

November 21, 2005

CR05-156

To: His Worship the Mayor  
and Members of City Council

Re: Landfill Gas Hydrogen Generation Project

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The Works and Utilities Committee, at its meeting held on November 15, 2005, considered the following report from the Administration:

### BACKGROUND

As part of the City's Landfill management plan, the control of methane gas has been investigated for a number of years. The City applied for and received funds from the Green Municipal Enabling Fund (GMEF) to conduct preliminary feasibility studies on the collection, control and disposal of methane gas at the Landfill. Methane gas is a greenhouse gas (GHG) which is a contributor to climate change, and is generated from landfills through the decomposition of refuse. Controlling and recovering landfill gas for productive reuse is an environmental stewardship initiative.

The City of Regina was approached in December of 2004 by a consortium centred around SHEC Labs (Solar Hydrogen Energy Corporation Ltd.) which is headquartered in Saskatoon. This consortium requested the City's participation in their submission of a proposal to access federal funding for the construction of a hydrogen production facility, utilizing renewable solar energy and landfill gas. The City's participation is for the supply and sale of raw landfill gas as the raw feedstock for the hydrogen production process as well as the provision of a suitable location.

The City supported the consortium's application to Sustainable Development Technology Canada (SDTC) and in October of 2005, the project was awarded funding for a demonstration scale project. Federal funding comprises approximately \$2,000,000 out of the total \$6,000,000 project cost.

Federal funding has been approved and the City has now been requested to sign a Project Agreement indicating the City's continuing support and partnership in the project, and triggering access to SDTC funding. In addition to the Project Agreement required for the consortium to access the SDTC funding, the City will be looking to negotiate a Memorandum of Understanding with the consortium that outlines at a high level the areas intended for negotiation. Subsequent Development and Operating Agreements will be required between the City and the consortium to solidify the scope of the project, and the terms of the relationship between the City and the consortium.

### DISCUSSION

The SHEC solar hydrogen project consortium consists of a number of private and public sector partners, including SHEC Labs, Giffels Associates Limited (An Ingenium Group Engineering Company), Clean 16 Environmental Technologies Corporation (associated with the University of Toronto Department of Chemical Engineering), and two other associated firms, including a Fortune 500 industrial gas supplier and a global food corporation, who wish not to be named in any publicly available documentation without their prior written approval. SaskEnergy is also considering participation in the project subject to internal evaluation and approval.

The project will build a demonstration scale project, followed by commercial scale facility to produce hydrogen as well as substitute natural gas. In the process, landfill gas, which contains many contaminants, will undergo a cleaning process to purify it into methane and carbon dioxide, which are then chemically reacted to form hydrogen gas and carbon monoxide. A secondary reaction then converts the produced carbon monoxide into hydrogen and carbon dioxide with the addition of water. While this is a simplification of the general chemistry, the final products are hydrogen and carbon dioxide from the raw input of landfill gas and water.

The City's component of this project is construction of a landfill gas collection system at the Fleet Street landfill in 2006. This project which was originally scheduled for 2007 will be contained in the proposed 2006 capital budget and is estimated to cost \$1,900,000. There is a cost to operate the gas collection system, but this cost will be offset by the value of the recouped methane and, potentially, the value of GHG credits.

This project represents a significant new technology for the production of hydrogen. This process, if proven to be commercially viable, will generate a marketable product from a pollutant with positive environmental benefits. There is also the opportunity to generate revenue for the City through sale of the landfill gas as a commodity, as well as through the future value of GHG credits.

Methane produced from landfills is a greenhouse gas (GHG) which has 21 times the impact of carbon dioxide on the earth's biosphere. A process that captures and destroys methane prior to it reaching the atmosphere is an eligible process for GHG credits. Although greenhouse gas tracking and evaluation is not yet clearly defined in North America, other parts of the world, notably Europe, have an established GHG credit trading system and market.

At this stage of the project, SDTC requires formal commitments from the partners involved in the project in the form of a Project Agreement. The Project Agreement stipulates the City's Fleet Street landfill as the host site for the project, as well as the City's responsibility for construction and operation of the landfill gas collection system.

The Project Agreement does not speak to financial arrangements between the parties, although there is an inherent value in both landfill gas and GHG credits that needs to be negotiated between the City and SHEC Labs.

Your Administration is proposing a multi stage process to negotiate the terms of the business relationship between the City and the SHEC consortium. It is proposed that a Memorandum of Understanding first be agreed to outlining the intended areas for negotiation, such as; respective responsibilities of the partners, design and construction of the components and conditions for termination.

Subsequently, a Development Agreement will define the details of the landfill gas collection system, details and timelines for the construction of the pilot project, and the relationship between the City and the consortium partners.

A third and final Operating Agreement will define the purchase price of the landfill gas, the scope of the phases of the project, commissioning, pilot and commercial operation, and provisions that would come into effect should the demonstration project not meet the goal of being commercially viable.

In Canada, there are several municipalities that have negotiated landfill gas utilization agreements. All of these agreements recognize a value in both monetary terms, as well as GHG credits for the captured and destroyed methane. Arrangements and methods of recognizing the value of both methane and GHG credits are unique to each situation. The City is using the services of a consultant, Conestoga Rovers Associates, to assist with the technical and economic evaluation of the landfill gas.

Terms of the Operating Agreement will recognize the demonstration nature of this current project, as well as the long-term value of the City's commodity. Of particular interest is the creation and marketing of "substitute natural gas", which is essentially landfill gas with the contaminant constituents removed for resale. This product will be available if there is a surplus of cleaned landfill gas that is not needed for hydrogen production.

The City of Regina is one of the key partners in Communities of Tomorrow. Other key partners in Communities of Tomorrow include the Government of Canada, Government of Saskatchewan, National Research Council of Canada and University of Regina. The goal of the \$30.0 million initiative is to develop, demonstrate and commercialize technologies and management practices for sustainable communities. The objective of Communities of Tomorrow is to bring together the partners, including the City of Regina, in a unique community environmental laboratory to test and assess the applicability of existing; new and emerging technologies and applications to sustainable community development. Two calls for proposals resulted in research and development projects in the community and the City is a participant in a range of these projects. Communities of Tomorrow has continued to seek collaborative opportunities for sustainable community development. The City of Regina has pledged an in-kind commitment of \$5.0 million to Communities of Tomorrow over five years. The Landfill Gas Hydrogen Generation project is entirely consistent with the direction being taken by Communities of Tomorrow and buttresses the City's partnership with Communities of Tomorrow. The City of Regina's contribution to this project would constitute a significant portion of that in-kind commitment to Communities of Tomorrow.

The recently announced New Deal funding for municipalities also has direct ties to projects that support the federal and provincial initiatives of clean air, clean water and the reduction of GHG emissions. This project aligns with the objectives of the New Deal funding by developing a project that reduces GHG emissions in not only an environmentally sustainable manner, but develops a value added product from a pollutant.

### BUDGET IMPLICATIONS

Construction of the landfill gas collection facility in 2006 will require advancing funds originally contemplated to be spent in 2007. Total cost is estimated to be \$1,900,000 which is available from the Landfill Reserve. Operating costs for the gas collection system are anticipated to be in the \$80,000 per year range. The project provides an opportunity to offset operating costs by the sale of landfill gas to the consortium. The annual compensation for the sale of the landfill gas has yet to be negotiated. The value of GHG credits produced by this project will be retained by the City and have a future potential value as implementation of the Kyoto protocol proceeds.

### COMMUNICATION PLAN

A communication plan will be developed in collaboration with the project participants. The plan will recognise the economic and environmental benefits of this project. Timing and content of

the communication plan must recognise and accommodate the situation of other key participants in the project.

### ENVIRONMENTAL IMPLICATIONS

Landfill gas contains methane and is a significant source of greenhouse gases. The City is committed to collecting and destroying the methane in landfill gas by flaring. Use of landfill gas in a process that converts the methane to hydrogen or natural gas has the added benefit of replacing non renewable fossil fuels and further reducing GHG emissions. Additionally, the solar hydrogen production process utilizes energy captured from the sun to make the conversion from methane to hydrogen, greatly reducing the requirement for energy from non renewable fossil fuels. The project will convert a potent greenhouse gas, into value added hydrogen, with no net increase in air pollution or greenhouse gases.

City Council has adopted GHG reduction targets of for both the City corporately and the community as a whole. The corporate target set by City Council was to reduce the greenhouse gas emissions by 20% of 1990 levels by 2005 and then effect further emissions reductions by 1% each year thereafter until 2012. The City has made progress to achieve this target having reduced the emissions by about 12 % of 1990 levels.

The community target is to effect reductions of greenhouse gas emissions by 6% of 1990 levels by 2012. Currently, the community emissions have been increasing and not reducing. In 2001, the community greenhouse gas emissions in Regina were about 4.1 million tonnes as compared to 3.5 million tonnes in 1990.

Destruction of landfill gas is deemed to be a community GHG reduction; it is not eligible for inclusion in the City's corporate GHG reduction targets. At full capacity, the landfill gas collection system will collect and destroy approximately 56,000 tonnes of Carbon Dioxide equivalent per year.

### DELEGATED AUTHORITY

The authority to execute agreements related to the SHEC solar hydrogen project requires City Council's approval.

### CONCLUSION

As part of the City's landfill management plan, a feasibility study has been completed on the construction of a landfill gas collection system to manage and destroy the methane generated by decomposing refuse. The City was approached to support a Saskatchewan firm (SHEC) and a consortium of partners in its proposal to the Federal Government for funding to construct a facility to convert landfill gas into Hydrogen, and destroying methane recovered from the landfill in the process.

Federal funding was received by the consortium, and in order to trigger the flow of funds to initiate the project, the project partners, including the City of Regina, have been requested by SDTC to enter into Project Agreements indicating their intent to proceed.

The City will be constructing a gas collection system at the Fleet Street landfill as part of this project to supply raw landfill gas for feedstock to the SHEC process. Your Administration is recommending that the City enter into agreements with SHEC to solidify the scope of the

project, the compensation to the city for the landfill gas supplied, ownership of GHG credits generated, and other terms of the relationship.

### RECOMMENDATION

Your Administration recommends that:

1. The City Clerk be authorized to execute a suitable Memorandum of Understanding between the City of Regina and SHEC Labs for the City's participation in the solar hydrogen production project to outline the broad terms of negotiations between the parties with the agreement first to be approved by the City Manager and City Solicitor; and
2. The City Clerk be authorized to execute a suitable Project Agreement between the City of Regina and SHEC Labs for the City's participation in the solar hydrogen production project for submission to the Federal Government indicating the City's commitment to proceed as part of the project, with the agreement first to be approved by the City Manager and City Solicitor; and
3. The City Manager be authorized to negotiate suitable Development and Operating Agreements between the City of Regina and SHEC Labs for the City's participation in the solar hydrogen production project which detail the City's participation and compensation for this project; and
4. That the City Manager provide subsequent reports with recommendations to City Council for approval to execute the negotiated Development and Operating Agreement between the City of Regina and SHEC Labs.

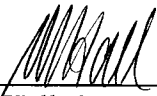
### **RECOMMENDATION OF THE WORKS AND UTILITIES COMMITTEE - NOVEMBER 15, 2005**

The recommendation contained in the report be concurred in.

Councillors: Badham, Bryce, Hincks, Hutchinson and Murray were present during consideration of this report by the Works and Utilities Committee.

Respectfully submitted,

WORKS AND UTILITIES COMMITTEE

  
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Erna Hall, Secretary

