

Edmonton Trolley Coalition Bulletin



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Consultants Release Trolley Report Close examination of study reveals flaws and omissions

The results of a study by a U.S. consulting firm on the city's trolleybus system were made public on January 26th at a meeting of the Edmonton Transit System Advisory Board. The study was commissioned to assist administration in making a recommendation to Council on how to decide the trolley system's future. The current trolley fleet is expected to be life expired by 2010 and would need to be replaced. The study itself makes no recommendations, but strongly suggests abandoning trolleys would save costs. It claims that stricter standards on diesel emissions will result in "cleaner" diesel buses by 2008, making the difference between trolleys and diesels less "perceptible". Spread over six years, the capital cost to phase out trolleys is cited as \$369 million, and the cost to retain them--including a brand new trolley fleet--is quoted at \$389 million. This is a cost difference of 5%.

The study looks at the operating, maintenance and long-term capital cost aspects. But significant flaws can be found in its analysis. The operating cost analysis is incomplete, with no calculation of *per passenger costs* and no *discounted cash flow analysis*. The latter is a standard means of comparing investments. *Per passenger cost* figures, at least, would enable one to compare the trolley, diesel and LRT systems and see how well each is doing at covering the costs associated with its operation. Strikingly, the conclusions in the maintenance cost analysis actually run contrary to what the data show. Aging diesel buses show up in the data as more expensive to maintain than trolleys--in some cases more than twice as expensive--but the study concludes maintenance costs are similar.

While the projected capital costs may be reasonable 'ballpark' figures, one senses uncertainty about the exact *technology* that will be used to meet post-2007 emission standards. One might expect this uncertainty because there are several technologies in testing and development. At one point the study refers to "particle traps, NOx reduction catalysts and low sulphur fuel" to meet the standards; elsewhere it alludes to hybrid diesel-electric buses, which cost about \$700,000 a piece. If hybrids are required to meet future standards, the capital cost difference between keeping trolleys and going all-diesel narrows considerably. The long-term maintenance costs of the new diesel technologies are also unknown and impossible to project, so technologically sophisticated diesels could end up costing more operationally.

There are other questionable projections in the report. For instance, it predicts that diesel fuel prices will remain relatively stable in the future. Recent history suggests otherwise. For three years in a row, the city budget has had to grapple with rising diesel fuel costs. Power prices are negotiated on contract and remain fixed over the contract's term. Because Edmontonians are shareholders in the power company, the chances of "getting a good deal" are far better with Epcor than with oil companies, where prices

fluctuate according to world markets. A return to the 1970's, when diesel fuel prices were significantly higher than power costs, might be just around the corner. In fact, economists predict it will be worse this time, as world oil production reaches its hiatus and slides into permanent decline.

Trolleybuses are certainly not suitable for all applications; they are optimally used on routes like those in the city core, where the revenue from higher patronage offsets the cost of investing in overhead wires. Running a trolleybus system also poses more challenges to management than the operation of diesels. There is little doubt that an all-diesel fleet would make some things easier, and the economies of size might perhaps exert some short-term influence on rising costs, helping management's books look good.

But on the other hand, public transit isn't intended to benefit management; it's intended to serve citizens. And it does so in many ways. It not only provides mobility, but it removes vehicles from the roads, easing traffic congestion, and improving quality of life. To provide these benefits, transit vehicles have to run through communities. Diesel buses, in particular if there are a lot of them, are very disruptive because of their high noise levels. Diesel buses can generate noise in excess of 80 db, while trolleys are nearly silent. In some communities, trolleys pass by over 400 times a day. Imagine the noise impact on these communities if their transit routes are converted to diesel permanently.

Diesel emissions are also harmful. The study does look at this issue, but only makes a cursory examination of in-street (curbside) emissions, preferring to focus on 'area wide' emissions instead. But in-street emissions actually have the greatest health impact. The study says toxic diesel particle emissions at bus stops can be up to *40 times higher* than levels in the ambient air. It doesn't mention that while new emission standards may reduce the amount of diesel particles released, they won't reduce their toxicity. And the emissions would still be released *in the streets*. Environment Canada says there is *no safe level* of particle exposure. Even if trolleys do cost more, would we really be doing the best thing for the communities of our growing city core by tossing out our investment in zero emission, quiet trolley technology? Despite all its fancy graphs and charts and its pages of analyses, this is a question the study just doesn't provide any answers to.

An administrative recommendation will go forward to the City's Transportation and Public Works Committee on March 16th. A public hearing is to take place sometime in April. The time frame seems very short, and there appears to be much haste to push for a quick decision on this issue. Management is pressing for more garage space, despite the recent acquisition of the old Cromdale facility. They claim they could put off building a new garage if the trolley system were scrapped soon. And then there is the issue of 12 poles that need to be moved to accommodate a roadway change in Rosedale by July. Of course, the new roadway would require street lighting poles anyway whether trolleys run or not, and these poles represent only 12 out of 4,600 in the trolley system. 19 new poles were installed on 101 Street when a rail overpass was removed in 1999, without issue.

Given the massive investments this city has made in trolley technology and the fact that trolleys benefit a very important core area of our city that is undergoing revitalization, it would seem more prudent to step back and look at this in a little more detail. At the very least, there needs to be in-depth consultation with those communities who would be directly impacted and whose futures could be changed by making the wrong decision.

In 1993, Toronto abandoned its trolleybus system under pressure from the Ontario provincial government that 'clean' natural gas buses would be just as effective, and would make use of inexpensive and plentiful natural gas reserves. The Toronto Transit Commission found that the new technology CNG buses were expensive to maintain, and that they were not as 'clean' as promised. In 2000, Howard Moscoe, the Chair of the TTC, stated publicly that the abandonment of trolleybuses had been a "regrettable mistake".

Let's not make the same mistake in Edmonton!

Looking at the Trolley Study in Depth

What does it say, What doesn't it say?

(contributed by *Citizens for Better Transit*)

☞ **The study says the system comprises 140 km of overhead wire, 4,600 support poles and 8 power substations. 3,700 of the poles are “joint use poles” which also hold street lighting and other fixtures.**

A new trolley substation was built at Rossdale in 2000 at a cost of \$2 million, and there have been many upgrades to the trolley system recently. The study didn't consider capital investments.

The study identifies the replacement of some trolley support poles as a capital cost. (Street lamp poles in many areas are also being replaced.) This begs the question: If 3,700 of the trolley poles also support street lighting, how is this cost being shared? Is the entire cost charged to the trolley system?

☞ **The study says trolleys comprise 7.4% of all buses in service and serve 8.4% of all bus stops, representing a small portion of the ETS system.**


Whether the trolley system is small or large isn't a significant factor in determining its utility value. Small (ELF) minibuses form an even smaller portion of the fleet. At 37 vehicles, the LRT fleet is also smaller than the trolley fleet, and it serves only 10 stops, less than 1% of all stops in the transit system. Both of these sub-systems are highly valued by citizens and commuters. If we used the percentage of stops served or percentage of the fleet to measure of their worth, we should have abandoned both minibuses and LRT long ago.

More important in determining the value of any part of the transit system is the number of passengers it serves or can serve. Location in relation to activity centers and areas of denser population are considerations also. LRT connects important destinations, minibuses serve seniors centers and shopping malls where big buses can't enter. Trolleybuses serve the denser city core and connect with activity centers and LRT, serving lots of passengers. Denser downtown development means more people benefit from quality of life advantages (e.g. low noise levels) associated with trolleys.

☞ **The study says operating costs, calculated in cost per km, are higher for trolleys than for diesels, and will remain so even if trolley usage is increased.**


The study doesn't actually evaluate future operating costs, so there is no basis for this future projection. It looks at past cost comparisons, and doesn't present a complete picture of these. Cost per km doesn't take into account the work a vehicle does, for example in stopping for passengers, accelerating and operating in heavy stop-and-go traffic. An express or suburban bus that makes few stops and hauls few passengers will naturally have a lower cost per km than a popular bus route in the busy downtown that makes a lot of stops. But the popular downtown route will be more viable financially because it hauls more passengers, thereby earning more revenue. One would naturally expect the cost per km to be lower on the diesel system because it has many express and suburban runs that cover many kilometers with fewer stops. The trolley system operates mainly in the more congested city core. In order to be able to determine how well trolleys do in covering the costs of their operation, one needs to know more than cost per km. A cost per passenger or cost per passenger km comparison is required. Looking at cost per hour would also be useful since City Council allocates transit service in terms of service hours.

An accepted methodology for comparing two investment scenarios is a discounted cash flow (DCF) analysis. If properly done, a DCF analysis would allow one to compare the costs associated with trolleys and diesels over the long-term in a more balanced manner, taking into account cost factors that are not directly related to vehicle mileage.

 **The study says trolleybus maintenance costs are similar to diesels over the long run. It says trolleys cost more to maintain in 2002 than diesels, and then concludes trolleys will continue to cost more to maintain than diesel buses.**

None of these conclusions are substantiated by the data in the study. The data actually show the most expensive buses to maintain are 9 to 11-year-old (6V92) diesels. They cost 1.53 per km in 2002, vs. only 0.72 for a 21-year-old trolley. Diesel buses of comparable age to the trolleys averaged 0.11 more per km for maintenance over the three years examined. The figures also indicate that maximizing trolley usage would make trolleys the least expensive vehicles to maintain of all the buses 10 years of age and older. This obvious error casts doubt on the study's reliability.

Like the operating cost analysis, one can also identify problems with the method used for the maintenance cost analysis. The study only examines maintenance costs over the last three years. It calculates an average maintenance cost for a diesel fleet consisting of almost 50% new vehicles, and compares this average directly against the maintenance cost for 20+ year-old trolleys. Naturally diesels come out cheaper because there are so many new buses in the diesel fleet. "Life cycle costing" is the method fleet operators prefer for making comparisons; looking at the life cycle costs of trolleys and diesels of similar ages would have provided a more informative comparison. This could form part of a discounted cash flow (DCF) analysis.

 **The study says that because of dramatic improvements in diesel engine controls (spurred by impending 2007 exhaust regulations), trolleys no longer will offer advantages in "area wide" emissions.**

The study devotes much analysis to "area wide" emissions, but the crucial issue in deciding the trolley vs. diesel question is actually pollution along major arterials, in high density core areas of the city and in public areas such as bus stops and even inside buses. In other words, it is street-level or localized pollution, not "area wide" emissions. Whether a power plant 100 km away emits a fraction more or less pollution to run electric trolleys compared to diesels is hardly significant when the diesel's emissions are released into the streets, in close proximity to hundreds of people. Environment Canada states there is no safe level of exposure to particle emissions and recommends avoiding exposure wherever possible. In its cursory look at local impacts, the study says passengers waiting at bus stops are exposed to particle levels 40 times higher than ambient levels. If these levels are unsafe, then even the reduced levels from newer diesel engines must be considered unsafe. Reducing the emissions from diesel buses by a factor of 4 would still leave passengers at stops exposed to particulate levels 10 times higher than ambient levels. One wonders about exposure levels inside the buses themselves.

Emissions from vehicles operating in real world conditions often vary considerably from test data used for federal certification. New diesel buses may not be as 'clean' in reality as the standard promises.

 **The study says trolleybuses produce lower noise levels than diesels under most conditions.**

Diesel buses produce noise levels in excess of 80 db, but passing trolleybuses are barely audible above ambient noise levels. A special exemption clause (covering heavy vehicles) was required in the City's noise bylaw to permit the operation of diesel buses in residential areas. Edmontonians have voiced concerns about diesel bus noise in the past. Parkallen residents, for instance, recently rejected plans for a transit center in their community as part of LRT expansion because of the noise impacts from diesel buses. A noise impact assessment evaluating the number of noise peaks per weekday above 80 db that would result in each affected community from a trolley to diesel conversion would be useful to be able to quantify the noise impacts to citizens. In areas served by trolleys, replacing them with diesels adds anywhere from ~25 to 500 such noise peaks per weekday, depending on service levels.

The study says new trolley acquisition cost is arguably the biggest disadvantage vs. motorized buses. New trolleys cost about twice as much as diesel buses, mostly because the market in North America is intermittent.

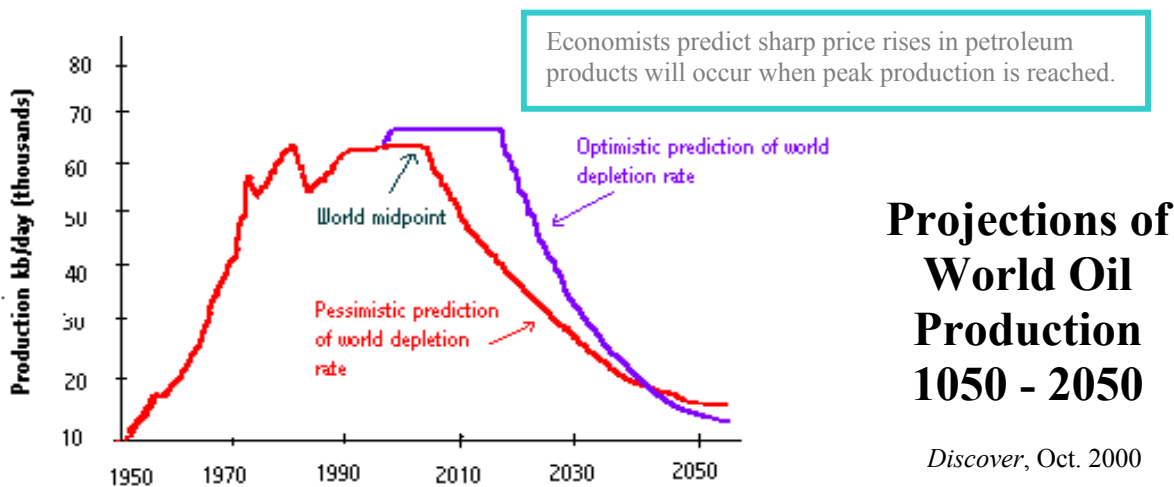
Edmonton needs less than 50 trolleybuses--the study says 49. By the time the trolleys need to be purchased in 2008, the replacement of the old GM diesel fleet will have been largely completed. Currently, the City buys about 40-50 diesel buses per year. 25 trolleys would involve about the same annual expenditure. Spreading an order of 49 trolleybuses over two years will not require annual funding above and beyond what is currently spent on diesel buses. The higher per unit cost of new trolleybuses therefore should not pose a problem.

New Flyer Industries of Winnipeg is due to complete an order of trolleybuses for Vancouver by the end of 2007. With an assembly line in place, this manufacturer would be in a position to turn out trolleybuses for Edmonton and to offer a competitive price. Because of the timing of Edmonton's order, the fact that North American manufacturers are not regularly producing trolleybuses should not be a problem.

The study says petroleum prices are forecasted to remain stable. Diesel fuel costs will likely increase by 2 cents per litre in 2007 due to ultra low sulfur requirements.

This statement contradicts recent experience. For the past three years, the City has had to add several million dollars to the budget to cover rising diesel fuel costs for the transit fleet. Petroleum prices are governed by the world market, and history indicates this market is anything but stable. Power for trolleys, on the other hand, is bought on contract over a longer term. Price stability over the contract's term is guaranteed, and the City is likely to be able to negotiate a "good deal" because it owns the power company.

Petroleum refiners actually predict a price rise of 0.20 per US gallon or about 0.05 per litre on diesel fuel due to the 2007 low sulphur requirements. But beyond this, prices are forecast to rise sharply sometime in the next two decades, as world petroleum production peaks (see graph below). Could this jeopardize the long-term sustainability of diesel powered public transport? Should Edmontonians give up their trolley system based on a gamble that economists might be wrong about oil price rises?



The study says it will cost \$369 million to phase out the trolleys and \$389 million to continue with trolleys over the next 6 years. (The latter figure includes a brand new trolley fleet.)

One premise of this study is that future emissions standards will make diesel buses 'cleaner', but one detects uncertainty about what technology will be used. At one point, the study says "sophisticated engine controls, particulate traps, NOx reduction catalysts and ultra low sulphur diesel fuel" will enable

the standards to be met (p. 34). On another page (p. 38), it suggests hybrid (diesel-electric) buses may be the industry's choice to meet post-2007 standards. The long-term performance, reliability and maintenance costs of both of these technologies are largely unknown, but because they are more sophisticated, one might expect such costs to be higher. The hybrid bus, for instance, uses about 40 batteries which have to be replaced about every two years. The study does not evaluate maintenance cost implications for future fleets at all, but presents only the above capital cost assessment.

The study estimates that a 40 foot diesel bus will cost about \$500,000 after 2007 because of the added emissions equipment. It uses this figure to project future capital costs for diesel buses. But if hybrid technology is needed to meet post-2007 standards, the capital cost of a new diesel bus could increase to \$700,000—almost as much as a new trolley. The study does not take this into account in a “margin of error”. If future emission standards require hybrids at \$700,000 a piece, the capital cost difference between keeping trolleys and going all-diesel narrows considerably. The capital cost assessment is thus really just a “guess” that falls apart if any of the assumptions it is based on are not met. This may explain why the consultants were reluctant to make any recommendations.

In deciding the future of its trolley system, how much faith should we put in the guesswork of a study which exhibits significant shortcomings in a number of areas?



Would we be better to err on the side of caution and simply continue with trolleys? At least we can be certain they produce no in-street emissions, and we know they are quiet and community friendly. Experience in other cities shows they also attract riders. Isn't that the kind of transit we want for Edmonton's growing downtown: zero in-street emissions, quiet and attractive to riders?



◀ **New Low Floor Electric Trolleybus for Boston – 2004**

New trolleys have appeared recently in San Francisco, Seattle, Dayton and Boston. Vancouver has new trolleys on order. (H. Hylton/Courtesy R. C. DeArmond)

How can Edmontonians support the retention of trolleybuses?

Call or write your City Councillor or the Mayor's Office; Contact the Citizens Action Centre at 496-8200, by fax at 496-8210 or by electronic mail at cacentre@edmonton.ca

Speak to City Council: March 16th at the Transportation and Public Works Committee Meeting
In April at public hearings.

For further information on how to speak to Council or for details of the above meetings, please call the City Clerk's Office at 496-8178 or contact them by e-mail at: civic.agencies@edmonton.ca

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Sources: *Diesel Fuel News*, Aug. 14 2000; *Discover*, October 2000; Fred Pearce, “Dry Future”, *New Scientist*, July 1999.