Bill No. 98
2018

By-law No. A.-_____

A by-law to authorize and approve a Memorandum of Understanding between Resource Energy Development of Canada, Ltd., and The Corporation of the City of London and to authorize the Mayor and the City Clerk to execute the Memorandum of Understanding.

WHEREAS section 5(3) of the *Municipal Act, 2001,* S.O. 2001, c. 25, as amended, provides that a municipal power shall be exercised by by-law;

AND WHEREAS section 9 of the *Municipal Act, 2001*, S.O. 2001, c. 25, as amended, provides that a municipality has the capacity, rights, powers and privileges of a natural person for the purpose of exercising its authority under this or any other Act;

AND WHEREAS it is deemed appropriate for The Corporation of the City of London (the "City") to enter into a Memorandum of Understanding with Resource Energy Development of Canada Ltd. to carry out testing and develop data/information on the viability of the Concord Blue Reformer® advanced thermal conversion technology to be delivered and constructed by Lockheed Martin Canada to manage various types of organic feedstocks, including biomass, bio-solids, solid waste materials, including mixed solid waste, commonly known as household garbage. This will be done through research at an off-site location housing a demonstration facility or by constructing and operating a pilot-scale facility containing an advanced thermal conversion system.

AND WHEREAS it is deemed appropriate to authorize the Mayor and the City Clerk to execute the Memorandum of Understanding on behalf of the City;

NOW THEREFORE the Municipal Council of The Corporation of the City of London enacts as follows:

1. The Memorandum of Understanding between The Corporation of the City of London and Resource Energy Development of Canada Ltd., attached as "Schedule A" to this by-law, is hereby authorized and approved.

2. The Mayor and the City Clerk are hereby authorized to execute the Memorandum of Understanding authorized and approved under section 1 of this by-law.

3. This by-law shall come into force and effect on the day it is passed.

PASSED in Open Council on March 6, 2018.

Matt Brown
Mayor

Catharine Saunders
City Clerk

First Reading – March 6, 2018
Second Reading – March 6, 2018
Third Reading – March 6, 2018

“Schedule A”

Memorandum of Understanding

Between

The Corporation of the City of London (“City”)

And

[Resource Energy Development of Canada, Ltd.] (“RediCan”)

Whereas the City has established a special policy area in the City’s Official Plan, referred to as the Waste Management and Resource Recovery Area, that plans for the continued evolution of the W12A Landfill and nearby lands into an “Integrated Waste Management Centre” that utilizes environmentally responsible and sustainable operations and practices and achieves a high standard of compatibility with its environs and neighbours;

Whereas the remaining life expectancy of the W12A Landfill as of January 1, 2017 is approximately eight years or less;

Whereas the City wishes to examine, support, conduct research and/or implement projects under the broad classification(s) of resource recovery, energy recovery and/or waste conversion within the special policy area, in other locations in London, or in collaboration with others outside of London as part of its continuous improvement system for solid waste management. The continuous improvement system is described in several public documents including City of London Continuous Improvement System for Waste Management (1997), A Road Map to Maximize Waste Diversion in London (2007) and Road Map 2.0 The Road to Increased Resource Recovery and Zero Waste (2013);

Whereas the City wishes to pursue projects, relationships and partnerships for the purpose of innovation, creativity, best practices and excellence in solid waste management and is proposing to operate, subject to final Municipal Council approval, under a banner known as the London Waste to Resources Innovation Centre (LWRIC);

Whereas RediCan has a broad range of operational expertise in the management of the conversion of organic feedstocks to a variety of value-added resources;

Whereas RediCan has the non-exclusive Canadian rights to a proprietary gasification technology commonly known as advanced thermal conversion, that has successfully converted a range of biomass materials into a variety of bio-products including energy, chemicals and/or fuels and now wants to determine the viability of this technology on solid waste materials, including mixed solid waste, commonly known as household garbage; and

Whereas the City and RediCan recognize that the current framework direction for waste management and waste diversion in Ontario has been set through the *Waste Free Ontario Act, 2016, the Resource Recovery and Circular Economy Act, 2016* and the Strategy for a Waste-Free Ontario: Building the Circular Economy (February 2017);

1.0 Purpose of the Memorandum

This Memorandum of Understanding (“MoU”) is intended to set out the mutual intentions of the City and RediCan to advance their joint waste conversion, resource and energy recovery objectives. The MoU is based upon the mutual understanding that the combined expertise, influence and commitment of the parties are better applied together to support their common goals. The MoU establishes the non-legally binding framework and set of principles for enhanced and focused coordination and collaboration to support their shared interests in waste conversion and resource and energy recovery.

The parties to this MoU acknowledge that if they wish to jointly carry out specific initiatives that may arise out of this MoU, they will have to engage in further discussion and prepare necessary agreements to define, authorize and execute, among other things, each party's roles and responsibilities, resource allocation and other details.

The MoU is not an exclusive arrangement and does not restrict either party from pursuing their mandates either on their own or in collaboration with any other party.

2.0 Short Term Objective

The short-term objective of the collaboration between the City (Attachment A) and RediCan is to:

- Build on the existing foundation of traditional and innovative projects to divert waste from the landfill and create value added products from residues and waste;

- Create a focal point (location or locations) for the ongoing examination of innovative solutions for waste reduction, resource recovery, energy recovery and/or waste conversion into value-added materials;

- Establish partnerships and collaborations between government and businesses to synergistically build on existing strengths to create opportunities to prevent waste, to create products of value from waste, and to solve existing waste management challenges; and

- Be known as a Centre of Excellence with shared facilities and resources providing leadership, implementing best practices, undertaking research, providing knowledge and support to industry in the various fields of resource and waste management.

<u>Gasification Technology</u>
In addition, the short-term objective of the collaboration between the City and RediCan is to undertake testing and develop data/information on the viability of the Concord Blue Reformer® advanced thermal conversion technology to be delivered and constructed by Lockheed Martin Canada to manage various types of organic feedstocks, including biomass, bio-solids, solid waste materials, including mixed solid waste, commonly known as household garbage (Attachment B).

This will be done through research at an off-site location housing a demonstration facility or by constructing and operating a pilot-scale facility containing an advanced thermal conversion system that is designed for demonstrating the effectiveness of the process for the conversion of various organic feedstocks and waste streams. It is currently proposed that a demonstration facility would process between 50 and 75 tonnes of material per day while generating the following products: a hydrogen-rich synthetic (syn) gas that can be used as a renewable natural gas (RNG) and/or blended with natural gas, or be used to produce a variety of other forms of renewable energy and bio-products.

Complementing the technical processes is the ongoing development of the potential role for this technology to handle non-hazardous materials from the residential, institutional, commercial and industrial sectors and to contribute towards policies and programs established by the various levels of government (Municipal, Provincial and Federal) as well as other governmental agencies outside of Canada.

3.0 General Arrangement

The responsibilities of the City are to include:

- Assist with all approvals (e.g., Ministry of the Environment & Climate Change MOECC, City of London zoning, etc.);
- Provide land in the special policy area (Waste Management Resource Recovery Area) as a host site for three years with an option to renew for additional years subject to Council approval as part of the Formal Agreement (Section 4.0);
- Bring services (water, sanitary and hydro) to the location of the pilot scale facility subject to Council approval as part of the Formal Agreement (Section 4.0);
- Provide access to the boardroom and education room in the Material Recovery Facility (MRF);
- Participate, when available, in discussions, tours and related activities;
- Provide reasonable quantities of residual waste (garbage) and biomass materials for conversion;
- Assist with reporting, being available for media interviews and related matters;
- Possible sharing of other City resources; and
- Keep London Municipal Council informed.

The responsibilities of RediCan are to include:

- Obtain all necessary approvals and licenses;
- Construct and operate the pilot scale facility and all associated costs including utilities;
- Evaluate and report the results of the research and development work; and
- Provide overview reports quarterly to the City of London highlighting activities undertaken, key non-proprietary results and related matters noting that such reports are subject to the requirements of the *Municipal Freedom of Information and Protection of Privacy Act.*

4.0 Formal Agreement

The parties agree to work together to develop a formal agreement to undertake the approval, design, construction and testing and develop data/information on the viability of gasification technology as outlined above.

The Formal Agreement will follow the same approval processes as this General Arrangement.

5.0 Effective Date and Duration

This MoU will come into effect upon the date it has been signed by all signatories and will remain in effect until March 31, 2021.

This MoU will be reviewed two months prior to the anniversary date and any agreed to changes added to the MoU. Substantive changes will trigger the approval process for the MoU and this determination is at the sole discretion of the City.

A participant may withdraw from this MoU by providing a sixty (60) days written notice to the other parties.

This MoU is subject to approval processes required by each of the parties.

DATED this _____ day of _____.

IN WITNESS WHEREOF:

THE CORPORATION OF THE CITY OF LONDON

By:
Name: Matt Brown
Title: Mayor

By:
Name: Catharine Saunders
Title: City Clerk

I/We have authority to bind the City.

RESOURCE ENERGY DEVELOPMENT OF CANADA, LTD

By:
Name: Michael T. Appleby
Title: Chief Executive Officer

I/We have authority to bind the corporation.

ATTACHMENT A

OVERVIEW OF CITY OF LONDON WASTE MANAGEMENT FACILITIES (www.london.ca)

The City contributes to the health of the environment and its citizens through appropriate collection and management of garbage, recyclables, yard materials, household special waste, and other designated waste materials. This involves providing pick-up and drop-off services within London, processing and creating products of value from compostable/recyclable/reusable materials; and disposing of garbage in an environmentally responsible manner, including the ongoing monitoring and management of closed landfills and other sites producing methane.

To support these services the City owns and operates an array of Solid Waste diversion and disposal assets valued at over $64 Million. These range from public waste and recycling bins, to drop off depots and one active landfill (W12A) and many closed landfill sites.

The City also owns a centralized Material Recovery Facility (MRF) which provides recycling services to London and several neighbouring communities. The MRF was newly constructed in 2011 and is operated and maintained by an outside contractor.

Drop off locations (Community EnviroDepots) are provided for special wastes including household special waste, yard materials, electronics, scrap metal, tires, roofing, etc. Solid Waste is responsible for maintaining these assets in serviceable condition between replacement cycles, ensuring compliance with Provincial regulations and maintaining the continuity of solid waste services to the citizens of London and other customers.

General household waste is primarily collected by the City while recycling pick-up and processing services are contracted out. The City owns and operates a fleet of garbage truck.

The W12A Landfill consists of a number of assets including landfill cells, buildings, leachate and gas collection systems and stormwater maintenance ponds. This facility operates within its Operation Plan, with additional disposal cells being brought online to accommodate waste in accordance with its Environmental Compliance Approval. Based on projected use, the current landfill will reach capacity in about 2023, at which point it will require an expansion (or other long term disposal solution) to provide the city with the space needed to meet its future needs.

The W12A buildings (Incl. Site Works & Equipment) includes the roads, curbs and landscaping as well as the administration, maintenance and scale house buildings. The W12A Leachate Collection System collects and conveys leachate for treatment. This system is capable of meeting the current City's needs and is expanded as new disposal cells are constructed. The Landfill Gas Collection System collects and conveys landfill gas to the on-site landfill gas flare for destruction. This system is capable of meeting current City's needs and is expanded as new disposal cells are constructed.

On-site W12A Stormwater Management Ponds and site drainage infrastructure collect and treat surface runoff from snow and rain that impact the site. Maintenance occurs on a planned basis, with investments identified through regular inspections.

Any expansion or examination of alternatives will be undertaken as per the requirements of the Environmental Assessment Act.

Buffer land is comprised of City owned land adjacent or near the W12A Landfill that has been acquired to provide an appropriate buffer from existing operations and to provide buffering for possible future landfill expansion and resource recovery facilities. It is expected that additional land will be acquired for these purposes over the next several years.

ATTACHMENT B

PRIMER – CONCORD BLUE REFORMER®
ADVANCED THERMAL CONVERSION TECHNOLOGY

As governments, businesses and organizations of all types look to meet their sustainability goals, finding effective and affordable ways to manage waste disposal becomes a priority. The innovative advanced thermal conversion system from Lockheed Martin using Concord Blue technology provides an affordable, environmentally friendly solution. It's designed to handle a variety of organic feedstocks – from biomass to municipal solid waste and industrial waste and more.

The system converts organic waste to raw syngas. Once cleaned, the syngas is suitable for an internal combustion engine to generate electricity, for conversion to biofuels or for hydrogen production. The advanced thermal conversion/gasification system is flexible and scalable, making it an option for a wide variety of industries. Systems can be incorporated into an existing facility. The modular plant design allows much of the plant elements to be built offsite and requires as little as a one-half acre of land. In addition to saving money on waste disposal costs and transportation, the closed-loop system requires no additional power once the conversion process begins and therefore is self-sustaining. Power can be used at the site or sold to create an additional income stream.

Unlike incineration, the process is oxygen-free and flame-free, which means no harmful by-products are produced, emissions are limited and waste going to landfills is greatly reduced.

There are four key steps in the process:

Feedstock Collection: Wood-waste, municipal solid waste, industrial waste and more can be collected and used as input. The system will initially use wood-waste, with plans to transition to municipal, commercial or industrial waste to create its power in the future.

Feedstock Conditioning: Metal, glass and other materials are removed, and the feedstock is dried to specification.

Gas Creation: Proprietary heat carrier spheres are heated and mixed in with the organic feedstock. Once a certain temperature is reached, the feedstock turns into gas, which then travels to a reforming vessel where the gas is turned into synthesis gas (syngas).

Generation: The syngas is then used to fuel a combustion engine that produces electricity. Alternatively, the syngas can also be used to produce hydrogen and biofuels.

In September 2016, Lockheed Martin commissioned a small quarter-tonne per hour system to demonstrate the end-to-end capability of the facility and validate its ability to convert waste material into energy for the company's Owego operations, where it designs and builds space-flight hardware, military helicopters and fixed-wing aircraft.

What's Next

Building off the experience gained during development of the Owego facility, Lockheed Martin and Concord Blue are working on larger bioenergy systems for demonstration and validation of its economic and environmental capabilities. Resource Energy Development of Canada, through its partnership with California based Resource Energy Development, Inc. seek to establish themselves as leaders in the development, operation and management of sustainable bioenergy systems.

Concord Blue's unique technology benefits the environment and fulfills all international, Environmental Protection Agency and European regulations for renewable energy and air emissions.

APPENDIX B

EXISTING AND PREVIOUS MEMORANDUMS OF UNDERSTANDING

The City has four Memorandums of Understanding (MoUs) approved by Council:

- **Bio-TechFar Inc.** – a working relationship to undertake testing and research; write and present reports; develop data/information including a feedstock inventory; and work with industry, government and academic partners on the viability of its proprietary pyrolysis technology and processes to create higher value resources from biomass waste that would normally be sent to recycling and/or disposal facilities. Bio-Techfar have developed a proprietary pyrolysis technology, referred to as the BT-100/500, that has successfully converted a range of biomass materials into pyrolysis-oil and pyrolysis-char for both energy and non-energy applications. Bio-Techfar now wants to increase the technology throughput for biomass materials such as forestry residuals, agricultural residuals, yard waste and other industrial or municipal biomass materials/waste streams. The expiry date of this MoU is December 31, 2019.

- **Hawthorne Green Key Group** – a working relationship designed to undertake testing and research; write and present reports; develop data/information; and work with industry, government and academic partners on the viability of its proprietary pyrolysis technology and processes to create higher value resources from waste that would normally be sent to recycling and/or disposal facilities. Hawthorne has the Canadian rights to a proprietary pyrolysis technology that has successfully converted a range of biomass materials into energy, chemicals and/or fuels, now wants to determine the viability of this technology on solid waste materials, including mixed solid waste, commonly known as household garbage. The expiry date of this MoU is June 30, 2020.

- **Try Recycling Inc**. – a working relationship to undertake testing and research; write and present reports; develop data/information; and work with industry, government and academic partners on the viability of a range of technologies and processes to create resources from waste that would normally be sent to disposal facilities. Try has proprietary and other expertise related to the successful conversion of a range of waste materials into products with beneficial uses, in particular, the conversion of organic wastes into compost and various construction, renovation and demolition (CR&D) wastes into beneficial products. The expiry date of this MoU is December 31, 2019.

- **University of Western Ontario (Institute of Chemicals and Fuels from Alternative Resources - ICFAR)** – a working relationship covering the broad sectors of solid waste management, biomass management and related sectors that produce waste materials. ICFAR is a research facility with proprietary technologies and expertise that have contributed to the successful conversion of a range of materials into energy, chemicals and inert materials. Western has identified Environmental Sustainability and Green Energy as an area of research strength and ICFAR/Western has various research interests in the field of biomass conversion technologies and management and wishes to coordinate R&D activities, including multi-disciplinary, multi-institutional waste-to-resource initiatives, for the purpose of using the broad expertise to valorize biomass and organic wastes into marketable products at the local, regional, Canada-wide and international levels. The expiry date of this MoU is December 31, 2019.

The City has one expired MoU as follows:

- **Green Shields Energy (GSE)** – this was a working relationship designed to explore the viability of a Gas Phase Reduction (GPR) technology for managing solid waste. This technology had already been proven to manage a range of material including pesticides, soil, sediment, sludge, high-strength oils, tar, watery wastes, wood wastes, brominated fire retardants, CFC refrigerants. It has not been thoroughly tested to handle mixed solid waste (household garbage), source separated organics (Green Bin) materials, mixed plastic waste, etc. GPR is a process for the conversion of organic material to methane rich gas also known as synthetic gas or syngas. The

process comprises heating vaporized organic material in the presence of an excess amount of hydrogen gas and superheated steam to produce a methane rich fuel syngas. The syngas can be converted to various fuels or burned directly to create energy. The MoU expired on December 31, 2017. Reasons for the expiration included technology patent challenges, lack of confirmation of government grants and project financing challenges.