a heated indoor swimming pool be included in the TNEC Facility design. TNEC has agreed to provide thermal energy for space and pool water heating to the swimming pool, with the Town of Lewisporte being responsible for construction of the pool as well as pool operations including security, upkeep, and insurance. Additional recreational facilities, if provided at the site, will be the responsibility of the Town of Lewisporte.

We believe that contributions of public funds to pre-construction development of the TNEC project in the form of a grant or forgivable loan to help cover the costs of design and permitting would be appropriate and beneficial to Canada and its sustainability objectives.

Respectfully,

Todd Manuel
Project Development Director Canada
todd@synergywp.net

November 30, 2021

Mr. Todd Manuel
TNEC Director of Project Implementation
191 Road to the Isles
P.O. Box 70
Lewisporte, NL
AOG 3AO

Dear Mr. Manuel,

Thank you for your time on the phone yesterday. As the owner of Kinden's Treats From the Sea, a business located on Route 340 near the site of the Terra Nova Energy Centre, I look forward to the start of construction on the project.

I fully understand the activity that will be taking place during the construction phase as well as during operations and maintenance and remain one hundred percent in favor of the project.

Telephone numbers for my cell and home are listed below in case anyone from your team or the Department of the Environment and Climate Change wishes to verify my position on the Terra Nova Energy Centre or have questions regarding my views as owner of the business in closest proximity to the project.

Sincerely,

Everett Kinden

Everett Kinden
46 Centennial Drive.
Lewisporte NL.
A0G 3A0.
Phone: 709 541 1340 (cell)
709 535 8811 (home)

Letter to the Telegram in Response to Comments by Mercy Center for Ecology and Justice

Lewisporte Plastics to Liquid Fuels and Biomass Power Plants Will Provide Growth with Minimal Environmental Impact

This letter is in response to the questions raised by the Mercy Centre for Ecology and Justice regarding the Synergy World Power (SWP) liquid fuels and power plant facility proposed for Lewisporte. We appreciate the questions and concerns expressed in the letter and are taking this opportunity to respond to each question, in the order posed, with accurate information.

Air Quality: The Lewisporte plant will be designed, permitted and operated in strict accordance with Newfoundland Provincial Air Emission and Ambient Air Quality Standards. SWP stack emission concentrations will be well within regulatory limits. Average ground level particulate from the plant, in the immediate vicinity of the plant, will be about 0.8% of the regulatory limit in ambient air. The concentration of particulates at ground level will drop off with distance from the plant.

Energy Use: The SWP plant will be a net generator of electrical energy and fuel from dry plastic and biomass, known as selected recovered fuel (SRF). It will require no energy from the grid and will generate mainly renewable power that will be available to the grid at a cost below that of current provincial power rates.

Water Use: The plant will obtain fresh water from a large pond on the SWP site. The water will be treated as needed for domestic and industrial use at the plant. Wastewater and stormwater from the plant will be treated to surface water standards.

Long term environmental risks to water soil and air: The plant will be designed built and operated to strictly comply with all applicable environmental regulations.

Other countries where these plants have been accepted for use: The Sustane Technologies plastics liquids fuels (PTLF) plant in Nova Scotia produces 9,000 liters of liquid fuel per day. SWP will be obtaining its core PTLF technology from a company that has at least 10 sites where their pyrolysis plant designs are being used for recovering oil, not only from plastics, but also oil well drilling mud, oil refinery sludge, waste tires and tar sands. A facility in Norrkoping Sweden is an example of a plant that makes electrical power and fuel from wrapped bales of imported SRF.

Financial security: The SWP facility in Lewisporte will be built solely with private investment, without the need for sovereign guarantees. SWP will not be seeking financial subsidies from the Government.

Community Support: SWP has seen a very positive response to the project in our initial meetings with local community leaders in Lewisporte and Grand Falls Windsor, as well as from the ministries that will be involved in permitting and regulating plant operation.

Transport of materials, the possible introduction of toxic species: . Clean dry plastic, paper, cardboard, and wood (SRF) will be baled and wrapped in plastic to prevent fugitive material from leaving the ship while underway or the site while in storage. This system has been used in Europe for decades and we are unaware of any toxic species being transferred by this method, as illustrated below. Dry plastic and biomass (SRF) is baled, wrapped in plastic, and loaded onto bulk carriers. At the new dock on the south shore of Burnt Bay, bales will be unloaded and stacked outdoors. As needed bales will be moved indoors to be further sorted prior to final processing to make liquid fuel or electrical energy.

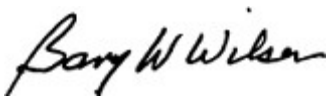
Carbon footprint: Life cycle assessment (LCA) carbon footprint calculations show operation of the SWP plant will result in a smaller carbon footprint by approximately 530,000 metric tons of greenhouse gas equivalent (GHGe) emissions per year when compared to the alternative, which is to burn the plastic components of SRF as a fuel for a cement kiln in Europe. Converting the plastic to fuel instead saves about 96% of the total energy that would be required to make the same amount of fuel from crude oil.

Disposition of stored material in case of plant failure: SWP will have full financial responsibility to properly store, process and dispose of this material.

Thorough Independent Environmental Assessment prior to approval: As a component of the permitting process, an independent international engineering firm, with offices in St. John's, will prepare an Environmental Impact Statement for the project, as required by Provincial law. As a component of this effort, an environmental baseline study will be conducted to serve as a control to determine the environmental impact of the plant going forward and ensure that it is operating in accordance with all applicable environmental regulations.

Synergy World Power was founded by environmental engineering and energy professionals who hold environmental stewardship as a core value. We find that our corporate culture is shared within Newfoundland and supported by Provincial laws and regulations. More information is available at www.synergyworldpower.com.

Respectfully,



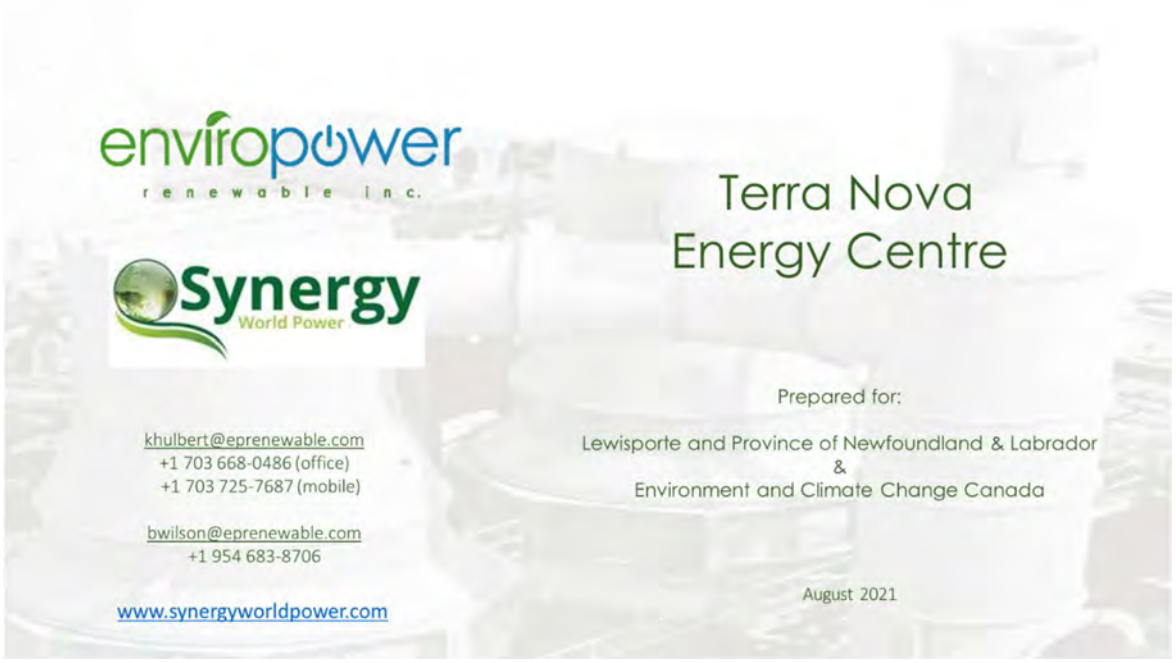
Todd Manuel
Director
SWP Canada

Bary Wilson, Ph.D.
Chief Technology Officer
Synergy World Power, Ltd.

APPENDIX H

MS Teams Video call presentation to Lewisporte Town Leadership Stakeholders and Citizens

Note: The following slides are from a presentation provided to Lewisporte stakeholders in August of 2021. In the case where certain details in the slides may vary from those presented in the present registration document, the language of the present registration application prevails.



Synergy World Power Overview and Mission

Synergy World Power, Newfoundland (to be established) and its parent company **EnviroPower Renewable (EPR)** are focused on improving global energy security and the environment by building, owning and operating technologically and economically viable biomass waste-to-energy (WTE) and Plastics to Liquid Fuels (PTLF) projects worldwide. SWP uses technology developed in the US and adapted for UK and Canadian applications by EnviroPower Renewable, Inc.

Our Mission is to combine proven technologies with experienced scientific, engineering and managerial talent, in order to create clean fuels and, renewable power from waste streams that could not otherwise be recycled. This material is used to clean liquid fuel and generate energy, while reducing waste going to landfills by up to 90%. Projects in the US, UK and Canada are owned by SPVs that are subsidiaries of EPR.

Scotland Renewable Energy Centre

Terra Nova Recovered Energy Centre in Lewisporte NL

Synergy World Power

Overview: TNEC Represents a Major Infrastructure Investment in the Lewisporte Area

- Overall private investment in the range of one billion dollars CDN. (Canadian Federal Sustainability grant funding will be applied for, if available)
- Eventual direct creation of more than 250 to 350 well-paying jobs
- Deep-water port for freighters and tankers up to 200 meters in length with a roll-on roll off dock and fuel jetty
- New plant for local production of clean renewable liquid fuels from waste plastics
- Renewable electrical baseload power generation to increase grid capacity and resilience
- Renewable heat and electricity for Public Private Partnership greenhouses, with irrigation and a CO_2 option
- Environmentally responsible treatment of Canadian MSW and C&D waste to produce power and liquid fuels
- Support of Die Trac Technical Institute curriculum with programs for development of skills needed at TNEC
- Interpretive visitors Centre for small events and describing the local environment and TNEC technology
- Heat and power for a Public indoor swimming pool and recreational area
- Port availability and onshore product logistics areas for others to use to expand through export

Terra Nova Energy Centre (TNEC)

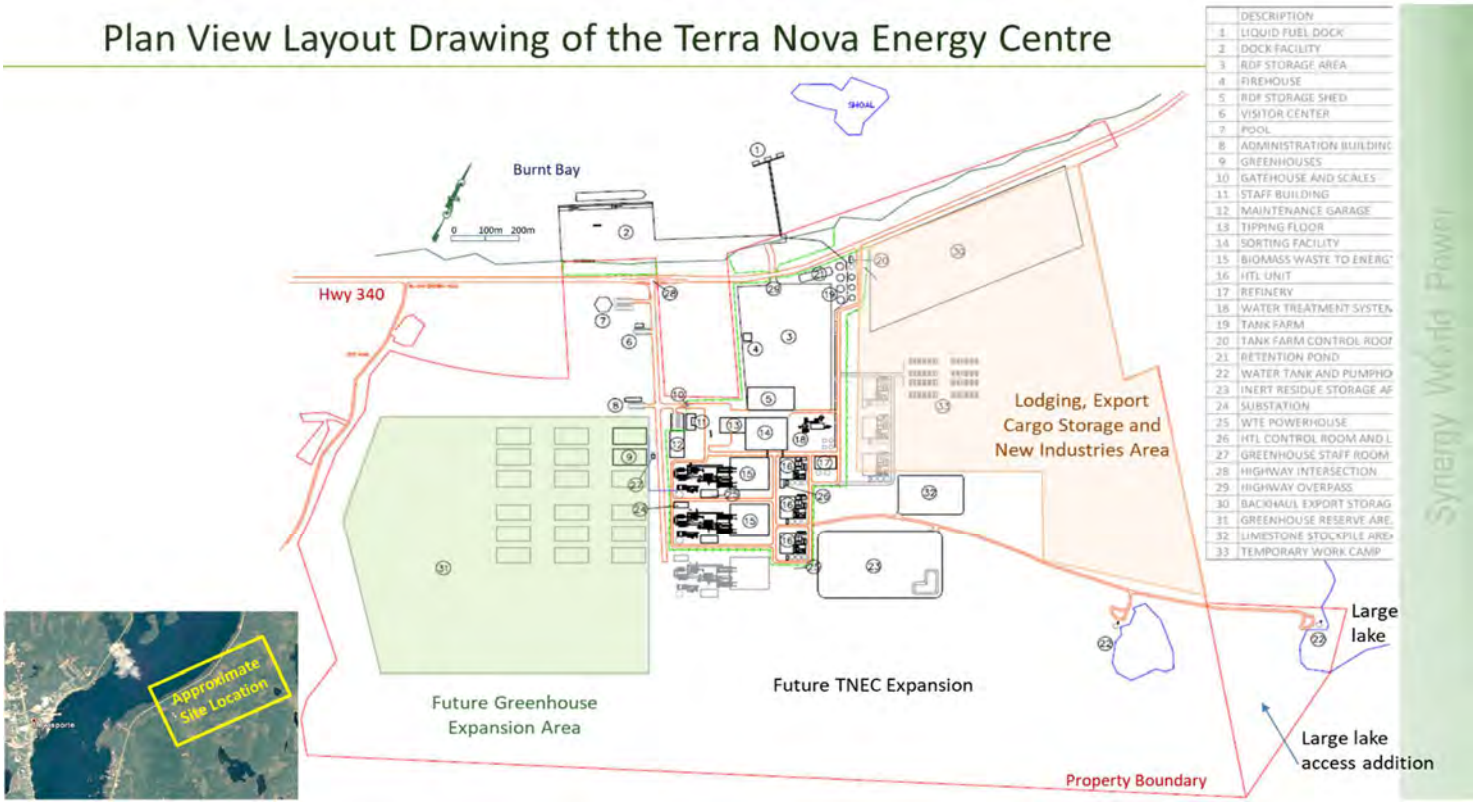
Project at a Glance

Company:	**Synergy World Power Canada Ltd.**
Location:	Lewisporte, NL, Canada
Project Area / Total Property Area:	**54** Hectares+ Dock / **280** Hectares with Greenhouses
Estimated Employment:	**250 - 350** FTE
Facility Specifications and Capacities in Phase I:	
Initial Import of European SRF for Processing:	750,000 t/y
Initial Intake of Domestic SRF:	50,000 t/y
Scrap Metal Recovery for Sale:	8,000 t/y
Baseload Power Generation (Net):	36 MW (280,000 MWh/y)
Thermal Energy (Hot Water for Greenhouses) :	42,000 MWh thermal/y
Production of Fuel Oil	172,000 m^3/y
Potential Additional Capacities in Phase II	
Import of European SRF	350,000 t/y
Intake of Domestic SRF:	50,000 t/y
Baseload Power Generation (Net):	18 MW (140,000 MWh/y Additional)
Thermal Energy (Hot Water for Greenhouses) :	21,000 MWh thermal/y (Additional)
Production of Fuel Oil	86,000 m^3/y (Additional)
Scrap Metal Recovery for Sale:	4,000 t/y (Additional)

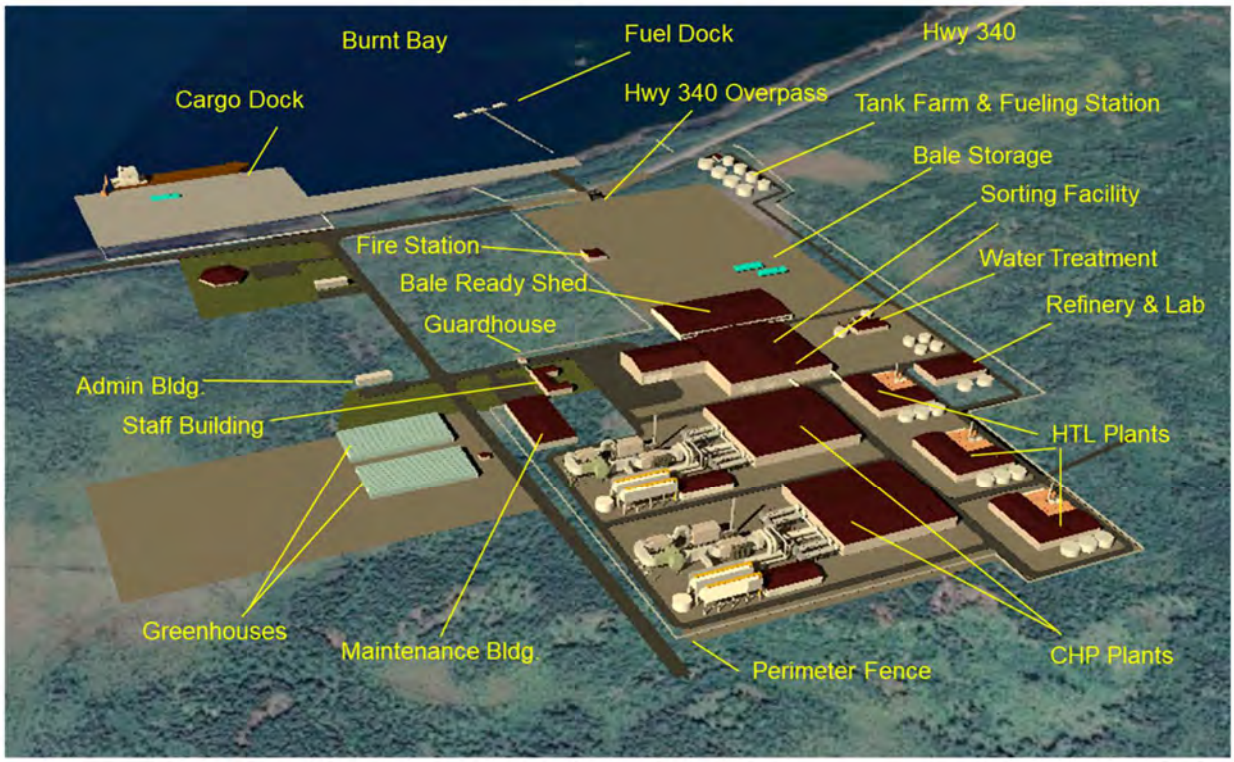
Synergy World Power

APPENDIX H

Plan View Layout Drawing of the Terra Nova Energy Centre



TNEC Layout Overview



TNEC Solid Waste and Water Summary

Solid Discharge

TNEC will produce two primary forms of solid discharge: Sintered Bottom Ash and Spent Reagent

Sintered Bottom Ash from the Rotary Kilns will be carbonless and inert. Sintering ash densifies it, making it more desirable for use in cement and construction. The plant will produce about 200 TPD. The site plan includes a temporary holding area from this material.

Bottom ash is widely used as a construction material. Markets for TNEC sintered bottom ash will be identified in Canada and Europe, where an international construction materials company has expressed interest. Potential uses in NL include soil amendment, road grit, aggregate for construction and landfill daily cover.

Spent Reagent, which will include fly ash, will consist largely of Calcium Chloride and Calcium Sulfate. The plant will produce about 15 TPD of this material. There is unlikely to be a market for this material and it will be landfilled at Norris Arm Landfill

Water

Water Usage: TNEC will use surface water from two ponds on site. The site, including greenhouses and pool, will require around 1,860 cubic meters of water per day.

Storm Waste Management: TNEC will include a stormwater system to prevent excess runoff into Burnt Bay. This will include retention ponds along Hwy 340.

Wastewater Discharge: Wastewater will include sewage water from onsite employees and visitors, and RO rejects from the water treatment system.

Sewage water will be treated by septic tank and released through a drain field. RO rejects will be used to wet ash to prevent airborne dust when handling.

Air emissions, as well as aqueous and solid discharge monitoring and control, will be described in the **Operations and Environment Management Plan**

TNEC Air Emissions Summary

TNEC will use **Best Available Control Technology** (BACT) to minimize air pollutant emissions, including:

- Flue Gas Recirculation (FGR)
- Low NOx Burners with Reforming Stage
- Dry Sorbent Injection,
- Electrostatic Precipitator (ESP),
- Selected Catalytic Reduction (SCR), and
- Fabric Filters (Baghouse)
- CEMS System

Estimated Annual Air Emissions (t/y) and Stack Concentrations (ppmv)

	t/y	ppmdv
CO	33.4	10.6
HCl	3.7	0.9
NOx	81.1	15.7
SOx	63.1	8.8
PM	9.8	

Air Dispersion Modelling from similar EPR plant compared to NL Provincial Standards:

	1 hour		3 hour		24 hour		Annual	
Pollutant	PSD*	NL Standard	PSD	NL Standard	PSD	NL Standard	PSD	NL Standard
CO	2.86		2.86		1.71		0.29	
NOx	3.84	400	3.84		2.30	200	0.38	100
SOx	1.84	900	1.84	600	1.10	300	0.18	60
PM	0.84		0.84		0.50	120	0.08	60
Pb	0.40		0.40		0.24		0.04	

*Potential for Significant Deterioration, the maximum amount the air quality would be reduced by the EPR facility under any condition

APPENDIX H

Public Private Partnership for Greenhouse Farming and Future Industrial Park

The Town of Lewisporte and TNEC will enter into a Public Private Partnership wherein TNEC provides:

- greenhouse heating,
- electrical power,
- irrigation water and a
- CO_2 plant growth acceleration option,

for agriculturists leasing greenhouses to be constructed in the area as shown.

The area to the east of the TNEC main facility (shaded in blue) is intended as:

- Worker housing during construction, and future industrial park with
  - Land for storage and staging of other goods as cargo for export,
  - Land for spin off businesses related to the TNEC and the new port.

Related business and industries may include:

- Newfoundland minerals export,
- Newfoundland lumber export,
- Fining and export of sintered ash for use as:
  - aggregate in construction, precast cement, cement block, bricks,
  - soil amendment,
  - road grit
- Production of renewable specialty chemicals from HTL hydrocarbon feedstock.

Investment and Amenities Provided by the Project to the Local Community

Financial investment in the project: Anticipated investment for Phase I is approximately **USD$800 million**

New employment: Phase I Construction and Operations will generate between 250 and 350 new jobs.

Financial assistance to local schools, colleges and industrial art training Centres in a cooperative program to ensure that the Project has the trained leadership and talent to maintain and operate the Facility in a safe and productive manner.

Academic support to local high schools and colleges. SWP has three Ph.D. scientists and engineers on staff with college teaching and international science fair mentoring experience among them. They are willing to help organize student projects, regional science fairs and technical apprenticeship programs in the local area.

Visitors Centre at the plant with displays, artifacts, videos and scheduled lectures and tours related to the operation of the plant highlighting the reduction in greenhouse gas emission equivalents and the reduction in plastics waste due to Project facility operations.

Agricultural Greenhouse Public Private Partnership using heat and power from the TNEC gasification power plant to allow year-round growth of food crops. This would be a Public Private Partnership project with the Town of Lewisporte, for the benefit of the agricultural community and to increase fresh produce production in the Province

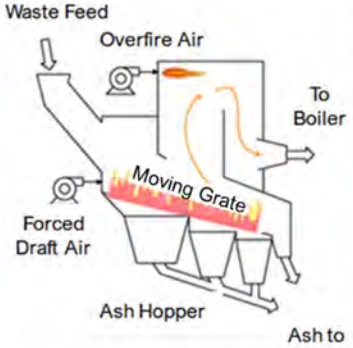
APPENDIX H

EPR Rotary Kiln Gasification Compared to Incineration

EPR gasification systems are designed with a main emphasis on reliability and environmental performance.

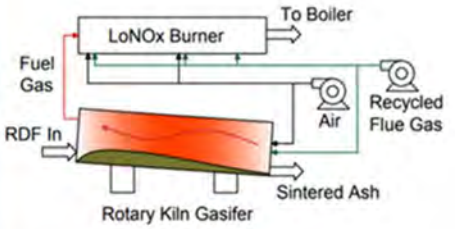
Since waste to energy projects are paid to process the fuel they use, thermal efficiency considerations can take a back seat to reliability and environmental performance without negatively affecting the overall bottom line.

The outstanding environmental performance of the EPR LoNOx and sintering kiln designs is described below.



Incineration

- Operates with excess air
- Generates more PM, NOx and VOCs
- Equipment larger and more expensive
- Ash is often special or hazardous waste



Gasification

- Operates at sub-stoichiometrically with much lower gas flow through the main reactor
- Lower mass flow means less particulate produced
- Generates less PM, NOx and VOCs and no ozone.
- Gasification systems are less expensive
- Ash residue is clean and can be used for construction fill

Synergy World Power

EPR LoNOx Rotary Kiln Gasification Plants Meet or Exceed the Strictest Air Emission Standards Anywhere in the US.

Performance of the plants will be guaranteed by the manufacturers and the engineering company that builds the project.

CLARK COUNTY
DEPARTMENT OF AIR QUALITY
4701 West Russell Road, Suite 200, Las Vegas, Nevada 89118
Synthetic Minor Source Permit
Source: 17399
Issued in accordance with the
Clark County Air Quality Regulations
(Section 12.1)

ISSUED TO: **EP Renewable Las Vegas, Inc.**
601 S. Federal Hwy, Suite 203
Boca Raton, FL 33432

SOURCE: **EnviroPower Renewable Las Vegas Gasification Facility**
Apex Industrial Park
Las Vegas, Nevada 89124

RESPONSIBLE OFFICIAL:
Name: Bary Wilson
Title: Chief Technical Officer
Phone: (561) 843-0843
E-Mail Address: barywilson@eprenewable.com

Permit Issuance: May 5, 2015 **Expiration Date:** May 4, 2020

ISSUED BY: CLARK COUNTY DEPARTMENT OF AIR QUALITY

Richard Beckstead
Permitting Manager, Clark County Department of Air Quality

metso

EnviroPower Renewable, Inc.
601 S. Federal Highway, Suite 203
Boca Raton, FL
33432 USA

Attention: Keith A. Hulbert
CEO, EnviroPower Renewable Inc.
Email: khulbert@eprenewable.com

Phone: +1 703 668 0486
Cellular: + 1 703 725 7687

Project Name: Enviropower Las Vegas
Client Reference: Las Vegas
Metso Proposal: 539647 YRK

Dear Mr. Hulbert

Thank you for inviting Metso to participate in the EPR Las Vegas project. We have thoroughly reviewed the Heat and Material Balances that you have provided and understand your proposed process.

The functions of the kiln and multi-stage burner system are very familiar to Metso as are the concepts associated with the proportioning of air, recycled flue gas, and steam to control the temperature profiles of the system for optimal devolatilization and combustion. If awarded a contract for the technical design and commercial supply of this equipment, Metso would be pleased to provide both a mechanical warranty and a performance guarantee for this equipment. The performance guarantee could be based on achieving the devolatilization and combustion of a specified flow rate, composition, and heat content (HHV) of biomass thus enabling EPRenewable to maintain a steady heat load to the boilers.

Metso typically offers performance guarantees on rotary kiln projects in-line with our customers' operational goals. For this type of project, we understand that the heat released from the waste stream and the heat content in the exhaust gases are the primary source of value, so we will guarantee the heat release for a prescribed biomass feed. For other kiln projects, we offer similar guarantees. For instance, for petroleum coke calcining projects, we guarantee the controlled devolatilization of green coke feed while also achieving quality parameters for the calcined petroleum coke product (CPC). For mineral processing systems, the guarantee is usually related to fuel consumption and quality of product. We don't keep a running list of projects executed with performance guarantees, but I'm quite certain the total is greater than 100 (and maybe much, much more).

SUSTAINALYTICS

Second-Party Opinion
EnviroPower Renewable Las Vegas Green Bond

Evaluation Summary

Sustainalytics is of the opinion that the EnviroPower Renewable Las Vegas ('EPRLV') Green Bond Framework is credible and impactful, and aligns with the four core components of the Green Bond Principles 2018. This assessment is based on the following:

USE OF PROCEEDS The eligible category for the use of proceeds (the biomass power plant Apex Astra Renewable Energy Facility or "AAREF" and the biomass fuel storage facility Garnet Valley Energy Facility or "GVEF") is aligned with those recognized by the Green Bond Principles (Renewable Energy and Pollution Prevention and Control). Sustainalytics considers that AAREF biomass power plant in conjunction with the GVEF biomass storage facility will help decrease fossil fuel reliance, landfill dependence, contribute to lower Nevada's overall energy intensity and GHG emissions, and will advance the UN Sustainable Development Goals 7 and 12.

PROJECT EVALUATION / SELECTION EPRLV's internal process in evaluating and selecting projects is aligned with market best practices as the technology and design supporting the biomass power plant and biomass storage facility was independently reviewed, validated and approved by various third-parties including the Oak Ridge National Laboratory and CDS Engineers who performed the authorization on behalf of the US Army. Additionally, EPRLV added a clear set of exclusionary criteria specifically excluding GVEF's three gas fired turbine generators, which are typically used for back-up ad peaking power purposes.

Evaluation date	July 20, 2018
Issuer Location	Boca Raton, USA

Report Sections
Introduction 2
Sustainalytics' Opinion 3
Appendices 7

For inquiries, contact the Sustainable Finance Solutions project team:
Ankita Shukla (New York)
Project Manager
ankita.shukla@sustainalytics.com
(+1) 617 603 3329

12/4/2017 RPS

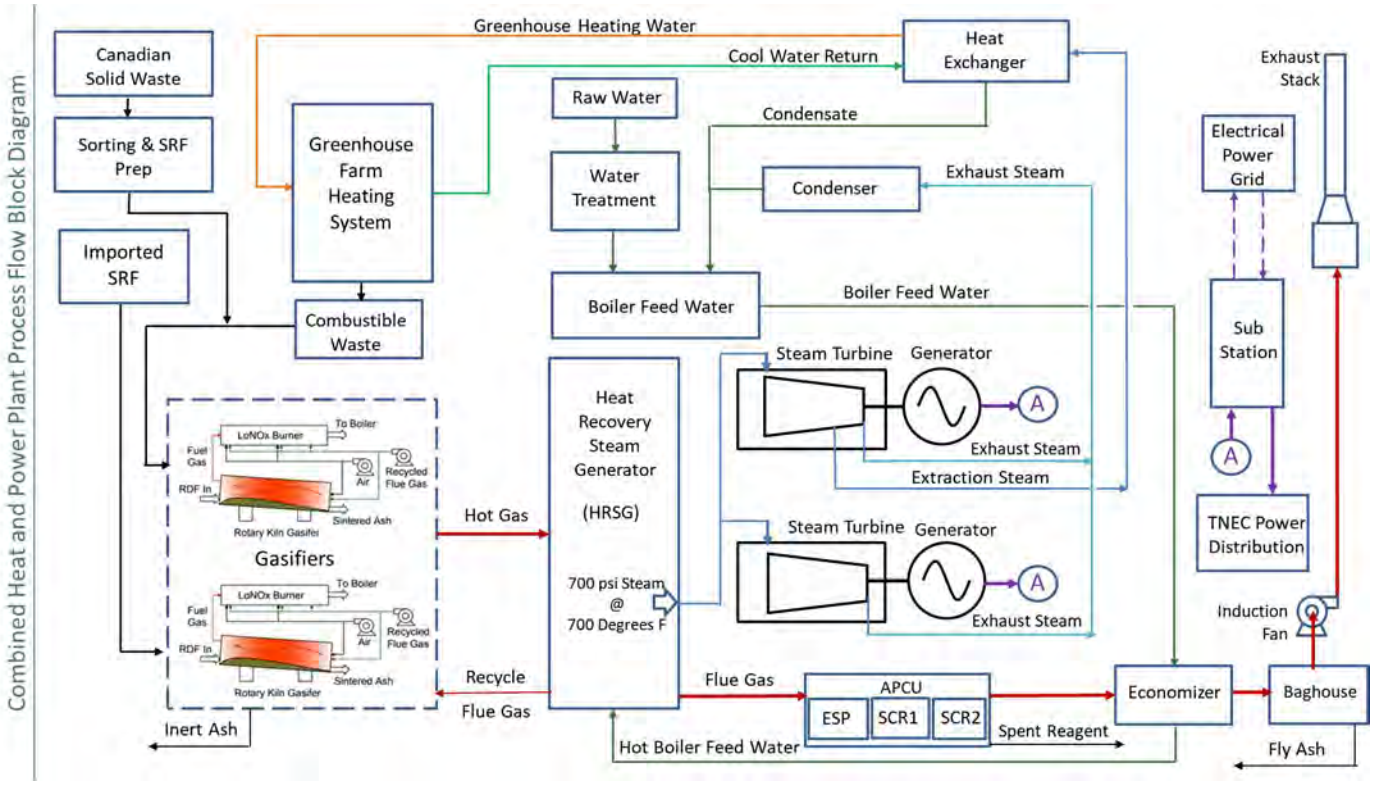
CA.GOV CALIFORNIA ENERGY COMMISSION

Facility Summary

Facility Certification
Type:
Facility Name:
Begin On:

Applications

APPENDIX H



A Seasoned Leadership Team With Domain Expertise...

Keith Hulbert (Chief Executive Officer): Keith Hulbert has more than 25 years of experience in the power industry and has been directly involved in project management and operational control of power generation plants, substations, transmission lines, and related energy infrastructure projects. Keith was Vice-President of Infrastructure for Serco in the United States, and served as CEO at Lakeland Electric, the 20th largest public power utility in the US. Keith also served as Chief Operating Officer at Viasys, a multifaceted infrastructure and construction company focused in the utility, transportation and telecommunications space. He was also regional manager at Florida Power Corporation where he worked for over 18 years.

Dr. Bary Wilson (Chief Technology Officer): Bary Wilson has founded or co-founded a number of technology companies in the US and overseas and served on the board of directors of ENER1 a publicly traded company as well as on the boards of scientific journals. During his 24-year tenure at the Pacific Northwest National Laboratory, he co-managed intellectual property for the National Security Division and has designed and led projects in coal gasification and liquefaction. He has conducted electric power related research for the US Department of Defense, the US Department of Energy and EPRI and designed the integrated solid waste management system for the Duqm Governorate in Oman. He is an inventor of several patents related to waste to gasification processes. Dr. Wilson holds a B.Sc. in Physics from the University of Washington, a Ph.D. from the University of London in the UK and served a post-doc in Chemistry at MIT.

Craig Kettler (Chief Financial Officer) : Craig has over 25 years of experience as a trusted business advisor, angel investor, and entrepreneur focused on value realization and maximization. He has experience in merger and acquisition advisory, business strategy, and business valuation both domestically and internationally. He has been co-founder of two businesses, including the first independently owned transmission company in the US, TransElect, focused on the acquisition and operation of transmission systems, the development and construction of new transmission lines and the upgrade of existing transmission systems. Craig earned his Bachelor of Science in Mechanical Engineering from Kansas State University and an MBA from Southern Methodist University.

APPENDIX H

A Seasoned Leadership Team With Domain Expertise II...

Darren Lloyd, Chief Commercial Officer. Darren is based in the UK and is a seasoned businessman with over 40 years experience in marketing, negotiation and program management with extensive overseas experience. During his early career he was part of a small senior team driving N Brown Group from a market cap of £28m to over £1billion. More recently his executive experience includes ownership of Marketing, Printing and Chemical companies with representation of WTE projects. He is a driven individual in project and financial management with experience in Venture Capitalist exits and negotiations.

Todd Manuel, (Business Development Director Synergy World Power Canada): Todd has 20 years in the electrical industry 10 years in the land development, construction and building sector in Newfoundland. He is an approved designer registered with Dept of Health Service NL and has 3 years in the biomass recycling industry. Todd has port and marine industry experience having managed construction and dredging operations at the Lewisporte marina. He is a community leader and as a director of SWP Canada will act as community Liaison for the TNEC Project.

Brandon Wilson, Ph.D., P.E. (Director of Research & Engineering): Dr. Wilson holds a Ph.D. in Materials Science and Engineering, and is an inventor of the ATEC, LoNOx and Sintering Kiln patents as well as other software applications and intellectual property to which EnviroPower Renewable has exclusive rights. Dr. Wilson was formerly in charge of the SEM and high temperature process development facilities at the University of Washington and has expertise in the high temperature processing of oxide materials. Dr. Wilson provides engineering expertise including development of proprietary engineering design and process modeling software.

Bryan Borland (Construction Director Synergy World Power Canada): Bryan has extensive experience in site development and in the site clean-up world; he is versed in the transportation of over-dimensional, international logistics and in heavy construction, site development, soil and site remediation, and has worked in extreme environments including the Winter Roads in the Arctic. All this after five years constructing transmission lines across the province of Newfoundland and Labrador, island portion; and Bryan has spent 20 years building and supporting agricultural businesses in the province.

A Seasoned Leadership Team With Domain Expertise III...

Ray Bell (Construction Director - UK): Ray Bell is a Chartered Civil Engineer with more than 25 years' experience in the, construction of energy, process, water, marine, rail, highway, civil engineering and building projects. Ray has a sound working knowledge of the processes involved in delivering projects on time, safely and to forecast. His wide-ranging experience includes permanent and temporary works design, planning and estimating. In addition, he is familiar with many forms of contract and has been responsible for the successful management of many complex projects through both pre-contract and post contract negotiations. Ray is currently involved with both the development and project management of a number of Renewable Energy Projects in the UK, Europe and Middle East with schemes ranging from 250MW on and off-shore wind farms to solar PV power plants and Energy from Waste plants.

Chris Butler (Technical Director - UK): Chris comes from a solid design background in civil engineering on major Waste to Energy projects, bridge structures, ports & harbours and general large building construction, Chris has a wealth of experience both in UK and Overseas. With over 15 years' experience spent in Tanzania and Pakistan and the United Arab Emirates. Chris has been involved in a broad range of projects across the whole of the Middle East GCC countries. With a great deal of experience in the Energy sector, Chris has worked with both offshore and onshore wind farms and also a new generation of deep-water wind turbine foundations. He also has extensive experience in Waste to Energy working on D&B's / PFI's with leading UK contractors on Waste Recycling Centres and Energy from Waste projects.

Dr. Barry Liss Ph.D., P.E. (Lead Engineer): Dr. Liss is an internationally recognized expert in the field of fluidization engineering and the design of solids gasification systems, as well in the design of compost plants, odor treatment systems, and wastewater treatment systems, including leachate treatment systems. Dr. Liss' Ph.D. was on the mathematical analysis of the dynamic behavior of particulate systems, and his post-doctoral work was on fluidized bed gasification. Dr. Liss has been involved in the design, development, planning, and financial analysis of more than 20 integrated solid waste management projects in the US and overseas. He is the lead inventor on two patents related to enhanced air pollution control by minimization of NOx emissions through practical control of NOx formation mechanisms and in the production of virtually inert, carbon-less aggregates by ash sintering gasification.

LTC (ret) Fred Moll (Director International Business Development): Colonel Moll served for 22 years in the US Army with background in Armor, at the tactical level, and combat vehicle acquisition management. He holds a BS in Economics from Widener University and a MS in Human Resources Management from the University of Utah as well as completing post graduate work at Syracuse University for Army financial comptrollership. In the field of DoD acquisition management. he was selected as the first TRADOC Systems Manager for the Armor Gun System (AGS) program and was part of the design team for the M1A2 Abrams MBT program. His civilian career includes being a Project Manager Turkey for the General Dynamics Corporation. He has been a consultant to such fortune 500 companies as Boeing, Lockheed Martin, and Raytheon.

APPENDIX I: Patent Information Related to LoNOx Rotary Kiln Gasification Technology

APPENDIX I

(12) **United States Patent**
Liss et al.

(10) **Patent No.: US 10,329,500 B2**
(45) **Date of Patent: Jun. 25, 2019**

(54) **SYSTEM AND METHOD FOR REDUCING NOX EMISSIONS FROM GASIFICATION POWER PLANTS**

(71) Applicants: **Barry Liss**, Pompano Beach, FL (US); **Brandon Ruf Wilson**, Bothell, WA (US); **Bary Wallace Wilson**, Coconut Creek, FL (US)

(72) Inventors: **Barry Liss**, Pompano Beach, FL (US); **Brandon Ruf Wilson**, Bothell, WA (US); **Bary Wallace Wilson**, Coconut Creek, FL (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 185 days.

(21) Appl. No.: **15/417,908**

(22) Filed: **Jan. 27, 2017**

(65) **Prior Publication Data**

US 2017/0218284 A1 Aug. 3, 2017

Related U.S. Application Data

(60) Provisional application No. 62/388,396, filed on Jan. 28, 2016.

(51) **Int. Cl.**
C10J 3/00 (2006.01)
C10J 3/48 (2006.01)
(Continued)

(52) **U.S. Cl.**
CPC ***C10J 3/005*** (2013.01); ***B01D 45/16*** (2013.01); ***B01D 46/02*** (2013.01); ***B01D 53/40*** (2013.01);
(Continued)

(58) **Field of Classification Search**
CPC Y02E 20/12; Y02E 50/30–50/346
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

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5,262,577 A * 11/1993 Velcich C10B 53/00 201/17

(Continued)

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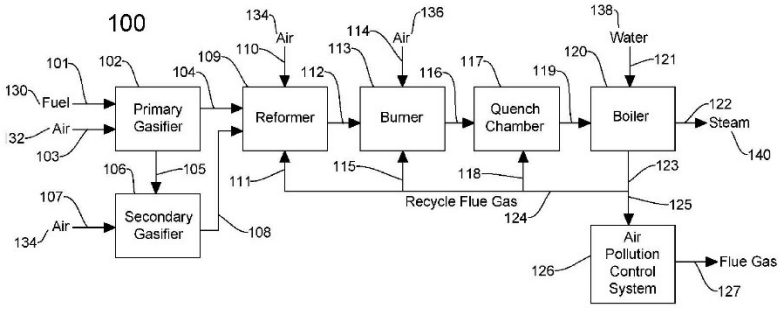
International Search Report and the Written Opinion of the International Searching Authority dated May 23, 2017 in PCT Application No. PCT/US2017/015396, international filing date Jan. 27, 2017. (10 Pages).

Primary Examiner — Laert Dounis
(74) *Attorney, Agent, or Firm* — Ingram IP Law, P.A.

(57) **ABSTRACT**

An apparatus is provided that receives waste and generates electrical power or thermal energy with minimal NOx emissions. A gasifier is provided that receives the waste and air to produce fuel gas for delivery to a fluidly coupled reformer. The reformer receives the fuel gas, recycled flue gas, and air to auto-thermally produce a reformed fuel gas and destroy fuel gas pollutants at a first temperature without a catalyst. A burner is fluidly coupled to the reformer and receives recycled flue gas and air to oxidize the reformed fuel gas at a second temperature that prevents nitrogen oxide formation, the second temperature being lower than the first temperature. A quench chamber is fluidly coupled to the burner and receives flue gas from the burner for quenching with recycled flue gas. A heat recovery system is fluidly coupled to the reformer, burner, and quench chamber to extract usable energy.

12 Claims, 6 Drawing Sheets



US010782021B2

(12) **United States Patent**
Liss et al.

(10) **Patent No.: US 10,782,021 B2**
(45) **Date of Patent: Sep. 22, 2020**

(54) **ASH SINTERING GASIFIER**

(71) Applicants: **Barry Liss**, Pompano Beach, FL (US); **Brandon Ruf Wilson**, Bothell, WA (US)

(72) Inventors: **Barry Liss**, Pompano Beach, FL (US); **Brandon Ruf Wilson**, Bothell, WA (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 186 days.

(21) Appl. No.: **15/586,722**

(22) Filed: **May 4, 2017**

(65) **Prior Publication Data**

US 2018/0051877 A1 Feb. 22, 2018

Related U.S. Application Data

(60) Provisional application No. 62/494,846, filed on Aug. 22, 2016.

(51) **Int. Cl.**
F23G 5/50 (2006.01)
F23G 5/20 (2006.01)
(Continued)

(52) **U.S. Cl.**
CPC ***F23G 5/50*** (2013.01); ***F23G 5/027*** (2013.01); ***F23G 5/0276*** (2013.01); ***F23G 5/12*** (2013.01);
(Continued)

(58) **Field of Classification Search**
CPC F23G 5/50
See application file for complete search history.

(56) **References Cited**

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OTHER PUBLICATIONS

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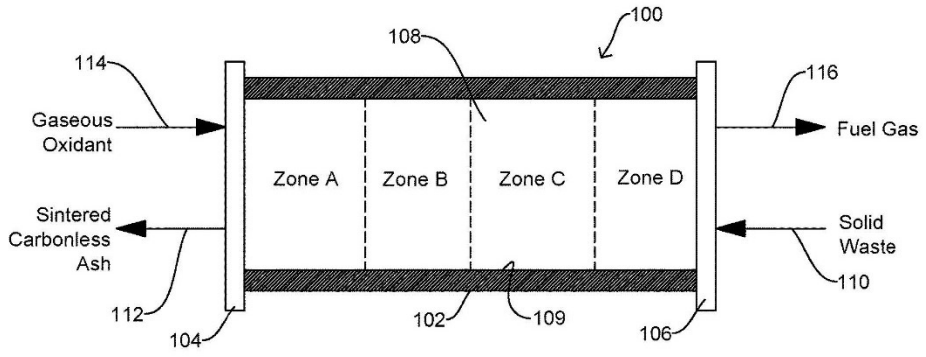
Primary Examiner — Nathaniel Herzfeld
(74) *Attorney, Agent, or Firm* — Ingram IP Law, P.A.

(57) **ABSTRACT**

A method is provided for thermally converting non-radioactive combustible wastes to a substantially non-hazardous, non-leachable, sintered particulate carbon-less ash by-product in a kiln having a plurality of reaction zones. The kiln including first and second ends and a body provided between the first and second ends that defines a cavity having a refractory lining that provides resistance to heat conduction. A processor and flow rate controllers are provided that control a flow rate through the body of waste that enters at the first end of the kiln and the flow rate of oxidant gas that enters at the second end of the kiln, the second end being opposite to the first end. The body may be positioned substantially horizontal and may include a length-to-diameter ratio and a resistance to heat conduction that provides a temperature gradient within the cavity to forms separate reaction zones during operation.

14 Claims, 5 Drawing Sheets



US010947466B2

(12) **United States Patent**
Liss et al.

(10) **Patent No.: US 10,947,466 B2**
(45) **Date of Patent: Mar. 16, 2021**

(54) **METHOD FOR REDUCING NOX EMISSIONS FROM GASIFICATION POWER PLANTS**

(71) Applicant: **Mobil Tensor Holdings LLC**, Pompano Beach, FL (US)

(72) Inventors: **Barry Liss**, Pompano Beach, FL (US); **Brandon Ruf Wilson**, Bothell, WA (US); **Bary Wallace Wilson**, Coconut Creek, FL (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **16/420,287**

(22) Filed: **May 23, 2019**

(65) **Prior Publication Data**

US 2019/0276757 A1 Sep. 12, 2019

Related U.S. Application Data

(62) Division of application No. 15/417,908, filed on Jan. 27, 2017, now Pat. No. 10,329,500.
(Continued)

(51) **Int. Cl.**
C10J 3/00 (2006.01)
F23G 5/00 (2006.01)
(Continued)

(52) **U.S. Cl.**
CPC ***C10J 3/005*** (2013.01); ***B01D 45/16*** (2013.01); ***B01D 46/02*** (2013.01); ***B01D 53/40*** (2013.01); ***B01D 53/86*** (2013.01); ***B03C 3/00*** (2013.01); ***C10J 3/485*** (2013.01); ***C10J 3/721*** (2013.01); ***C10J 3/723*** (2013.01); ***C10J 3/84*** (2013.01); ***C10J 3/845*** (2013.01); ***C10K 1/003*** (2013.01); ***C10K 1/026*** (2013.01); ***C10K 1/34*** (2013.01); ***C10K 3/005*** (2013.01); ***F01N 3/2066*** (2013.01); ***F01N 5/02*** (2013.01); ***F23G 5/006*** (2013.01); ***F23G 5/0276*** (2013.01); ***F23G 5/16*** (2013.01); ***F23G 5/20*** (2013.01); ***F23G 5/46*** (2013.01);
(Continued)

(58) **Field of Classification Search**
CPC Y02E 20/12; Y02E 50/30
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

3,874,116 A * 4/1975 White C10K 1/004 48/209
5,262,577 A * 11/1993 Velcich C10B 53/00 201/17
(Continued)

Primary Examiner — Laert Dounis
(74) *Attorney, Agent, or Firm* — Ingram IP Law, P.A.

(57) **ABSTRACT**

A method is provided for thermally processing waste to produce steam and generate energy while minimizing air pollutants in a staged thermal reactor. The method includes gasifying the waste to convert the waste to a fuel gas and a substantially carbon free, inert, granulated, sintered mineral ash and reforming the fuel gas auto-thermally to minimize creation of nitrogen oxide when the fuel gas is combusted. The method further includes burning the reformed fuel gas to minimize creation of nitrogen oxide in a flame region of a fuel gas burner and recirculating cooled flue gas to control oxygen content and temperature during the reforming operation and the burning operation. In one example, reforming the fuel gas converts non-molecular nitrogen species into molecular nitrogen in an auto-thermal non-catalytic reformer unit by decomposition reactions promoted by a prevailing reducing gas atmosphere.

10 Claims, 6 Drawing Sheets