

# GREENING THE LINK: A CALL FOR SUSTAINABLE TRANSPORTATION FUEL AT CSB|SJU

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## Abstract

The College of Saint Benedict and Saint John's University have a unique partnership that allows students to take classes at both institutions. A small fleet of buses, dubbed "The Link", help connect the campuses which are approximately 7 miles apart by road. The current fleet runs solely off of diesel fuel. This petroleum-based fossil fuel is economically and environmentally unsustainable. There are several possible alternative fuel sources that reduce pollution and could be incorporated into the schools' current infrastructure. Possible fuels include hydrogen, electricity, natural gas, and bio-fuels. Any of these alternative fuels would increase the sustainability of The Link, however, none of these options are feasible for implementation in the near future. The best alternative for increasing sustainable transportation at CSB|SJU is to continue upgrading the fleet, as well as attempt to increase ridership, as The Link is a more sustainable mode of transportation than individually driving.

The Link Fleet Upgrades				
Bus Year	Upgraded exhaust	Engine heaters	Urea injection	Biodiesel compatible
1997	X	X		
1998	X	X		
2001	X	X		
2004	X	X		
2007	X	X		
2009	X	X	X	X
2012	X	X	X	X

Table 1. A comparison of upgrades that have increased the sustainability of "The Link" by reducing emissions through more efficient exhaust systems, urea injection to reduce NO<sub>x</sub> and engine heaters that allow for less warm-up idling time. Also shown are the biodiesel compatible buses.

## Methods

Personal interviews were conducted with the director of the CSB Transportation Department, as well as with members of the Sustainability Offices at both CSB and SJU in order to learn first-hand the research, planning, and decision-making process that is done before any decisions about sustainability are made. These interviews provided detailed and comprehensive steps that CSB|SJU have already taken in 'greening' the fleet, as well as the direction in which they are heading. In order to gain necessary background knowledge of the fuel industry, the busing industry, entities that had already converted to sustainable fuels, and the decision making process behind all of it, an in-depth literature review was conducted. Sources include governmental agencies, environmental organizations, universities, recent case studies, and scholarly literature published by experts.

## Data

Fuel	Advantages	Disadvantages
<b>Biodiesel</b>	<ul style="list-style-type: none"> <li>. Decrease in many GHG emissions</li> <li>. Reduction in fossil-fuel use</li> <li>. Renewable source of energy</li> </ul>	<ul style="list-style-type: none"> <li>. Increase in NO<sub>x</sub> emissions</li> <li>. Lack of availability</li> <li>. Not reliable in cold climates</li> </ul>
<b>Hydrogen fuel-cell</b>	<ul style="list-style-type: none"> <li>. No emissions</li> <li>. No moving parts</li> <li>. Higher efficiency compared to ICEs</li> </ul>	<ul style="list-style-type: none"> <li>. High cost of production and storage</li> <li>. Lack of availability</li> <li>. May not work in cold climates</li> </ul>
<b>Natural gas</b>	<ul style="list-style-type: none"> <li>. Lower cost than gasoline</li> <li>. Large amount of NG reserves in US</li> <li>. Reduced GHG emissions</li> </ul>	<ul style="list-style-type: none"> <li>. Non-renewable fossil fuel</li> <li>. Lack of widespread filling station availability</li> <li>. Reduced range of the vehicle</li> </ul>
<b>Electricity</b>	<ul style="list-style-type: none"> <li>. No direct emissions from vehicle</li> <li>. Electricity is widely available</li> <li>. Higher efficiency compared to ICEs</li> </ul>	<ul style="list-style-type: none"> <li>. Reduced range of the vehicle</li> <li>. Power plants producing electricity release emissions</li> <li>. Batteries must be charged regularly</li> </ul>

Table 2. Advantages and disadvantages of biodiesel, hydrogen, natural gas, and electricity as sustainable transportation fuels as compared to diesel.

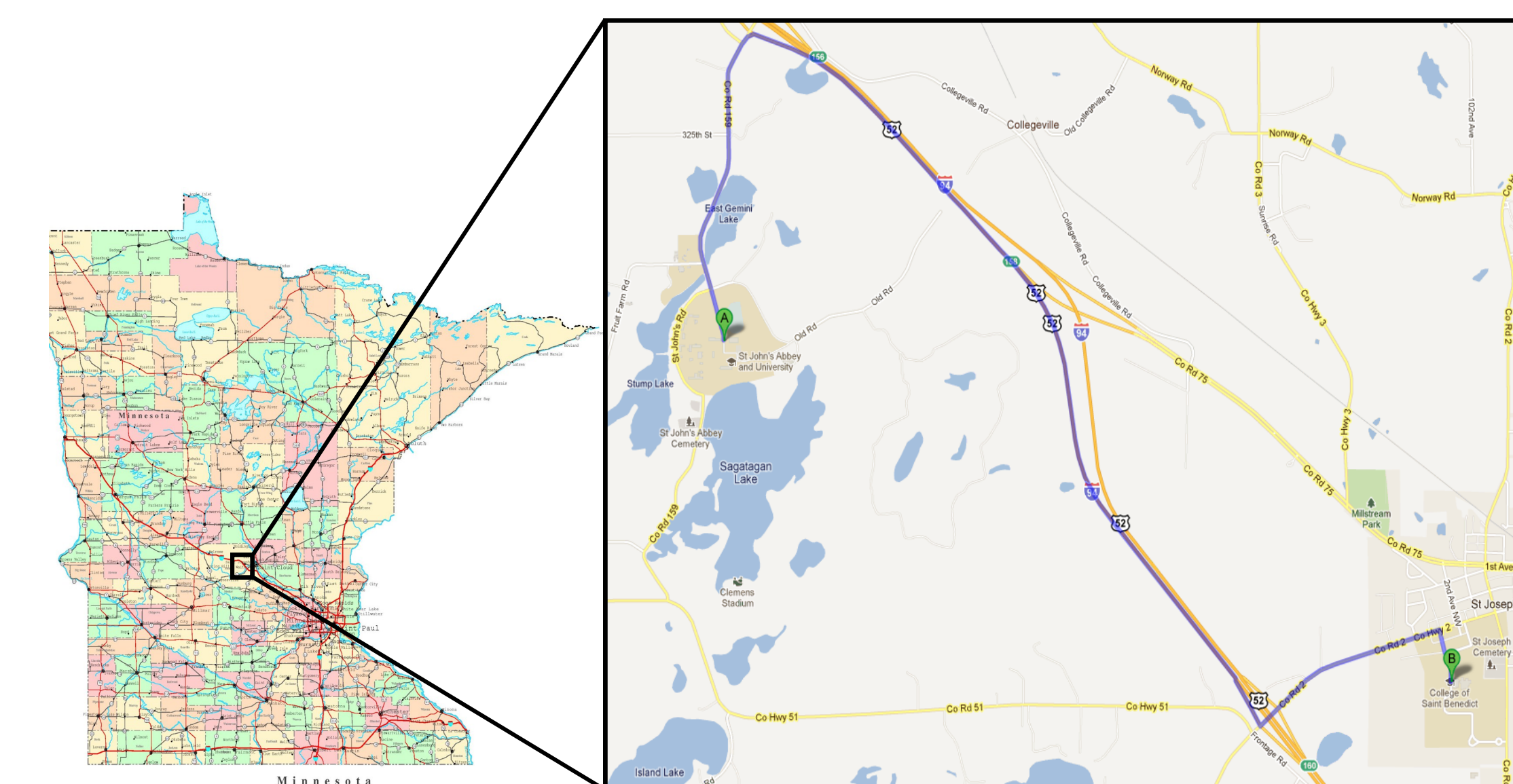


Fig 1. Location of CSB|SJU and the route taken by "The Link" from each campus.

## Conclusion

There have been many factors considered in developing a plan for creating a sustainable Link. It is clear many of the alternative fuels such as hydrogen, electricity and natural gas are cost prohibitive and ultimately infeasible in the near future. Biodiesel is the only marginally potential alternative fuel for use by the fleet. However, a combination of barriers exist that make biodiesel an improbable option for "greening" The Link in the short term. The best way for The Link to decrease the impact of its fossil fuel use right now is to continue upgrading to more efficient buses when decommissioning old ones, as well retrofitting older buses with newer and more efficient diesel technologies, such as urea injection and upgraded exhaust systems. This may only marginally decrease the emissions from The Link, however, upgrades and retrofits are the only practical means of achieving a level of sustainability in the near future. As alternative fuels mature and become more accessible, the outlook for the incorporation of them into the fleet may become a more viable option. In the short term the most cost-effective option to increase transportation sustainability at CSB|SJU is to increase ridership of The Link. By doing so, the capacity of each bus can be maximized, increasing the overall efficiency of each trip.

### References:

- Arent, Douglas Jay. 2009. *Alternative transportation fuels and vehicle technologies: challenges and opportunities : a report of the CSIS Energy and National Security Program, CSIS Global Strategy Institute, and National Renewable Energy Laboratory.* Washington, D.C.: Center for Strategic and International Studies.
- Consumer Energy Center. "Transportation Choices for Consumers." California Energy Commission, accessed November 29, 2011. <http://www.consumerenergycenter.org/transportation/index.html>.

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