



THE VAN HORNE INSTITUTE

Cost Update for

Calgary/Edmonton High Speed Rail:

An Integrated Economic Region



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The Van Horne Institute is pleased to release a **Cost Update** to the **Calgary/Edmonton High Speed Rail: *An Integrated Economic Region*** report released in 2004.

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Introduction

In response to recent inquiries about the cost of implementing High Speed Rail (HSR) in the Calgary-Edmonton corridor, the Van Horne Institute (VHI) updated the cost estimate developed as part of its 2004 HSR feasibility study.

This update was confined exclusively to the cost estimates in the 2004 study. New site investigations of land availability for the alignments, station locations, and maintenance facility were not undertaken. Other aspects, such as changed environmental regulations, changes in codes, right-of-way engineering issues and routing changes also were not addressed as part of this exercise.

The reader is therefore cautioned that costs could vary if land development subsequent to the completion of the 2004 report has encroached on areas previously assumed available for the rail right-of-way or because other significant variations in the 2004 assumptions have occurred. Before proceeding with implementation, a review of potential changes should be undertaken to confirm both the project scope and budget as a result. Nevertheless, the updated project cost should provide a reasonable ballpark estimate of the current cost of implementing HSR in the corridor.

The following outlines the approach taken to complete the update.

Property

The 2004 study identified the need for five stations – downtown Calgary, suburban Calgary in vicinity of Calgary International Airport, Red Deer, a location near Edmonton International Airport and downtown Edmonton adjacent to the Grandin LRT station – and a maintenance centre in proximity to Red Deer. The current cost for station and maintenance facility land acquisition was estimated based on current municipal assessment data and commercial land sale prices. Based on these sources, the current cost for station and maintenance facility land acquisition was estimated to be approximately \$27.4 million (2011).

The 2004 study also identified the need for 108 to 309 hectares of land acquisition for the CPR option right-of-way¹ and 1,430 hectares for the Greenfield options. Two methods were employed to calculate the right-of-way acquisition costs in 2004. In the case of the CPR option, CP Rail provided data on recent sales prices paid for land acquisition according to different sections of the alignment. Where the land required for the Greenfield options deviated from that of the CPR option², average land costs provided by Alberta Transportation were used.

To update land acquisition costs for right-of-way purposes, Statistics Canada's data on the increase of farm land values between 2004 and 2011 (61.76%) was used to inflate the 2004 estimates for right-of-way acquisition.

¹ This included land severances.

² Common alignment was assumed entering both Calgary and Edmonton to avoid acquisition of a new rail right-of-way in these congested urban areas.

The following are the current estimates of total property acquisition cost for the options.

PROPERTY COST ESTIMATE		
Options	\$ 2004 (millions)	\$ 2011 (millions)
CPR Option	\$22.8	\$30.3
Greenfield Options	\$47.8	\$70.8

Rolling Stock

Market research carried out as part of the 2004 feasibility study revealed that two hours or less was the threshold required to attract significant demand in support of the service. To meet this travel time threshold, technology options able to operate at 200 kph or more are necessary. The 2004 study examined two rolling stock technology options – the 200/240 kph *JetTrain* and 320 kph electric trains. The CPR option’s design was predicated on a 200 kph due to concerns over mixed freight traffic operations, whereas the Greenfield option was designed for both 240 kph and 320 kph operations.

Since completion of the 2004 study, various market and technological changes and advances have occurred that may influence not only rolling stock sourcing and supply but also pricing. Bombardier’s *JetTrain*, which had been developed in conjunction with the US Federal Railway Administration and was available in prototype form in 2004, failed to secure a contracted buyer and has not proceeded into production.³ Additional players in the design and manufacture of high speed rail equipment, including both Korea and China, have entered the market, introducing greater supply and price competition. In addition, technological advances have occurred that may affect price.

At the same time, several limiting conditions that affected Calgary-Edmonton HSR in 2004 remain. First, despite the Obama administration’s commitment to advance HSR in the US, implementation of HSR comparable to that found in Europe or Asia has yet to be achieved. Only the *Acela* (240 kph) service in the US Northeast corridor between Boston and Washington is currently in operation. Thus, issues concerning adaptation of proven European or Asian HSR rolling stock to meet North American safety standards are still supply and cost consideration factors.

Second, the Calgary-Edmonton order is small both in terms of the number of train sets (five) and seating capacity requirements, which translates into a higher per unit cost, particularly that a tag-on order to a large European or Asian procurement is precluded by the former consideration.

Third, HSR rolling stock orders remain relatively few and far between and fraught with individual conditions, such as local supply and manufacture conditions that affect price. This makes benchmarking current costs based on recent orders very difficult especially given the former two limitations inherent in the Calgary-Edmonton HSR context.

³ Alternative higher speed diesel trains that can meet the 200 kph design speed of the CPR option are available on the market.

The inherent limitations of the Calgary-Edmonton HSR rolling stock procurement were thoroughly analysed in developing the 2004 cost estimate for rolling stock. For this reason, one approach was to update the 2004 rolling stock cost estimate by using the Canadian rate of inflation since 2004 (15.5 %). To test the reasonableness of this approach, rolling stock supply contracts for high speed (200 to 250 kph) and very high speed (320 kph plus) trainsets awarded to the three largest train manufacturers (Alstom, Bombardier and Siemens) between 2004 and 2011 were reviewed, an adjustment factor North Americanization and the small size of the Calgary Edmonton HSR order used in 2004 was applied and then were inflated to current dollars.

The following table compares the results of these two approaches:

ROLLING STOCK COST ESTIMATE (CDN \$ 2011 MILLION)		
5 Train Sets	Inflated 2004 estimate	Supplier Based Estimate
Up to 250 kph non-electric (8 cars)	\$375.4	
(10 cars)	\$425.5	
Up to 250 kph electric (8 cars)		\$375.2
(10 cars)		\$425.1
320 to 380 kph electric (10 cars)	\$432.4	\$464.3

Based on the above, the cost for rolling stock for the purpose of this exercise has been assumed to range from \$375 to \$465 million (Cdn) in current dollars for options.

Other Capital Costs

Estimates for the Calgary Edmonton High Speed Rail were prepared in April and May 2004. The estimates are inflated on the basis that work will commence in the year 2011, and are inflated over the construction period. The overall inflation rates used are as follows:

2004 to 2005	7.00%
2005 to 2006	7.00%
2006 to 2007	9.00%
2007 to 2008	8.00%
2008 to 2009	3.00%
2009 to 2010	2.00%
2010 to 2011	2.00%

These percentages were further analysed into labour, material, equipment, overhead and fee elements. Equipment was inflated at 2% per annum. The inflation rate reflect the high material inflation experienced in 2004 and 2005, together with the construction industry being extremely buoyant in 2006 to 2008 with labour costs increasing at very high rates often at around 10%.

COMPARISON OF CAPITAL COSTS (\$ MILLIONS)			
	CPR	Greenfield	Greenfield Electric
Property	30.3	70.8	70.8
Rail Infrastructure	1,022.8	1,951.3	1,951.3
Stations and Parking	37.7	37.7	37.7
Maintenance Facilities & Equipment	92.0	102.3	106.7
Road Work	379.5	167.0	167.0
Electrification	0	0	846.4
Total Construction Costs	1,562.3	2,329.1	3,179.8
Vehicles, TVMs & Communication Systems*	393.9	465.5	478.3
Engineering	120.8	216.5	298.4
Project Management	13.2	130.9	181.0
Testing and commissioning, Ops prep	11.2	11.2	11.2
Insurance & Bonding	23.7	84.1	110.9
Total Engineering & Management	169.0	442.6	601.5
Contingencies	234.2	361.5	488.2
TOTAL PROJECT COSTS	2,359.4	3,597.7	4,747.8

*TVM – Ticket Vending Machine

The reader is cautioned that the above estimates do not include either interest or inflation during construction as the period over which this would take place is unknown. In addition, the above is an inflated estimate of the project as reported in the 2004 study. Given the passage of time and potential for changes to have occurred, the addition of 5% to the contingency as shown above is prudent and is indicated in the final updated estimate in the conclusion.

Conclusion

The current estimated cost in 2011 for HSR in the Calgary Edmonton corridor with the additional contingency allowance is as follows:

- \$2,465.5 million for the CPR option
- \$3,702.3 million for the Greenfield non-electric option
- \$4,969.0 million for the Greenfield electric option.