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Title: Coupling Wastewater Treatment with Renewable Energy Production using Membrane Bioreactor Technology

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In 2007, 2.8% of Canada's energy production derived from biomass and waste resources, whereas, as early as 2001, 10% of Nova Scotia's energy requirements were drawn from renewable resources including wood combustion processes. However, generating power from wood resources is inefficient and the diverting land and crops from food to energy production and feedstock for biofuel production is problematic. Efforts to increase the proportion of power from renewables to 25% by 2015 and 40% by 2020 require innovative, efficient, environmentally friendly and economic new approaches to renewable energy. The use of bacteria, algae and activated sludge for energy production is an emerging and promising renewable source. Moreover, lipids extracted from microorganisms can be combined with alcohols to produce biodiesel and glycerol, while the activated sludge, which is a byproduct of wastewater treatment, can be minimized, yet subsequently used as feedstock for anaerobic digestion for biogas production.

The Membrane Bioreactor (MBR) is an innovative method of wastewater treatment which uses microorganisms to break down organics and harmful contaminants into inorganics and microbial biomass. Biomass is prevented from leaving the MBR by size selective nano-sized pore membranes. Current research in pesticides and compost leachate treatment achieved significant reductions in overall organic concentration (COD reduced by 99.9%) and target contaminants (65 – 99% reductions of pesticides). Coupling an aerobic MBR to an anaerobic reactor will significantly reduce nitrogen and phosphorous levels and produce effluent acceptable for discharge and also generate significant amounts of biogas. MBR is an effective wastewater treatment process and also provides a significant source of renewable energy.