IC

THE FUTURE OF NEWSPRINT MANUFACTURING IN CANADA

Report No. 3

NORTH AMERICAN NEWSPRINT PAPER SUPPLY ANALYSIS

Competitiveness Analysis
Corporate and Industrial Analysis Branch

in collaboration with

Forest Industries
Resource Processing Industries Branch

INDUSTRY CANADA

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Table of Contents

1.0 INTRODUCTION

Given the recent performance of the newsprint industry, many analysts were and are asking many questions concerning the product's future, the outlook for existing firms, and the potential for future investments. The future of newsprint is challenging from both a demand and a supply perspective. Competing means of communications have led to concerns that the products traditional markets may diminish significantly. On the supply side, the evolution demands for recycle fibre content to meet environmental requirements. This has significant consequences with respect to the cost competitiveness of various sources of supply.

The above concerns are of particular importance for the Canadian pulp and paper industry given Canada's concentration in newsprint , the need to import recycled fibre and the age and capacity of some of our mills. The Competitiveness Analysis Group has prepared three studies that should serve as a beginning to address these serious concerns. The first two papers in this series examine the future demands for newsprint and supply, demand and pricing of recycled fibre.

This report presents an analysis of the long run competitiveness of Eastern Canadian locations for newsprint manufacturing. The "construction" of the state-of-the-art newsprint mill in Canadian and U.S. locations enables us to determine whether Canadian costs (fibre, labour, energy, cost-of-capital, etc.) permit Canada to attract investment. If Canada is an attractive location then the policy direction is very different from the circumstance where Canada can not be competitive in the long run. Having established Canada's position in the long run then there is a foundation for examining the adjustment path for the existing capital stock of the industry.

1.1 Background

This study comes at an opportune time for the industry. A severe recession on the North American continent and now on the European continent has resulted in a drop in newsprint demand and prices levels that have put the industry under intense pressure. Operating rates have been at unsustainable low levels. The result has been large financial losses across the industry and extensive mill downtime and/or closures. This is most evident in Eastern Canada where the impacts of the recession have been particularly hard, with a number of mill closures, dowtime and personnel layoffs.

This relatively short-term phenomenon does not, however, provide a reliable indication of the long run competitiveness and thus the profitability of the Canadian industry in this global commodity market. Variables which do not necessarily impact the short-term market play much greater roles in determining the long-run competitiveness of the

industry, and it is the intent of this study to consider these and all other variables which do impact the long-run and thus the competitiveness and profitability of the industry. This report presents the findings and conclusions from this analysis.

The subsequent sections of this report provide the findings and conclusions drawn from the work undertaken by Industry Canada and H.A Simons. They will discuss all the relevant issues concerned with the production and marketing of newsprint in the North American marketplace, and will present 25-year cash flow projections upon which the profitability of each mill can be determined.

Five base scenarios have been assumed for this study in terms of the location of mill. The regions are: Quebec, Ontario, Alabama, New York State and New York City. The New York State and New York City mills are assumed to be 100% recycled mills using Old Newspapers(ONP) and Old Magazines(OMG) as their primary furnish, while the mills in the remaining three regions are assumed to be 100% virgin mills using pulpwood as primary furnish but with options of 20% and 40% recycled ONP and OMG wastepaper.

1.2 Objectives

The overall objective of the study was to evaluate and judge Canada's long-run competitive position in newsprint manufacturing in the North American marketplace. Specific objectives of the study were:

- To develop capital and operating cost comparisons between state-of-the-art virgin and recycled fibre newsprint mills located in key areas of North America, taking into account a twenty-five year forecast of the operating costs and the transportation costs to logical newsprint markets.
- Provide long-run competitive benchmarks for the production of commodity grade newsprint against which Canadian producers can assess their current performance and develop strategies to remain competitive.
- Measure the ability of each region to attract investment in competition with other locations.
- Value the forest resource in terms of its impact on newsprint sheet design.

2.0 THE APPROACH

2.1 Illustrative Mill Locations

The objective of this project is to compare capital and operating costs for newsprint production in five North American regions: Quebec, Ontario, Alabama, New York State and New York City.

In order to proceed with a detailed capital and operating cost analysis, it is of primary importance to choose an appropriate location for mills. The criteria used to locate the mills differed according to the type of mill, principally whether it was a virgin pulpwood-based mill or a recycled-based mill.

The criteria used to locate the virgin-based mill (Quebec, Ontario, Alabama) were as follows:

- access to the most suitable wood resource;
- access to softwood Bleached Kraft Pulp(BKP), where applicable;
- access to ONP and OMG wastepaper, where applicable;
- access to a good water system;
- energy infrastructure;
- transportation infrastructure;
- labour market;
- access to markets.

Concerning the wood resource, the location analysis was based on the overall inventory of the desirable wood species rather than on their immediate availability. Given the study is an analysis, even if in some cases the existing inventory of fibre was already committed, it was assumed that current license arrangements would expire or that old manufacturing facilities would be shutdown freeing up the adequate wood for a world scale newsprint mill.

The criteria used to locate the recycled-based mills (New York State, New York City) were as follows:

- access to ONP and OMG wastepaper;
- water and air quality emissions;
- public and political opinion regarding new industry;
- access to a good water system;
- energy infrastructure;
- transportation infrastructure;
- access to markets.

The location analysis has led to the selection of the areas displayed in Table 2-1, upon which the capital and operating cost analysis have been based.

Table 2-1
Mill Locations

Quebec	Estrie area
Ontario	Thunder Bay area
Alabama	Bolegee area
New York State	Hale Eddy area
New York City	Bronx area

2.1.1 Province of Quebec

The Estrie region has been chosen as a potential mill site as it is optimally located to access both the required softwood fibre-base and required wastepaper material and to deliver the finished product in the U.S. marketplace. In addition, the region has the necessary infrastructure: water resource, energy and skilled labour force. However, for the purpose of this illustrative cost analysis, it has been assumed that one existing old newsprint mill will be shutdown, freeing up the spruce/fir chips wood supply. Details of this site selection are described below.

Softwood Supply

The mill would be supplied on a chip form and the source of the chips would vary depending upon the level of recycling content as shown in Table 2-2 hereafter.

Table 2-2
Source of Softwood Chips

Recycled Content(%)	Softwood Chip Requirements(BDt)	Source	Hauling Distance
0	310,500	185,000 BDt from region 1,2 and 3	150km
		50,000 BDt from the U.S.	100km
		75,500 BDt from Abitibi region	675km
20	249,000	185,000 BDt from region 1,2 and 3	150km
		50,000 BDt from the U.S.	100km
		14,000 BDt from Abitibi	675km
40	177,000	177,000 BDt from regions 1,2 and 3	150km

* Region 1 is Quebec, Region 2 is Mauricie Bois Francs, and Region 3 is Estrie.

Access to Wastepaper

Most of the wastepaper will have to be imported either from the U.S. North East or from the U.S. North Central. The Estrie region is an optimal location in Quebec for this wastepaper supply. Based on the ONP/OMG analysis, the sources of wastepaper for the Quebec mill would be as presented in Table 2-3 under different recycled content scenarios.

Table 2-3
Source of Wastepaper Supply

	Supply Volume (metric tonnes)	
Source	**40% Recycled Content**	**20% Recycled Content**
Canada		
Quebec	10,850	7,250
Ontario	10,500	7,700
U.S.A.		
Connecticut	5,550	4,150
Delaware	3,250	---
District of Columbia	12,700	2,250
Maine	900	900
Massachusetts	13,700	6,350
Maryland	5,450	---
Michigan	2,800	---
New Jersey	15,000	10,500
New York	29,650	20,250
North Carolina	1,800	---
Ohio	9,900	---
Pennsylvania	16,850	10,800
Rhode Island	2,700	1,700
Vermont	900	900
Virginia	1,350	---
West Virginia	1,350	---
Total	**145,200**	**72,750**

Water

The Estrie region is drained through many lakes and rivers particularly the St-Francois river. This system can be used for process water and treated effluent dispersement.

Energy Supply

Electricity is available from the transmission grid of Quebec Hydro, the Crown Corporation that generates and distributes the vast majority of Quebec's electrical energy. In addition, natural gas distribution in the Estrie region is provided by Gas Metropolitan.

The mills in the Estrie region area produce 144,000 BDt of bark and 75,000 BDt of sawdust and shavings for a total of 219,000 BDt of wood residues. However, current wood residue uses total 230,000 BDt which means the region is in a deficit situation and needs to import such residues from other regions. The closest region, Maurice-Bois Francs is also in a deficit situation for wood residues, its production being 270,000 BDt and consumption 375,000 BDt.

Labour

The Estrie region uses skilled labour for the pulp and paper industry in the production of market pulp, fine paper and newsprint. The labour forces educational needs are serviced through elementary schools, secondary schools, colleges, and universities located in Sherbrooke and Lennoxville.

Transportation

The following list details the areas transportation infrastructure.

Railroads: The region is serviced by both CN and CP Rail.
Highways: The region is crossed by Highway 55 which connects with Highway 91 in the U.S. and the Eastern Seaboard.
Ports: Becancour and Montreal vis rail or truck.
Airport: A local airport is located near Sherbrooke.

Access to Markets

The main newsprint markets served from the Province of Quebec are the U.S. North East and U.S. North Central. The Estrie region is particularly well located to serve such markets. Table 2-4 details the assumed market for the Quebec mills output.

Table 2-4
Quebec Market-Mix (tonnes)

REGION	QUEBEC
Canada	**44,765**
Ontario	27,293
Quebec	14,621
Atlantic Provinces	2,851
North East U.S.A.	**125,342**
Maine	2,290
Vermont	975
New Hampshire	1,945
Massachusetts	12,262
Connecticut	7,028
Rhode Island	1,974
New York	35,365
Pennsylvania	22,736
New Jersey	16,934
Delaware	1,192
Washington	7,652
Maryland	4,776
Virginia	7,340
West Virginia	2,874
Southern U.S.A.	**38,796**
North Carolina	6,638
South Carolina	3,248
Georgia	5,473
Florida	15,879
Alabama	2,587
Tennessee	4,971
Central U.S.A.	**89,530**
Kentucky	5,013
Ohio	22,720
Indiana	11,484
Illinois	19,982
Wisconsin	9,884
Michigan	20,447
Total	**298,433**

2.1.2 Province of Ontario

Northwestern Ontario has the largest source of spruce in the province. Within this geographic area, Thunder Bay has been chosen as a potential mill site. Thunder Bay, which has all the necessary infrastructure in place (water resources, energy resources and labour supply), is the best location for a state-of-the-art pulp mill. With nearly all the softwood fibre fully allocated to the existing forest products industry, for the purposes of this study, it has been assumed that the existing capacity would be closed down to free up an adequate amount of the Spruce River Forest wood supply.

Water

There are two main sources of water available to a paper mill in the Thunder Bay region; Lake Superior and the Kaministiquta River. Currently, three regional paper mills access water from Lake Superior and also utilize the lake for treated effluent release. CPFP's integrated kraft/newsprint mill utilizes the river for water access and effluent release. Additionally, three large sawmills access Lake Superior.

Energy Supply

Electricity is available from the public utility that acquires power from Ontario Hydro. Ontario Hydro is a Crown Corporation that guarantees power supply to all industrial purchasers. Traditionally, large block users of electricity have been able to negotiate medium-term supply contracts at agreed rates.

Coal is currently used at Ontario Hydro's thermal generating station located on Thunder Bay's waterfront. For a new pulp and paper mill, access to coal would be similar to Ontario Hydro's procurement strategy; rail transport from mines in Saskatchewan and British Columbia. The transportation distance would range from 1,400 km(Saskatchewan) to upwards of 2,800 km from British Columbia. An average cost is approximately $60/tonne FOB Thunder Bay.

Natural gas is regionally available from Trans Canada Pipelines; access is available at most regional industrial sites. Cost varies by consumption volume and is a negotiated supply contract at agreed rates. Fuel oil is a bulk commodity that has traditionally been delivered to Thunder Bay via lake tankers to a bulk handling port facility and from rail tanker cars. The majority of fuel oil is purchased from refineries in Sarnia, Ontario; 500 km via boat from Thunder Bay. Fuel oil is also available from Winnipeg via pipelines. All contracts are bulk supply negotiated rates.

Biomass from other mills fibre resources is a potential fuel source for a new mill. The Ontario's North Central area mills are producing 1,045,000 BDt of wood residues of which 740,000 BDt find uses. the availability of such residues would be in the range of 305,000 BDt per year. Biomass has been available in the past for upwards of $7.50/tonne FOB sawmill. The average hog fuel haul distance would be approximately 50 km in this region at a cost of $5-$10/tonne.

Labour

The Thunder Bay/Lakehead region has a population of approximately 125,000; Northwest Ontario has a population of 200,000. The primary industry in the area is forest products, followed by government and the retail service sector. Within the current forest products labour force, there is a strong tradition in papermaking (newsprint, groundwood specialties, and coated papers), kraft pulping, mechanical pulping and products handling. Additionally, there exists a large unionized and non-unionized woodlands labour force. Within the mills, the pulp and paper experience is generally within an union structure. The average wage rates for the area are as follows:

- unionized pulp and paper $17/hour
- manufacturing $12/hour

Thunder Bay was recently named by Report on Business as one of the five best communities in Canada. This was primarily due to the combination of recreational infrastructure, housing costs, educational opportunities and climate.

Access to Wastepaper

Most of the wastepaper will have to be imported from the U.S. North-Central area. The Thunder Bay area is an optimal location in Ontario for this wastepaper supply. Based on the previously done ONP/OMG analysis, the sources of wastepaper would be as presented in Table 2-5 under different recycled content scenarios.

Table 2-5
Source of Wastepaper Supply

	Supply Volume(metric tonne)	
Source	**40% Recycled Content**	**20% Recycled Content**
Canada		
Ontario	14,050	8,350
U.S.A.		
Illinois	20,500	14,300
Indiana	26,950	8,800
Iowa	12,600	6,550
Michigan	17,800	9,350
Minnesota	11,150	8,800
North Dakota	900	900
Ohio	20,700	2,100
South Dakota	3,600	700
Wisconsin	16,950	12,900
Total	**145,200**	**72,750**

Transportation Systems

The following list details the areas transportation infrastructure:

Railroads: CPR and CNR - connections to Western Canada, Eastern Canada and U.S.
Highways: Trans-Canada N^{OS} 11 and 17
Bush Roads: FMA's, CMU's, and private lands fully accessed year round
Port: Thunder Bay (Seaway access 10 months)
Airport: Northern Ontario Hub (Jet access)

Access to Market

The Thunder Bay area is well located to serve the U.S. North Central newsprint markets. Table 2-6 details the assumed markets for the Ontario mills output.

Table 2-6
Ontario Market-Mix (tonnes)

REGION	ONTARIO
Canada	**44,765**
Ontario	27,293
Quebec	14,621
Atlantic Provinces	2,851
North East U.S.A.	**89,530**
Maine	1,636
Vermont	696
New Hampshire	1,389
Massachusetts	8,759
Connecticut	5,020
Rhode Island	1,409
New York	25,277
Pennsylvania	16,240
New Jersey	12,095
Delaware	852
Washington	5,465
Maryland	3,412
Virginia	5,243
West Virginia	2,037
Southern U.S.A.	**38,796**
North Carolina	6,638
South Carolina	3,248
Georgia	5,473
Florida	15,879
Alabama	2,587
Tennessee	4,971
Central U.S.A.	**125,342**
Kentucky	7,018
Ohio	31,808
Indiana	16,078
Illinois	27,975
Wisconsin	13,838
Michigan	28,624
Total	**298,433**

2.1.3 State of Alabama

Introduction

It has been decided to locate a pulp mill in the State of Alabama as this state has one of the heaviest timbered in the Southeast. Well over 65% of Alabama's land area is in timber production and this state has a surplus of softwood pulpwood. The area of Bolegee in Alabama has been selected as the illustrative location. This area is located on the Tombigbee River in Green County, Alabama. It is an area of good excess pine growth (presently) but a deficit area for hardwoods.

Wood Resource and Fibre Supply

The state of Alabama is a heavily timbered state with timber types varying from primarily pine in the Central and Southern parts of the state to pine-hardwood and upland hardwood in the Northern counties. In addition, there are also considerable acreages in bottomland hardwoods along the Warrior, Tombigbee, Alabama and Mobile Rivers which flow through the state to the Gulf of Mexico.

Pines vary from predominantly longleaf and slash pines in Southern counties and along the Coast to loblolly and shortleaf in the interior. There are scattered pockets of longleaf also in some of the Central counties and numerous stands of virginia pine scattered throughout the North and North Central portions of the state.

The possibility of acquiring large quantities of chips from sawmills, plywood plants, etc. are not good, as is generally true for all areas in the South. There are a considerable number of sawmills but they are presently making and selling chips to other pulp mills. Consequently, it would be difficult and costly to procure such chips as a fibre source.

Pulpwood use in the area would be about average for the Southeastern states. One would not expect any longleaf or slash pines (higher than average density) in the wood-mix unless the wood requirement was exceptional. Even then it would be minimal.

Based on the above comments and the fact that Bolegee has a surplus of softwood pulpwood, it has been assumed that the newsprint facility wood supply will be composed of 100% softwood pulpwood (219,825 BDMT).

Access to Wastepaper

Most of the wastepaper will be imported from the Southern States. The Bolegee area is well located for this wastepaper supply. Based on the ONP/OMG analysis, the sources of wastepaper for the Alabama mill would be as presented in Table 2-7 under different recycled scenarios.

Table 2-7
Source of Wastepaper Supply

	Supply Volume (metric tonne)	
Source	**40% Recycled Content**	**20% Recycled Content**
Alabama	19,300	18,050
Arkansas	8,800	3,250
Florida	17,300	8,450
Georgia	15,600	8,350
Indiana	800	---
Kentucky	8,150	5,700
Louisiana	9,450	4,100
Mississippi	10,050	9,550
Missouri	4,150	---
North Carolina	4,150	1,700
South Carolina	5,200	2,700
Tennessee	17,500	10,900
Texas	24,750	---
Total	**145,200**	**72,750**

Water

The Tombigbee River conditions are not ideal, however the river is adequate to support the facility.

Energy

The State of Alabama is providing tax incentives for oil and gas exploration from offshore, stripper, coal bed methane wells, and new oil and gas wells in the state. These incentives should develop and ensure a stable energy supply for industry in the future. Currently, sources of electrical power in Alabama are the Alabama Power Company, TUA Cooperative, and TUA Municipal. Nominal power costs are US $0.0415/kWh. Fossil fuels are commercially available with most mining activity occurring in the Warrior Basin. High quality bituminous coal suitable for industrial power plants and also metallurgical coal are mined in the state. The average cost of coal in Alabama is US $40.00/tonne. In addition,

Alabama is a major producer of natural gas with annual production of over 130 billion cubic feet and increases expected in the future. Nominal natural gas costs are US $0.085/m^3 cubic feet.

Labour

Green County is a very rural and low income county.

Union:	"Right-to-work" state
Area Wages:	Average manufacturing: US $9.01/h
	Average pulp and paper: US $13.80/h

Transportation Systems

The following list details the area transportation infrastructure:

Railroads:	Rail transportation in the area is good with two railroads serving a potential site. These railroads are the Southern and CSX.
Highways:	Interstates 20 and 59.
Water:	Barge transportation is possible but it would probably only find use in movements to Mobile for export handling.

Access to Market

Alabama is relatively well positioned with respect to the major U.S. markets. Given its southern location, Alabama's market-mix will tend to be more concentrated in southern regions than a typical northern mill. Table 2-8 details Alabama's assumed market-mix.

Table 2-8
Alabama Market-Mix (tonnes)

REGION	ALABAMA
North East U.S.A.	**89,530**
Massachusetts	9,138
Connecticut	5,235
Rhode Island	1,472
New York	26,338
Pennsylvania	16,943
New Jersey	12,620
Delaware	888
Washington	5,702
Maryland	3,575
Virginia	5,468
West Virginia	2,150
Southern U.S.A.	**149,217**
North Carolina	12,523
South Carolina	6,129
Georgia	10,328
Florida	29,964
Alabama	4,880
Tennessee	9,383
Mississippi	6,507
Louisiana	7,000
Texas	40,558
Oklahoma	6,962
Kansas	5,826
Missouri	9,157
Central U.S.A.	**59,687**
Kentucky	3,341
Ohio	15,146
Indiana	7,657
Illinois	13,322
Wisconsin	6,589
Michigan	13,631
Total	**298,433**

2.1.4 State of New York

Introduction

A state-of-the-art maxi-mill has been assumed for the State of New York. The mill will have a design production capacity of 298,433 tonnes annually, which will contain 100% recycled content using the ONP/OMG fibre mix discussed previously in this report.

The criteria for locating this paper mill will be slightly different than the criteria used to locate the corresponding virgin newsprint mills in Quebec, Ontario and Alabama because this maxi-mill uses wastepaper as its sole source of raw material. The most important of these criteria are discussed in detail below.

Locating a paper mill in the State of New York using wastepaper as its sole source of raw material will be dependant upon four principal factors:

- The location with respect to large urban areas containing sufficient quantities of wastepaper;
- Location in a region that can support such a facility with respect to air emissions;
- Political and public opinion for new industry or the papermaking industry;
- Location in a region which can support such a facility with respect to water emissions.

Based largely upon the above criteria, it was decided to locate the paper mill in the county of Delaware, on the lower reaches of the Delaware River near the town of Hancock. For the purposes of this study it has been assumed that the paper mill will be situated in the town of Hale Eddy, which is located approximately 8 miles north of Hancock on Highway 17.

Access to Wastepaper

The Hale Eddy area is well located with respect to wastepaper markets. Based on the ONP/OMG analysis, the sources of wastepaper for the Hale Eddy mill would be as per Table 2-9.

Table 2-9
Source of Wastepaper Supply

Source	Supply Volume (metric tonne)
Connecticut	3,650
Delaware	2,700
District of Columbia	33,100
Georgia	8,150
Indiana	2,250
Kentucky	4,550
Maine	3,650
Maryland	19,250
Massachusetts	22,050
Michigan	2,250
New Hampshire	4,100
New Jersey	31,650
New York	134,000
North Carolina	9,950
Ohio	4,500
Pennsylvania	55,400
South Carolina	5,900
Vermont	4,550
Virginia	15,400
West Virginia	4,100
Total	**371,150**

Access to Transportation Systems

The Hale Eddy area is well located with respect to transportation systems:

Railroads: Consolidated Rail Corp.(CRC) has a line running through the area. CRC along with Canadian Pacific, Delaware Railway Company and Hudson Railway Company make rail transport possible to all assumed markets for this mill site.

Highways: Hale Eddy is located on Highway 17. Highway 17 connects with a number of Interstate highways and therefore highway access is excellent.

Ports: The closest port to Hale Eddy is New York City 200 miles to the south.

Airport: The closest airport serving Hale Eddy is the Broome County Airport. A larger airport with more regular flights is in the town of Birghampton located 30 miles to the northeast of Hale Eddy. New York City is the closest airport handling international and other long haul flights.

Access to Energy

Both electricity and natural gas are supplied by the New York State Electric and Gas Corporation. Columbia Gas Corporation owns the gas pipelines in the area, however New York State Electric and Gas Corporation handles the distribution of gas. A gas pipeline runs along highway 17 and through the town of Hale Eddy and thus the mill will have access to this energy. Electricity is readily available in the town.

Access to Water

Hale Eddy is located on the Delaware river 8 miles upstream of Hancock. It is located just below the point at which the river broadens to become a major waterway, and thus sufficient quantities of water exist at all times of the year for the paper mill. Water discharges will be into the same body of water and will therefore have to achieve the designated water quality discharge standards imposed by the EPA.

Access to Markets

Hale Eddy is well situated with respect to markets, since it sits in the centre of the largest consuming newsprint region in North America - the Northeast. The northeastern states account for approximately 30% of the value of all newsprint sold in the US market, and therefore local sales for this mill will predominate. However, given the commodity nature of the product, important markets for this mill will also exist in other parts of the United States. Given the New York State mill's relative location with respect to the southern Quebec mill, a similar market mix has been assumed, as detailed in Table 2-10 below.

Table 2-10
New York State Market-Mix (tonnes)

REGION	NEW YORK STATE
Canada	**41,914**
Ontario	27,293
Quebec	14,621
North East U.S.A.	**128,260**
Maine	2,343
Vermont	997
New Hampshire	1,989
Massachusetts	12,548
Connecticut	7,192
Rhode Island	2,020
New York	36,189
Pennsylvania	23,265
New Jersey	17,328
Delaware	1,220
Washington	7,830
Maryland	4,887
Virginia	7,510
West Virginia	2,942
Southern U.S.A.	**38,478**
North Carolina	6,584
South Carolina	3,221
Georgia	5,428
Florida	15,748
Alabama	2,565
Tennessee	4,930
Central U.S.A.	**89,783**
Kentucky	5,027
Ohio	22,784
Indiana	11,516
Illinois	20,039
Wisconsin	9,912
Michigan	20,503
Total	**298,433**

2.1.5 City of New York

The mini-mill concept studied in this project is assumed to be located in an urban area such that the mill will access the abundant quantities of wastepaper available in the urban setting. It is assumed, for this study, that the mini-mill will be located in the City of New York. The source of wastepaper to supply such a mill is presented in the table hereafter.

Table 2-11
Source of Wastepaper Supply

Source	Supply Volume (metric tonne)
New Jersey	18,850
New York	97,050
Pennsylvania	13,700
Total	**129,600**

A detailed location analysis has not been completed for the New York mini-mill. The urban area does not have the limitations associated with non-urban rural areas, which makes the location of the mill less complicated. The New York City area has access to both electricity and natural gas, to all major forms of transport, as well as an abundant and motivated workforce. Land availability, the area required for the mini-mill, is found in most sections of the city.

It will be assumed, for purposes of this study, that the mini-mill will be located in the Bronx area of New York. Discussions with the New York City Economic Development Bureau suggest that the cost of land in the Bronx area for land sizes over 10 acres is in the US$ 400,000 range. The costs for clearing land will vary greatly, the greatest costs being associated with sites which require clean-up due to chemical or other severe forms of contamination. It is assumed in this study that the site selected will be relatively clean with no severe contamination problems. It is also assumed that the site has no existing buildings.

A second advantage of the mini-mill concept is that the relatively low volumes of paper produced by the mill can be sold within a relatively short distance. This compares to the production of a large state-of-the-art mill which sells its product over much greater distances. Table 2-12 details the assumed markets for the production out of the mini-mill.

Table 2-12
New York City Market-Mix (tonnes)

REGION	NEW YORK STATE
North East U.S.A.	**156,827**
Maine	2,865
Vermont	1,219
New Hampshire	2,433
Massachusetts	15,342
Connecticut	8,793
Rhode Island	2,469
New York	44,249
Pennsylvania	28,447
New Jersey	21,187
Delaware	1,492
Washington	9,574
Maryland	5,976
Virginia	9,183
West Virginia	3,597
Total	**156,827**

2.2 Fibre Properties in Newsprint Papermaking

Paper is a sheet-like product composed of cellulosic fibres and fibre fragments bonded together in the form of a three-dimensional network. Paper properties are dependent on the properties of the fibre, the properties of the bonds formed between the fibres and the geometrical arrangement of the fibres in respect to each other. Furthermore, paper contains non-fibrous components that enhance not only the physical but also the chemical properties of the fibres.

Paper products are produced from a wide range of raw materials each imparting specific characteristics to the end product. Wood is far and away the most abundant source of papermaking fibres, accounting for over 90% of the world's production. Non-wood fibre and synthetic fibre constitute the balance. The properties of wood pulp used in papermaking are determined by:

- wood species;
- pulping process;
- pulping conditions;
- past treatment (including recycling);
- stock preparation.

The objective of the paper maker for the vast majority of paper grades is to match the properties required to produce a sheet that is acceptable to the end user and to do so at minimum cost.

Spruce and balsam are good species for making the mechanical pulps used for newsprint production. These species, along with aspen and pine, are available in Quebec and Ontario and could be used to produce newsprint in these regions. The available mechanical pulping species in Alabama is loblolly or slash pine.

The fibre properties of these five species are displayed in Table 2-13. Note the thick, heavy walled fibres of loblolly as compared to the spruce, balsam fir and aspen fibres. These differences in fibre parameters lead to varying mechanical pulp properties and ultimately control newsprint furnish design.

Species with relatively thick cell walls as compared to species with thin cell walls tend to have higher tear strength, lower tensile strength and poorer printability. The width of the fibres influences the smoothness of paper that can be produced from the pulps and the number of fibres per unit weight in the pulp. Wood species with small fibre widths like aspen generally produce a relatively smooth surface which is critical to printing papers.

Table 2-13
Fibre Properties of Available Mechanical Pulping Species

Species	Length (mm)	Width (micron)	Wall Thickness (micron)	Density (kg/m^3)	Lignin (%)
Black spruce	3.5	27	2.4	400	27.6
Balsam fir	3.5	35	n.a.	340	29.4
Jack pine	3.5	36	4.5	390	28.3
Aspen	1.0	16	2.0	375	18.2
Loblolly	3.6	40	3.5	464	28.6

Three mechanical pulping processes are reasonable candidates for making virgin fibre pulps for newsprint production in Quebec, Ontario or Alabama. These pulping processes are thermal mechanical pulping(TMP), lightly chemically treated thermal mechanical pulping(cTMP) and pressurized groundwood(PGW).

The job of a papermaker is to run the lowest cost newsprint furnish possible without badly compromising key paper properties. The paper properties used in this study, derived by a survey performed by H.A. Simons, are listed in Table 2-14. Each illustrative paper mill has been modelled with an 80/20 mix of the standard 48.8 gsm grade and the 61 brightness 52.1 gsm grade to approximate market demand.

Table 2-14
Study Specified Newsprint Properties

Basis Weight (gsm)	CD-Tear (Index-mNm^2/g)	MD-Tensile (Index-Nm/g)	Opacity (ISO)	Brightness (ISO)
48.8	6.04	47.5	96.7	59.0
52.1	6.31	48.0	96.7	61.0

A technical sheet design analysis and an economic comparison of various alternatives was performed by H.A. Simons to determine the optimal newsprint furnish. From this analysis it was clear that *in Ontario and Quebec the preferred mechanical pulp is spruce/balsam cTMP* as it produces the desired paper characteristics at the lowest cost. For the newsprint mill to be sited *in Alabama, the preferred mechanical pulp was loblolly TMP* since the cTMP produces paper that is too bright for newsprint purposes. These become the mechanical pulping processes and virgin fibre species for the balance of the study analyses.

3.0 FINANCIAL ANALYSIS

3.1 Introduction

In this section the attractiveness of the five North American regions are compared. All the financial analyses are based on a 80:20 mix of 48.8 g/m^2 and 52.1 g/m^2 basis weights.

The capital and operating costs for all sites were examined. Net present values for each project were calculated using the appropriate weighted average cost of capital. Based on the results, and various qualitative reasons, the Quebec site was chosen as the benchmark site; the components of the capital and operating costs for this analysis are shown in detail. The other sites were compared against Quebec and the reasons for the differences were determined. The comparisons for the Canadian sites were based on an $US 0.80 per Canadian dollar.

Several sensitivities to alternative scenarios were investigated; these included variations in recycled paper content, exchange rates and recycled paper price.

3.2 Capital Costs

Total capital costs for each location are summarized in Table 3-1. No escalation figures have been included in the numbers shown below.(i.e. all data is in constant real 1993 dollars).

Table 3-1
Capital Costs by Region
($millions Cdn 1993)

	QUEBEC			ONTARIO		
	100% cTMP	20% DIP	40% DIP	100% cTMP	20% DIP	40% DIP
Direct	486.3	500.0	522.5	499.4	534.2	570.6
Indirect	138.2	142.4	148.8	140.8	150.7	160.9
Total	624.5	642.4	671.3	640.2	684.9	731.6

	ALABAMA			NY STATE	NY CITY
	100% cTMP	20% DIP	40% DIP	Maxi Mill	Mini Mill
Direct	134.5	505.2	527.0	601.9	325.0
Indirect	134.6	149.5	156.4	163.1	93.1
Total	577.7	654.7	683.4	764.0	418.1

For the virgin mills it is the fibre supply, recycled pulp content, and the steam and cogeneration plant configuration that were the most significant factors in explaining the difference in capital cost between sites.

Excluding the recycled paper input, Quebec receives 100 per cent of its wood in the form of chips. Ontario and Alabama must purchase roundwood and hence incur the capital and operating expenses for chipping the wood. The amount of recycled paper used at a mill is instrumental in determining the total steam and power demands. As recycled paper input is increased, the total mill steam demand increases marginally (eg. from approx. 217 GJ/hr for a virgin mill to 318 GJ/hr with 40% recycled content). However, this results in less steam being available from the TMP/cTMP recovery systems and this fact dictates the requirement for more steam generating capacity at the mill.

Conversely, higher recycled input results in lower total mill power requirements. Fundamentally, it is less energy intensive to re-pulp old newspaper than to create pulp from roundwood or chips. Going from a virgin wood configuration to a 40% recycled content will drop the total energy demand by 30 MWatts at the Ontario and Quebec mill sites and by 20 MWatts at the Alabama site. This is due to Alabama's use of a TMP process versus the cTMP process at the other two sites.

Power requirements, industrial electricity rates, fuel availability and steam consumption are all considerations in designing a cogeneration facility. Based on these considerations the following natural gas fired cogeneration facilities were installed:

- a simple cycle for the Ontario virgin mill;
- combined cycle for Ontario with 20% and 40% recycled content;
- combined cycle for Alabama with 20% and 40% recycled content;
- combined cycle for the New York state maxi-mill.

It was most economical for Quebec and the New York city mill to purchase electricity from the local utility. It was assumed that "crosshauling" (the selling electricity at avoided costs and "repurchasing" at lower industrial rates) would not be permitted for the purposes of this analysis.

3.3 Production Start-up Schedule

A production start-up schedule of each type of newsprint mill investigated has been developed.

Typically, a machine's start-up costs net of any revenues will be capitalized and amortized over a five-year period: start-up is defined as a paper machine reaching on a consistent basis 70% of its design capacity. The length of time required to reach this threshold is dependent upon numerous factors.

Maxi-mill: The start-up of the maxi-mill virgin newsprint machines were assumed to occur under normal conditions and within acceptable industry average times. From the date of start-up, it was assumed that full design capacity will be achieved after 18 months.

Table 3-2
Production Start-Up Schedule
(Maxi-mill)

Month	% of Design Capacity Virgin Machine
3	53
6	77
9	88
12	94
15	98
18	100

Recycled Mills: The start-up schedule of the recycled mills was assumed to be slightly slower than that of the virgin mill due to the complexity of the pulping systems involved.

Table 3-3
Production Start-Up Schedule
(Recycled mills)

Month	% of Design Capacity Recycled Machine 20% - 40% - 100%
3	48
6	70
9	85
12	93
15	98
18	100

Mini-Mills: The start-up schedule of the mini-mill was assumed to be similar to that of the recycled mills.

3.3 Weighted Average Cost of Capital

In order to calculate the net present value that will be used in the financial analysis, an appropriate discount rate, or weighted average cost of capital (WACC), must be computed. The WACC is used to bring all future cash flows back to the present (1993).

A separate paper produced by Corporate and Industrial Analysis investigated differences in the cost of capital that exist between Canada and the U.S. The paper concluded that Canadian companies, private and public, pay a significantly higher cost of capital than their U.S. counterparts. At a minimum, Canadian companies bear a 0.86 per cent higher real WACC than similar U.S. companies. This difference occurs because Canada historically has been a net importer of capital and has a higher level of country risk relative to the U.S.; foreign investors demand a higher return as compensation.

When exchange rate risk is considered (applicable for those companies which finance their operations in the U.S. money markets) an additional risk premium is created. Since an newsprint mill located in Canada will be exposed to exchange risk, it is appropriate to incorporate an exchange risk premium into the Canadian WACC. An estimate of the spread in the WACC between Canadian and U.S. companies operating in the pulp and paper sector was found to be 1.64 per cent.

Drawing from the results of the investigation, this analysis of the competitiveness of Canadian newsprint mills considers the average WACC for the pulp and paper sector. Although the average spread is not specific to newsprint mills, it is specific to the pulp and paper sector and is a reasonable approximation for Newsprint mills.

3.4 Assumptions

Listed below are the main assumptions used throughout the analysis:

- All values are shown in constant 1993 Canadian dollars.
- The base-case analysis assumes an exchange rate of US$0.80/C$ and a 80:20 product mix of 48.8 g/m2 and 52.1 g/m2 for all mills.
- Production and sales volume are equal each year, with no allowance for changes in inventory.
- Selling price is calculated as the value required for the benchmark Quebec mill to achieve a net present value of zero.
- Delivery costs are an average of the projected market-mix by destination as discussed.
- Start-up production is assumed to be sold for the cost of the fibre and chemicals due to off specification start-up tonnage which impacts on this year's net sales price.
- Operating labour, maintenance labour, salaried clerical and administrative personnel and maintenance materials are included in fixed costs. Rates per tonne in start-up years are higher due to the lower production levels through the start-up period.
- Full manning is assumed with the start-up of the paper machine.
- General and administrative costs have been assumed at $26 per tonne at design capacity on a fixed cost basis. Costs per tonne in start-up years are higher due to lower production levels through the start-up period.
- Property tax and insurance have been assumed at 1% of total capital costs.
- Start-up phase costs are estimated at between $2.6 million and $4.5 million and have been amortized over five years on a declining balance basis, as per generally accepted accounting principles. These costs are incurred between the completion of construction and commencement of normal operations; bringing production from zero to approximately 70% of targeted production. Some categories of costs typical to this phase are: salaries and expenses of mill operations and maintenance personnel, vendor contractor engineering assistance, input materials, additional fixed capital expenditures, lost product,

purchased trial paper, utility costs, etc.. Offsetting these costs are revenues earned from produced saleable output during this phase.

- Owner administrative costs are the costs related to mill administration, personnel and mill administration expenses that will occur from project inception to the end of the start-up phase. For the start-up phase, these costs are estimated at between $7.1 million to $16.0 million and have been amortized over five years.

- Working capital estimates are based on the following assumptions:

Wood and NBSKP	14 days
ONP/OMG	30 days
Chemicals and clay	30 days
Finished production	15 days
Receivables	30 days
Payables (Que, Ont, Al)	30 days
New York City:	10 days
New York State:	15 days

- Reinvestment capital has been charged to the project at a nominal rate of 2% of original capital costs. The expenditures have been phased in at lower rates for start-up years. This level of capital investment is in addition to normal operating maintenance costs included in cash costs and is considered to be an appropriate expenditure to keep the mill running efficiently at full production. This annual amount is not expected to provide manufacturing cost savings or production volume increases.

- A terminal value has been estimated for the mill operations based on five times earnings after tax in year 25.

3.5 Financial Analysis

This section provides a detailed financial analysis of cost competitiveness of the different regions and illustrates advantages and disadvantages for the various cost components in each region.

3.5.1 Methodology

The analysis encompasses generating financial statements for a twenty-seven year period with capital costs beginning in 1995 and operations beginning in 1997 and ending in 2021. Based on the cash flow statements, the net present values (NPV) were calculated.

A benchmark analysis was conducted which compared the NPVs and their underlying cost components of each location to a benchmark site; the Quebec location was selected as the benchmark site.

Revenues for the Quebec benchmark were derived such that total costs, capital and operating, are equivalent to total revenues adjusted for the time value of financing. As a result, the NPV of the cash flows will equal zero implying that the Quebec project is achieving normal returns.

In conducting the comparisons, only the cost components need to be considered because all mills are assumed to have the same revenues. The underlying cash flows include: the components of operating earnings; taxes, freight, and capital costs. All costs have been calculated as average costs per metric tonne and were obtained by dividing the present value of the individual cost components by the present value of production.

The net present values of the Canadian firms were analyzed under the sector specific weighted average costs of capital. Assuming that the exchange rate exposure of newsprint mills is similar to the overall exchange rate exposure of the pulp and paper sector; the spread between the Canadian and U.S. WACC is calculated at 1.64 per cent.

The net present values were also analyzed under different exchange rate scenarios. Since the U.S. mills incur all of their revenues and expenses in US dollars, only the Canadian sites need to be analyzed with respect to exchange rate movements.

3.5.2 The Quebec Benchmark Site

The Quebec region has for may years been an important supply region for newsprint papers. This region is close to the major newsprint printing paper markets and its forest resources are well-suited to the manufacturing of these papers. In addition, the Quebec location was determined to be the lowest cost producer. As such, the Quebec location is a good area to be used as a benchmark.

The cost of producing paper in Quebec, under the 40% recycled content scenario, is illustrated in Figure 3-1.

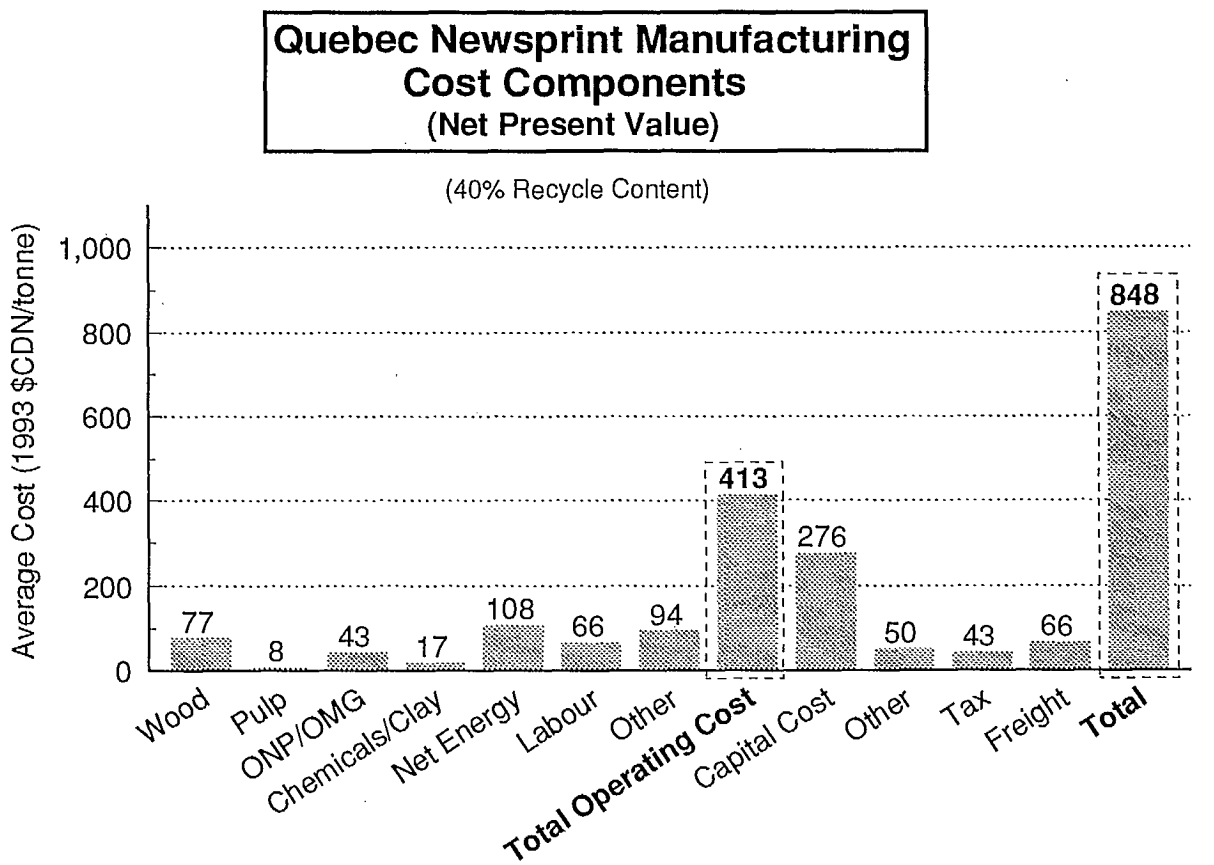


Figure 3-1 Quebec Manufacturing Cost Components

The first six bars in Figure 3-1 provide the average cost components that are included in the operating costs. Of the six operating cost components, net energy was the largest single cost averaging $108 per tonne. Combined fibre costs (wood, kraft pulp and recycled pulp) accounted for $131 per tonne The remaining three operating cost

components include chemicals/clay ($17 per tonne), labour ($66 per tonne), and other ($94 per tonne). Other including operating supplies, maintenance materials, general and administration, and property taxes and insurance. The total average operating costs per tonne was $413.

The capital costs include all plant and equipment costs. The "other" costs include pre-start-up and start-up, working capital, owners' administration, capital reinvestment, large corporations tax, salvage (terminal) value, and flow through (flowing the mill's losses through to the parent company). (Note that depreciation was not included in the capital costs as it was not included in the operating costs; however the tax effects related to depreciation are captured in the tax cost component discussed below.) The average capital cost was $276 per tonne and the average other cost was $50 per tonne.

The income tax rate for the Quebec mill is 30% (based on a net 21% federal rate and a 9% provincial rate [applied to taxable income reduced by federal tax]) which resulted in an average cost of $43 per tonne.

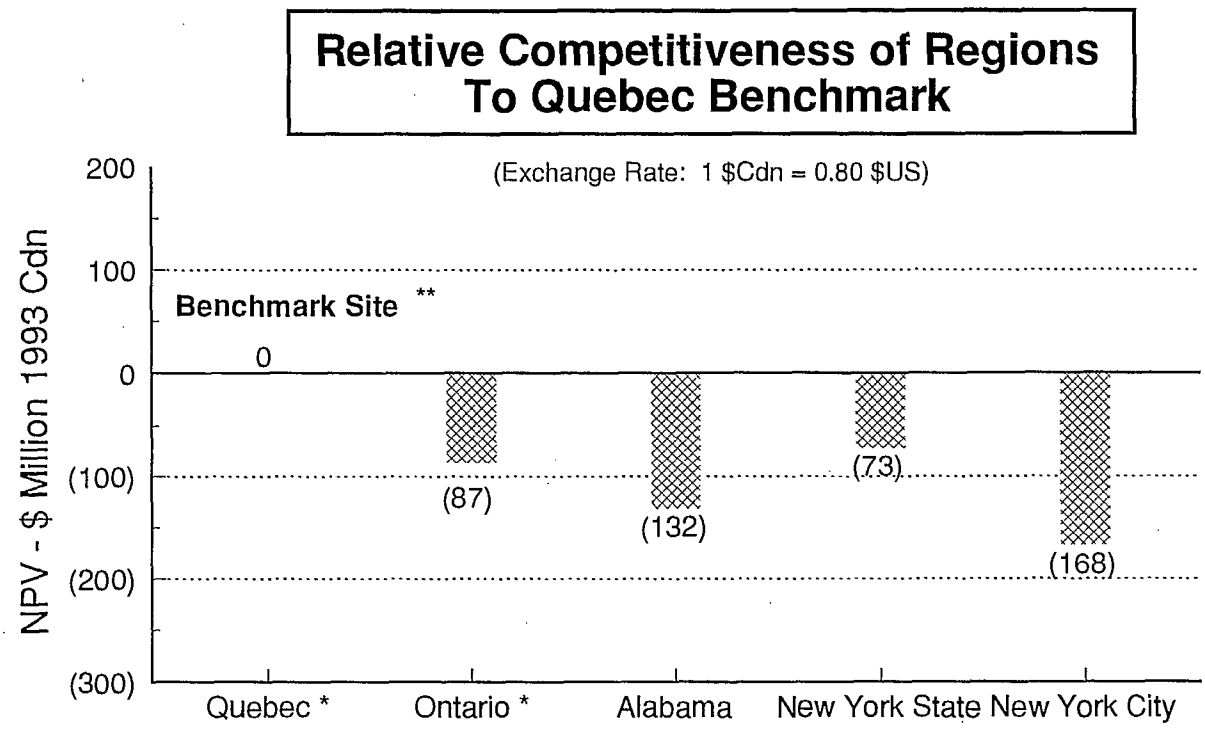
Freight charges include those expenses related to product delivery costs from the mill gate to the various market locations. Quebec's average freight costs, based on the previously discussed market mix were $66 per tonne.

The total combined average cost per tonne of paper at the Quebec location was $848.

3.5.3 Other Sites: Comparison With Quebec

The cost components of the other site locations are compared to the costs of the Quebec benchmark at the WACC spread of 1.64 per cent above the WACC used for the U.S. mills. This WACC represents the average incremental spread Canadian pulp and paper firms can be expected to pay relative to their U.S. counterparts and incorporates an average level of exchange rate exposure.

The comparison of the attractiveness of the four regions with the Quebec benchmark is illustrated in Figure 3-2.



* Based on a 1.64 percent higher WACC.

** Based on 40% recycled content.

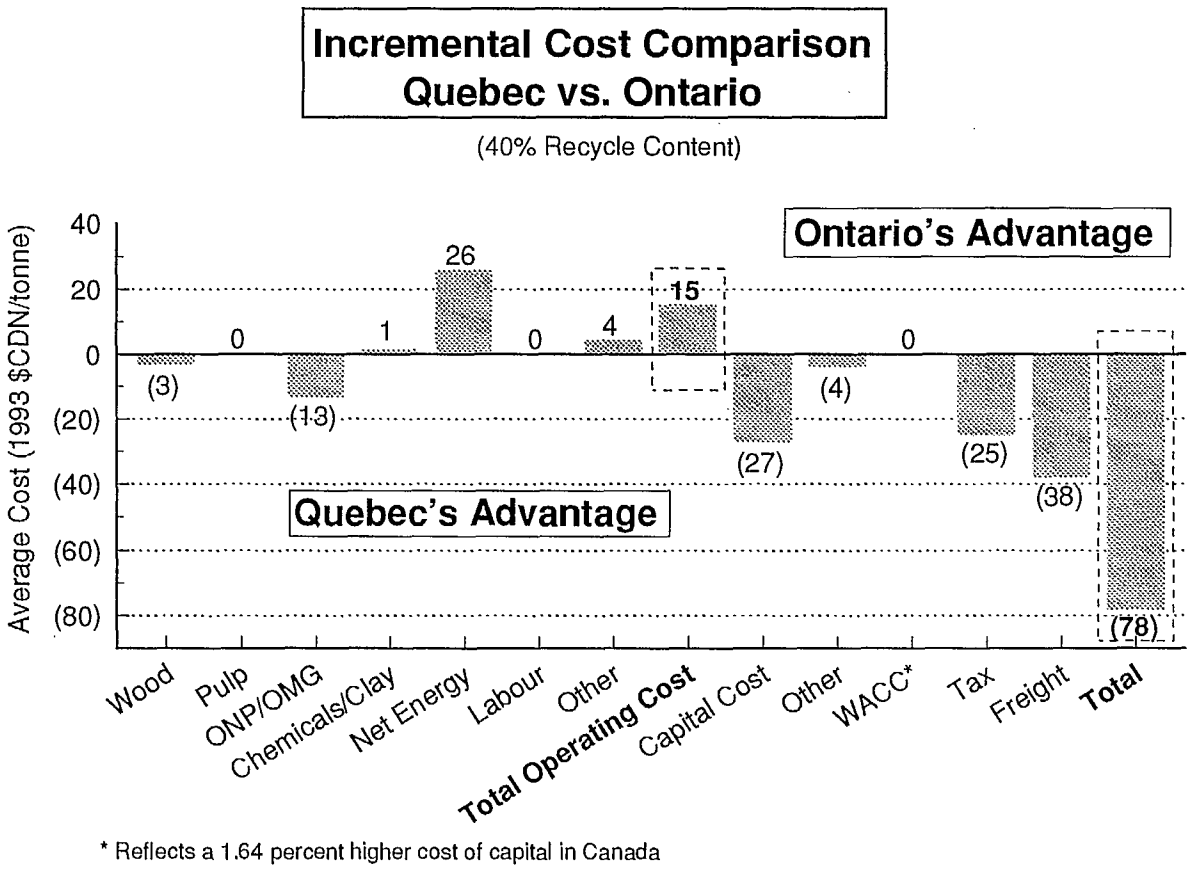
Figure 3-2 Relative Comparison of Other Regions to Quebec

Figure 3-2 illustrates that Quebec, with a 80 cent dollar, is the best location. All the other locations have negative NPVs which indicates the sites would not be economically viable. Ontario and the New York state maxi-mill yield similar results. The New York city mini-mill yields the lowest NPV at negative 168 million $Cdn.

The above NPV comparisons illustrate that Quebec is the only location for producing newsprint paper that would provide a normal return. Below, a detailed cost comparison which compares the individual cost components of each location with the Quebec benchmark is provided. This comparison examines why the Quebec location is the best suited for producing newsprint.

3.5.4 Quebec: Ontario Comparison

Figure 3-3 compares the individual operating and capital costs associated with the Ontario mill to those costs associated with the Quebec mill. Positive values shown in the top half of the figure indicate an advantage (lower average cost) for Ontario while negative values indicate an advantage for Quebec.



* Reflects a 1.64 percent higher cost of capital in Canada

Figure 3-3 Incremental Cost Comparison: Quebec vs. Ontario

Considering total average costs, the Ontario site has a disadvantage of $78 per tonne. When considering only total average operating costs, Ontario's average cost is lower than Quebec's average cost by $15 per tonne. This is mainly due to a $26 cost advantage Ontario has relative to Quebec with respect to net energy. However, since Ontario cogenerates the associated capital cost would reduce this advantage to almost zero. Hence, the principal benefits that a Quebec site enjoys are lower taxes and lower outbound transportation costs to market.

Quebec enjoys a $13 per tonne advantage with respect to onp/omg costs. This is due to the lower transportation cost Quebec pays to transport the onp/omg from the suppliers to its mill.

Québec had a $27 per tonne advantage in capital costs (plant and equipment). This reflects the $60 million higher capital costs in Ontario primarily for the cogeneration unit.

There is no cost of capital (WACC) difference between provinces.

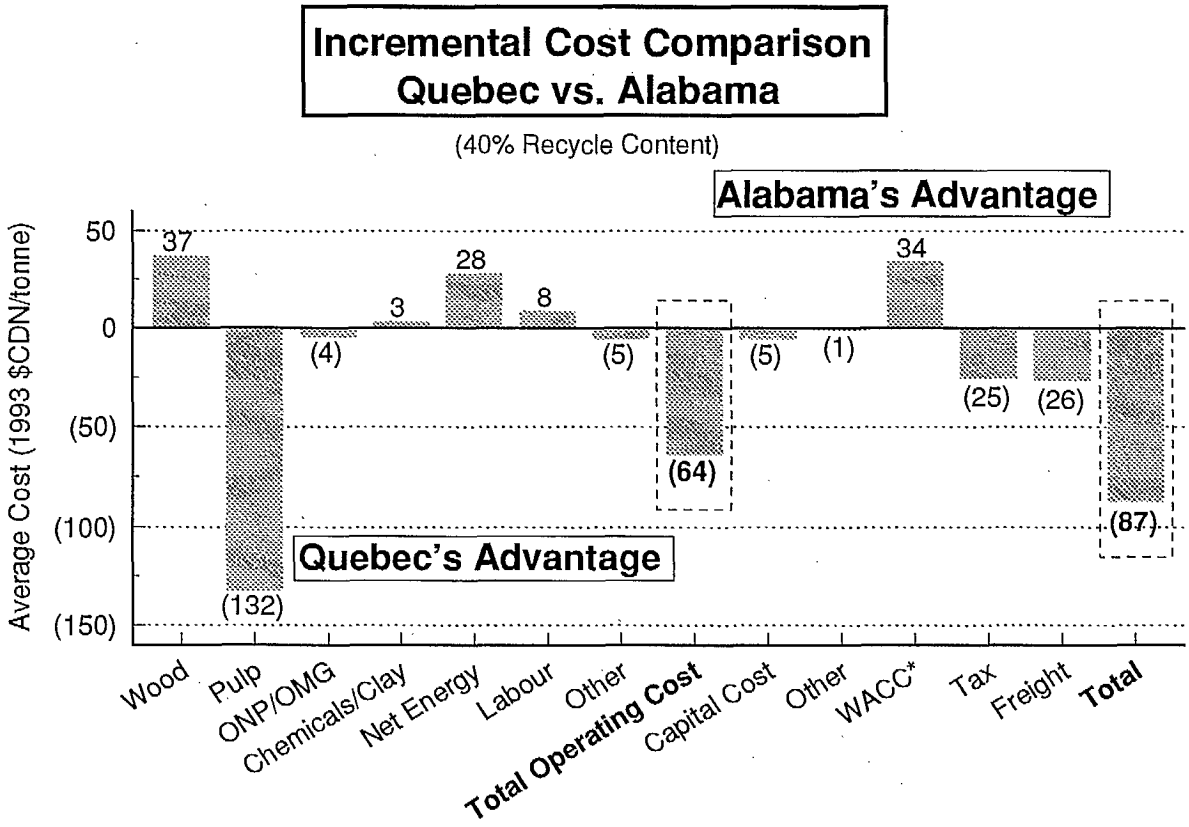
However, Quebec enjoys a tax advantage of $25 per tonne as a result of a lower provincial tax rate and a lower capital asset base (ie. lower large corporation tax payments). Depreciation rates are equivalent in the two locations.

Quebec has an average cost advantage of $38 per tonne relative to Ontario with respect to the cost of outbound transportation. This can be attributed to Quebec being located closer to its buyers (the market) than Ontario.

Overall, when combining all the advantages and disadvantages that are related to operating costs, capital costs, taxes and freight, Ontario is at a significant $78 per tonne disadvantage relative to Quebec (at an 80 cent Canadian dollar).

3.5.5 Quebec: Alabama Comparison

Figure 3-4 illustrates the incremental costs that exist between Quebec and Alabama.



* Reflects a 1.64 percent higher cost of capital in Canada

Figure 3-4 Incremental Cost Comparison: Quebec vs. Alabama

The Alabama location has a $37 per tonne advantage in wood costs relative to Quebec. Due to the fact that the Alabama location does not have the better-suited spruce/fir fibre available to make newsprint it relies on a lower quality fibre - loblolly pine. The physical characteristics of this fibre dictates that the Alabama mill must use a large amount of kraft pulp in the newsprint production to meet industry standards. The use of this kraft pulp reduces pulpwood consumption by 54,000 BDTpy relative to the Quebec mill, hence the wood cost advantage. However, the use of 52,000 ADTpy of kraft, which Quebec does not require, inflicts a $132 per tonne on the operation.

Alabama has a $3 per tonne lower average cost of chemicals and coatings than Quebec. This cost advantage can be attributed to the fact that Alabama uses clay instead of the other more expensive fillers Quebec uses. Alabama's proximity to clay sources allows it this small advantage.

Alabama also has a $28 cost advantage with respect to energy. This is due to the lower total power requirements at the Alabama location (ie. 82 MWatts versus 88 MWatts for Quebec) and that Alabama cogenerates. This value does not include allowance for the capital cost of the cogeneration unit.

The combined advantages and disadvantages of the operating costs result in Quebec having a $64 per tonne advantage.

Despite the additional cogeneration equipment capital costs, the total capital cost is only $10 million higher in Alabama than in Quebec. Most of the cost savings can be attributed to direct, physical costs as opposed to indirect, service-related costs. The higher capital cost provides Alabama with a $5 per tonne capital cost disadvantage.

Because taxable income for the Alabama mill (37.3%) is considerably higher than taxable income rate for the Quebec mill, Quebec enjoys a tax advantage of $25 per tonne.

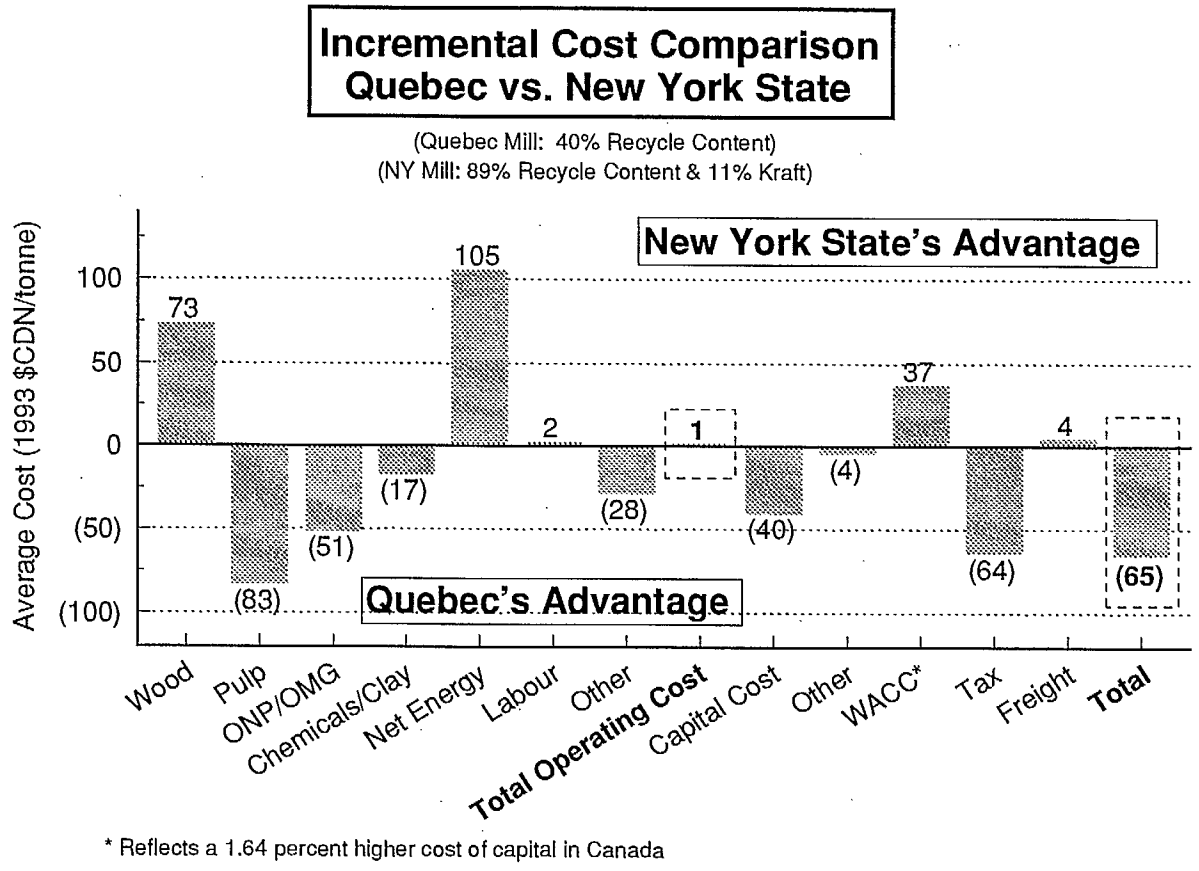
Offsetting Quebec's capital cost advantage is the 1.64 per cent lower after tax weighted average cost of capital (WACC) for Alabama which translates into a considerable $34 per tonne advantage to Alabama.

Transportation costs are lower for Quebec because of its relatively closer proximity to the market for its newsprint.

Overall, Alabama has a $87 per tonne disadvantage in total cash flows relative to the Quebec benchmark.

3.5.6 Quebec: New York State Maxi-Mill Comparison

Figure 3-5 illustrates the incremental costs that exist between Quebec and New York State.



* Reflects a 1.64 percent higher cost of capital in Canada

Figure 3-5 Incremental Cost Comparison: Quebec vs. New York State

As a 100% recycled paper facility, the New York State location uses no softwood but must add 11% kraft pulp to strengthen the furnish. As a result, New York has a $73 per tonne advantage in wood costs relative to Quebec but an $83 per tonne disadvantage in pulp. Including the onp/omg cost, the fibre content of the furnish gives New York State a $61 per tonne disadvantage.

Similarly, New York State has a $17 per tonne higher average cost of chemicals and coatings than Quebec. The recycled mill must purchase twice the hydrogen peroxide, Na-silicate, soap and dispersant compared to the Quebec mill.

Offsetting these disadvantages, New York State also has a cost advantage with respect to energy of $105 per tonne. This is directly attributed to the fact that their pulping operation requires only around half of the energy required at the Quebec mill.(eg. 45 MWatts vs. 88 MWatts). In addition, New York State uses cogeneration to produce all of its steam and power requirements.

The combined advantages and disadvantages of the operating costs result in Quebec having a $1 per tonne advantage.

The capital cost is $40 per tonne higher in New York State than in Quebec. This is largely the result of the cogeneration installation as the 100% recycled pulp lines are cheaper than the pulp facilities required at the Quebec site.

A tax disadvantage of $64 per tonne exists for New York State due largely to the lower tax rate in Quebec.

Offsetting Quebec's capital cost advantage is the 1.64 per cent lower after tax weighted average cost of capital (WACC) for New York which translates into a considerable ($37 per tonne) advantage to New York State.

With respect to transportation cost, New York has a marginal advantage.

Overall, the New York State maxi-mill has a $65 per tonne disadvantage in total cash flows relative to the Quebec benchmark.

3.5.7 Quebec: New York City Mini-Mill Comparison

Figure 3-6 illustrates the incremental costs that exist between Quebec and New York City.

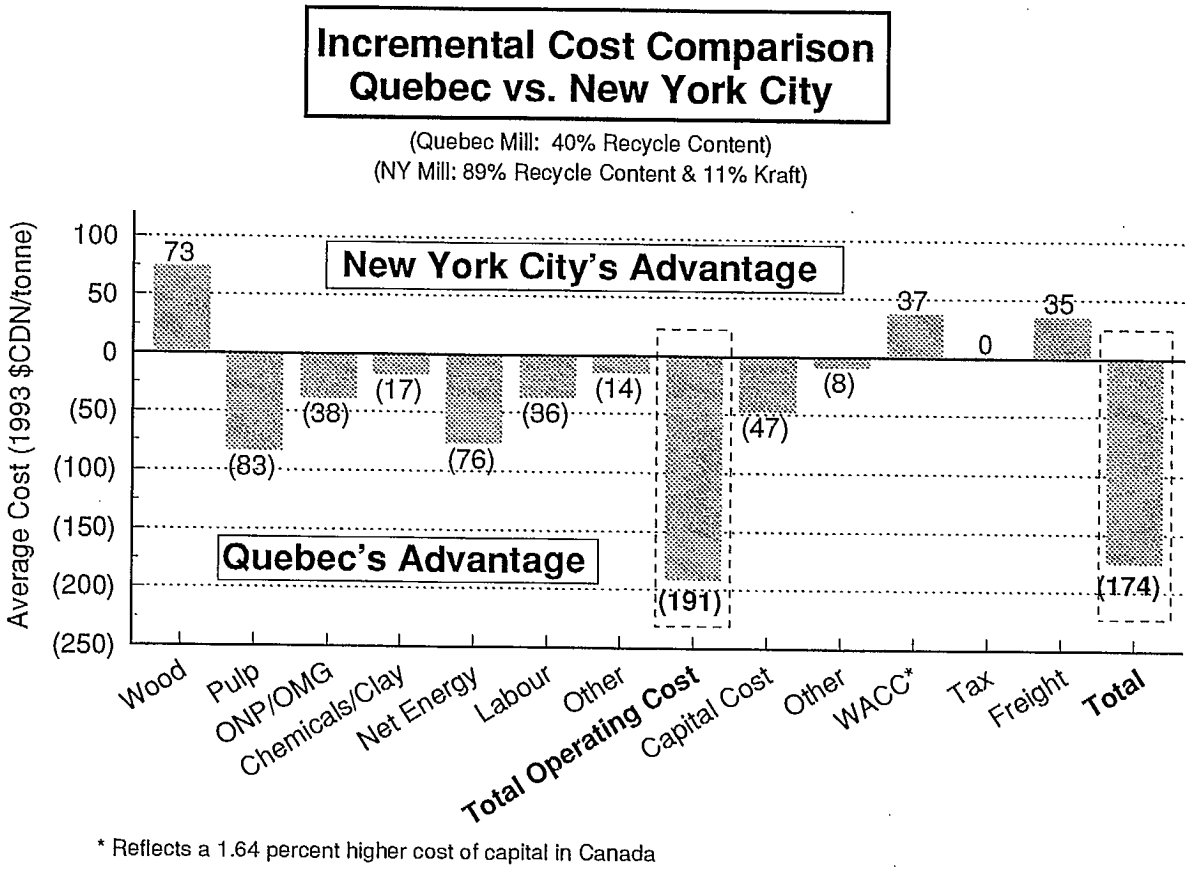


Figure 3-6 Incremental Cost Comparison: Quebec vs. New York City

The New York City mini-mill produces only 159,000 tonnes per year of paper compared to 299,000 tonnes per year at the Quebec mill.

As a 100% recycled paper facility, the New York City location uses no softwood but must add 11% kraft pulp to strengthen the furnish. As a result, New York has a $73 per tonne advantage in wood costs relative to Quebec but an $83 per tonne disadvantage in pulp. Including the onp/omg cost, the fibre content of the furnish gives New York City a $48 per tonne disadvantage.

Similarly, New York City has a $17 per tonne higher average cost of chemicals and coatings than Quebec and a cost disadvantage with respect to energy of $76 per

tonne. This energy disadvantage is due to the fact that the New York City mill does not cogenerate and hence must purchase steam and electricity. Natural gas consumption is also nearly equivalent despite the higher production levels at the Quebec mill.

Labour costs per tonne are higher in New York due to higher wages and total manning per tonne requirements.

The combined advantages and disadvantages of the operating costs result in Quebec having a $191 per tonne advantage.

The capital cost is $47 per tonne higher in New York City than in Quebec. This is result of the lower production at the mini-mill.

There is no tax advantage or disadvantage due to the profitability of the mini-mill. The lower tax rate in Quebec is offset by the tax loss carry forward created by the poor performance of the mini-mill.

Offsetting Quebec's capital cost advantage is the 1.64 per cent lower after tax weighted average cost of capital (WACC) for New York which translates into a considerable $37 per tonne advantage to New York City.

Transportation cost is the one real advantage of the mini-mill. New York has a $35 per tonne advantage because of its proximity to its smaller market.

Overall, the New York City mini-mill has a $174 per tonne disadvantage in total cash flows relative to the Quebec benchmark.

3.6 Canadian Sites: Sensitivities To Exchange Rate

Canadian pulp and paper companies sell most of their products in the U.S. market and are therefore exposed to a considerable amount of exchange risk exposure. This section examines historical exchange rate fluctuations that have occurred in the past twenty years and then examines the sensitivity of the Canadian mills' NPVs to various exchange rate movements.

¶ Exchange Rates in the Past Twenty Years

Figure 3-7 illustrates the volatility of the exchange rate over the past 20 years. In the early-to-mid seventies the Canadian dollar was very strong reaching over $US1.00 per Canadian dollar. During the mid nineteen eighties the dollar fell reaching nearly $US0.70 per Canadian dollar and then increased to over $US0.85 by the early nineties. The average for the 20 year period was just below $US0.86 with a standard deviation of approximately $US0.09.

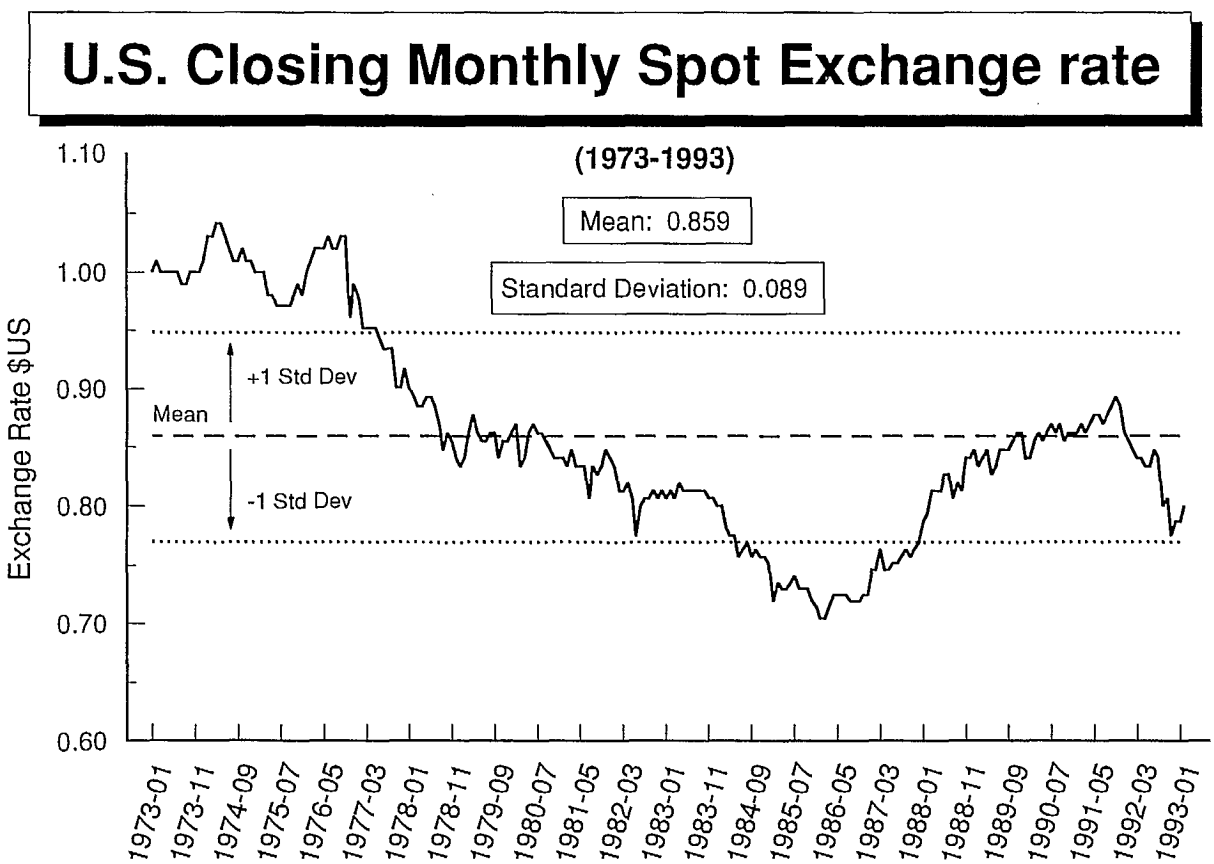


Figure 3-7 Canada-U.S. Exchange Rates (1973-1993)

When a shorter period is analyzed the average exchange rate and standard deviation are reduced significantly. Figure 3-8 illustrates the changes in the exchange rate for the past ten years. During this period the average was $US0.80 and the standard deviation was $US0.05.

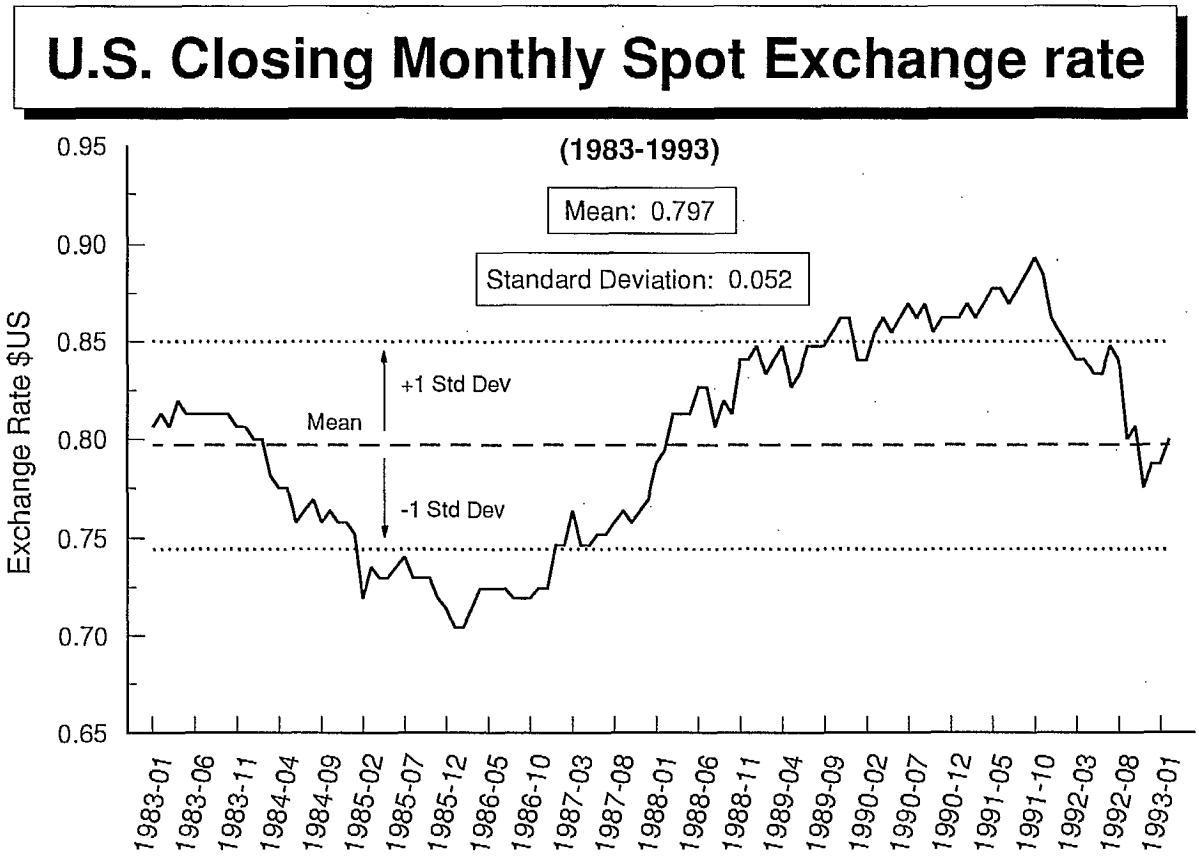


Figure 3-8 Canada-U.S. Exchange Rates (1983-1993)

Figures 3-9 and 3-10 illustrate the corresponding frequency distributions for the exchange rate movements during the past twenty and ten year periods. Neither figure suggests a strong central tendency towards the mean; especially the 1983-1993 period.

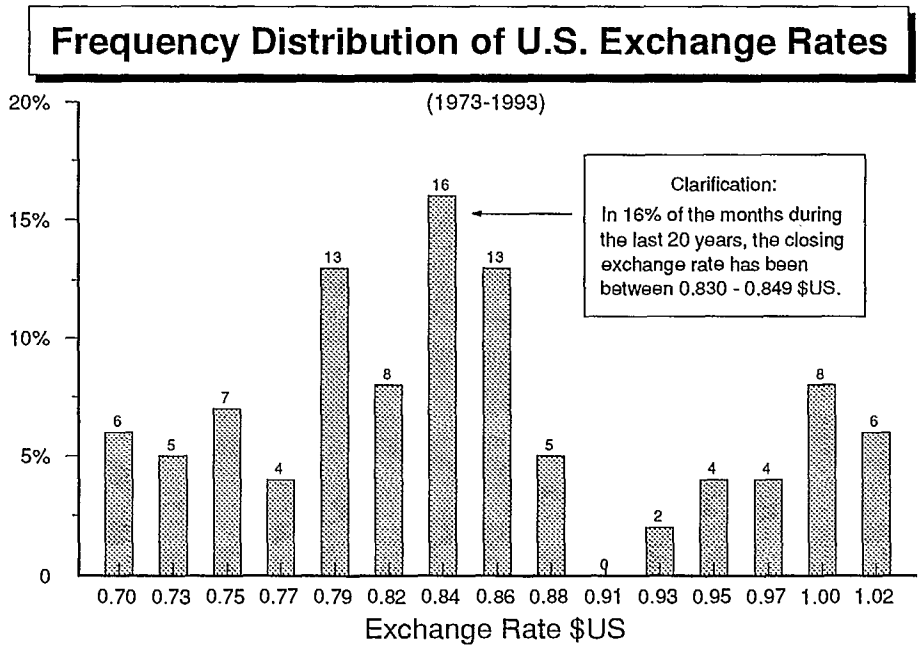


Figure 3-9 Monthly Exchange Rate Frequency (1973-1993)

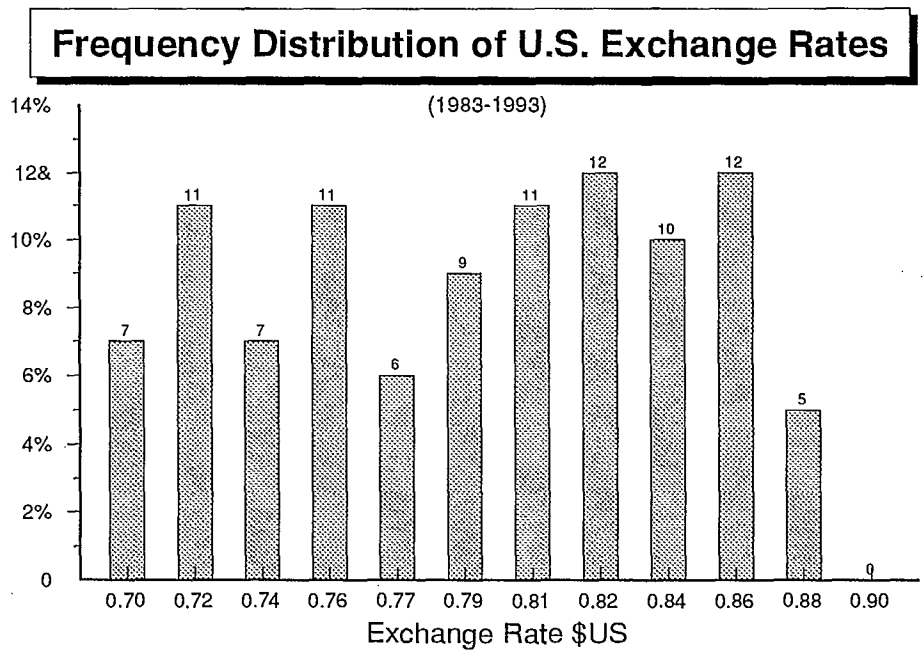
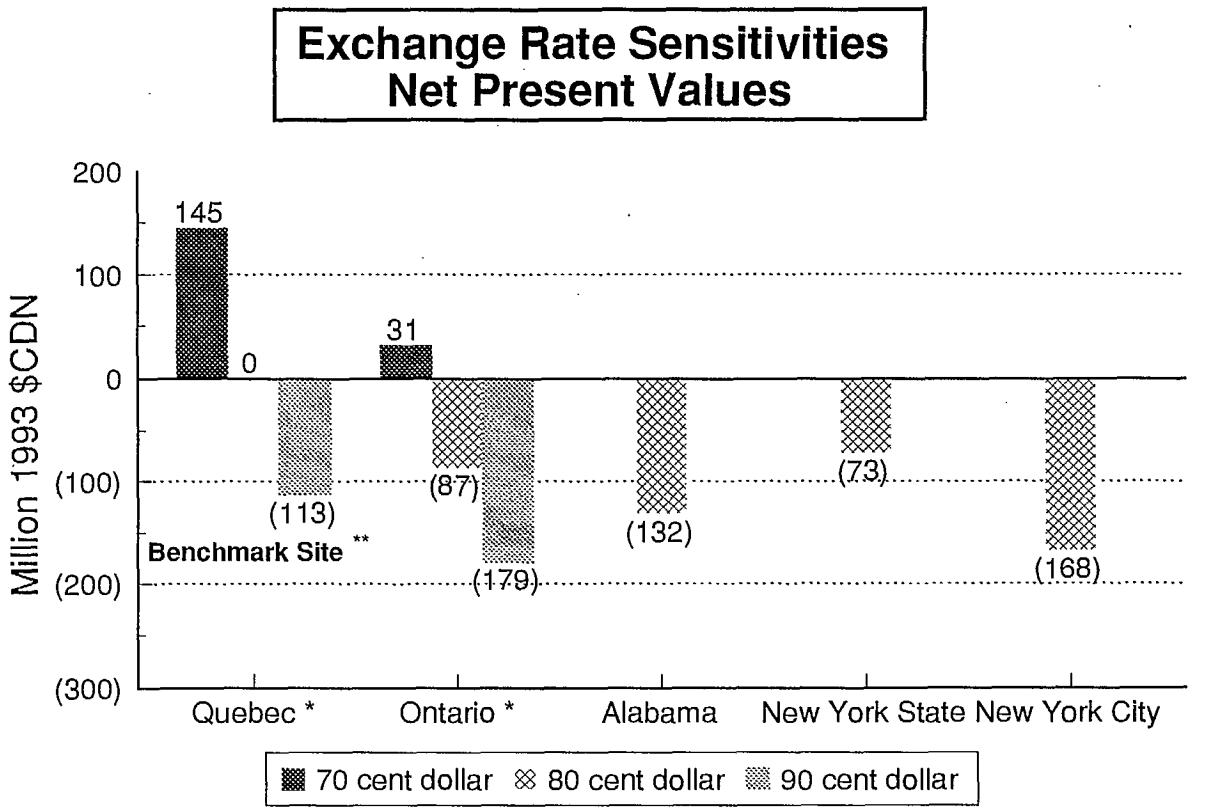


Figure 3-10 Monthly Exchange Rate Frequency (1983-1993)

¶ Sensitivity of Canadian Newsprint Mills to Exchange Rate Movements

A sensitivity analysis was performed to measure the effects of various exchange rate movements on the Canadian locations' NPVs. Figure 3-11 illustrates the results assuming the Canadian dollar is valued at US70¢, US80¢ and US90¢.



* Based on a 1.64 percent higher WACC.

** Based on 40% recycle content.

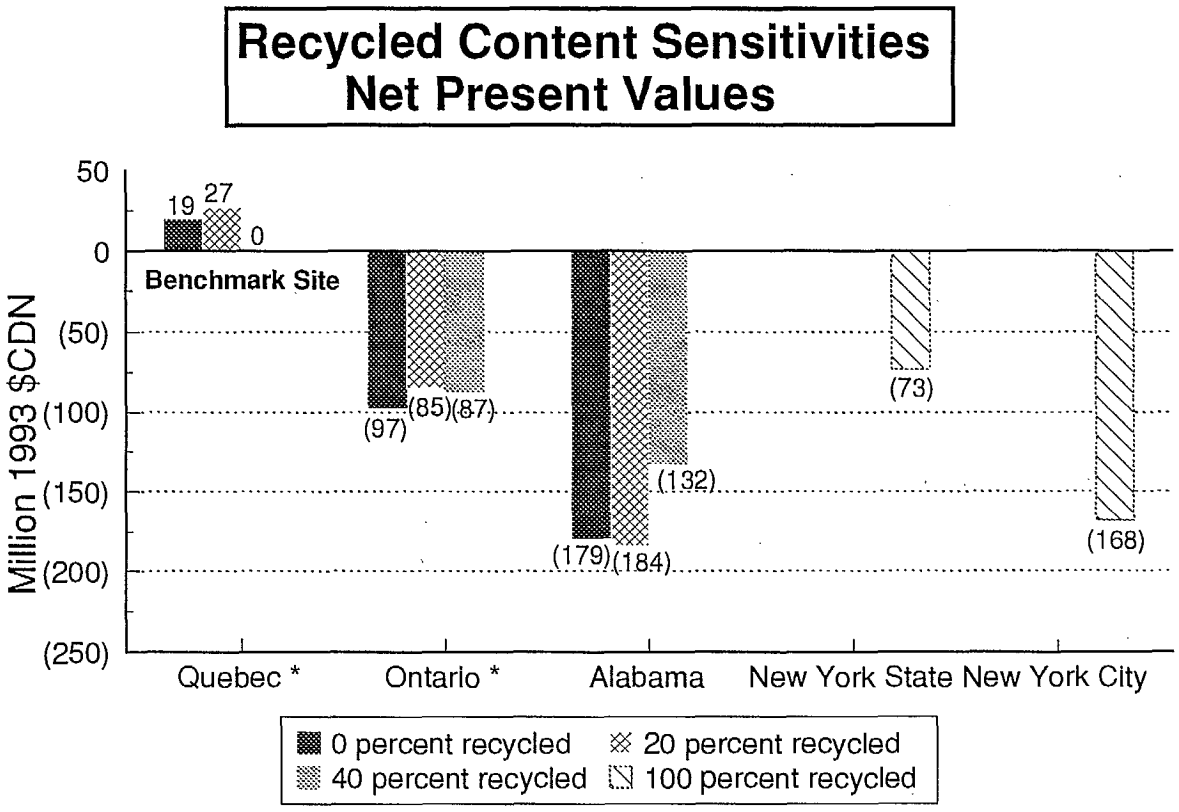
Figure 3-11 Exchange Rate Sensitivity

With a US70¢ dollar, Quebec and Ontario have NPVs which are considerably higher than the Quebec benchmark, $145 million and $31 million, respectively. In contrast, when the exchange rate is US90¢ per Canadian dollar, all Canadian locations have NPVs substantially below that of the Quebec benchmark. This illustrates the high sensitivity of Canadian mills' cash flows to movements in the exchange rate.

At the exchange rate of US90¢ per Canadian dollar, the New York State facility will become the new benchmark.

3.7 Recycled Content Sensitivities

A sensitivity analysis was performed to measure the effects of the level of recycled paper content on the "virgin" paper mills (ie. Quebec, Ontario and Alabama). The NPV of each location was calculated for 0%, 20% and 40% recycled content.



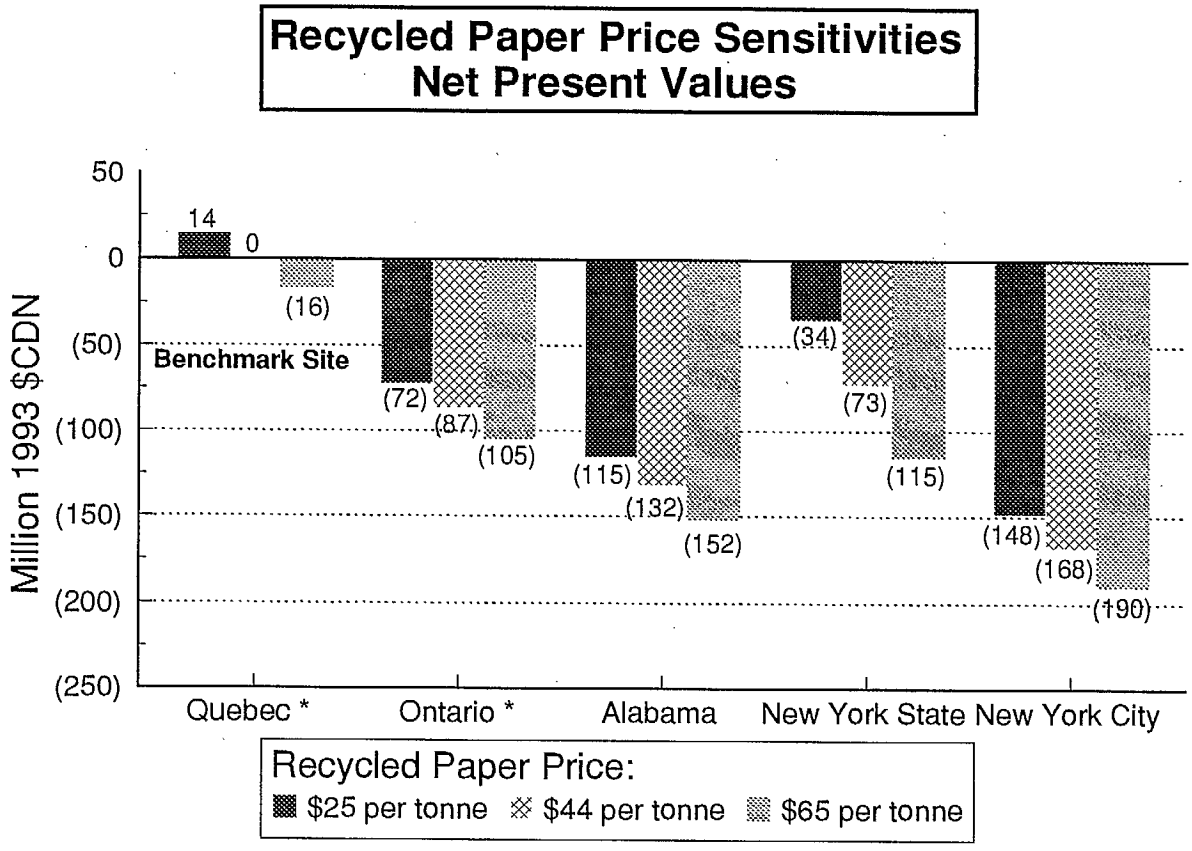
* Based on a 1.64 percent higher WACC.

Figure 3-12 Recycled Content Sensitivity

Quebec is most profitable with a 20% recycled content as the lower operating costs associated with recycled pulp offset the capital charges at this level. At the 40% level, The higher capital costs and increased transportation costs associated with gathering that quantity of scrap paper results in the lowest NPV for Quebec. Ontario prefers including recycled pulp in their furnish and is almost indifferent to the quantity. Energy savings help offset the higher capital costs and transportation costs associated with the recycled content. Alabama is helped by the higher recycled content by the amount of $57 million.

3.8 Recycled Content Sensitivities

A sensitivity analysis was also performed to measure the effects of the price of recycled.



* Based on a 1.64 percent higher WACC.

Figure 3-13 Recycled Content Price Sensitivity

As expected, the lower the price of scrap paper the higher the NPV for all of the projects. Industry analysts forecast the price of scrap to average $44 per tonne over the period of this study with a range of $\pm$ 50% around this value. A lower scrap price most positively affects the 100% recycled content mills, however, even at $25 per tonne the Quebec mill would be the most competitive.

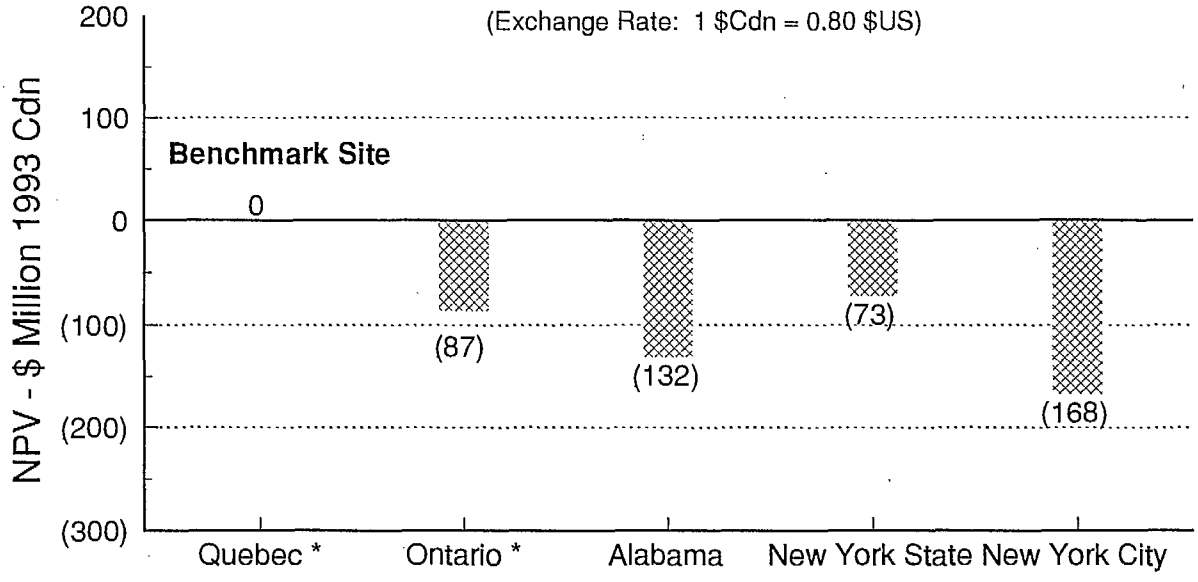
4.0 CONCLUSIONS

The analysis of Canada's comptetiveness as a newsprint site was based on comparing virgin fibre greenfield mills with a 100% recycled fibre maxi-mill and mini-mill down in the United States. The virgin mill and maxi-mill were a one machine, 300,000 tonnes/yr operation located in a rural setting. The mini-mill operation was a one machine 150,000 tonnes/yr operation located in an urban setting. The investment for these mills at the North American sites examined varied from $418 to $765 million Cdn (1993).

¶ The Quebec Benchmark Site:

The Quebec site was the most attractive of the five supply areas compared. The analysis confirms the historic logic of locating newsprint facilities in this region. Quebec was the "benchmark" used for assessing Canada's competitiveness.

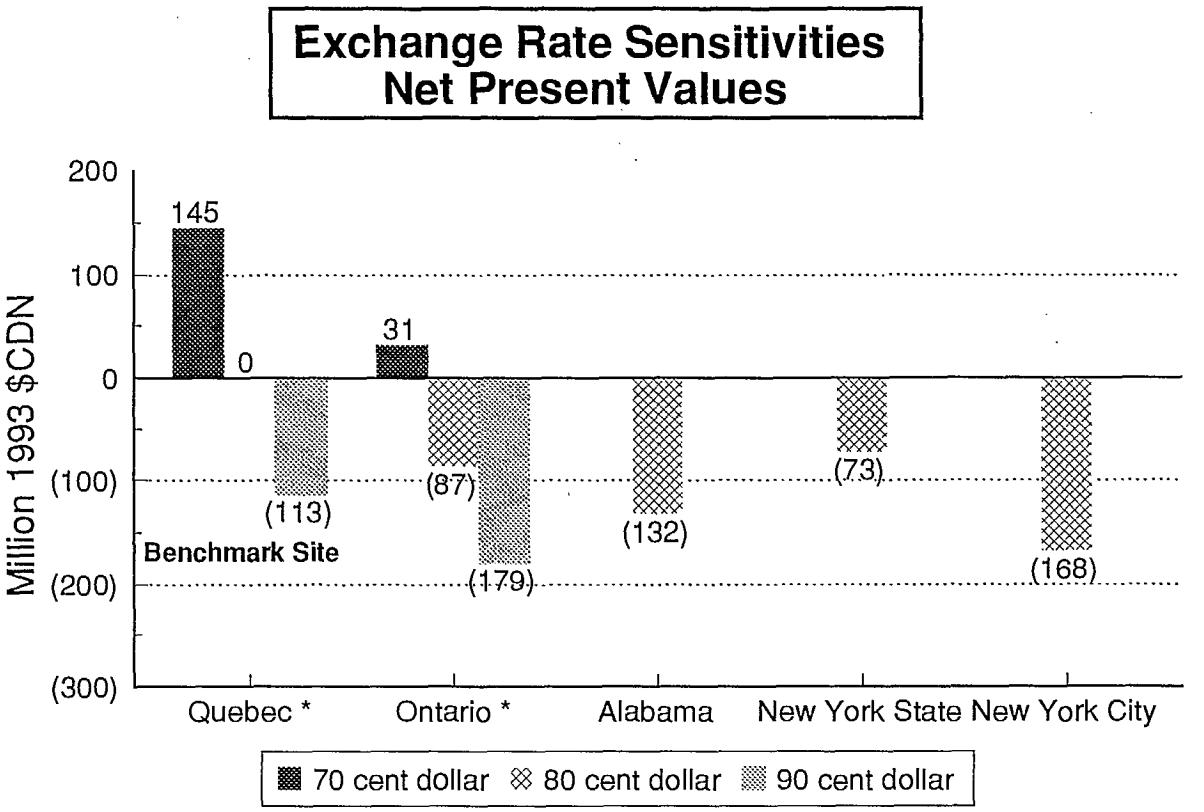
Relative Competitiveness of Regions To Quebec Benchmark



* Based on a 1.64 percent higher WACC.

¶ The results, however, are very sensitive to the exchange rate.

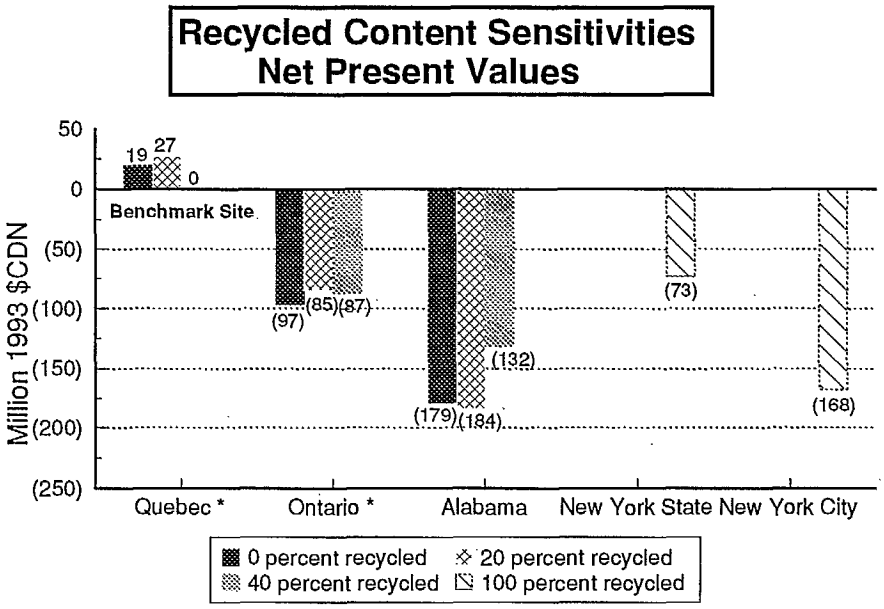
- As illustrated below, at a 70¢ Canadian dollar Ontario also becomes competitive.



* Based on a 1.64 percent higher WACC.

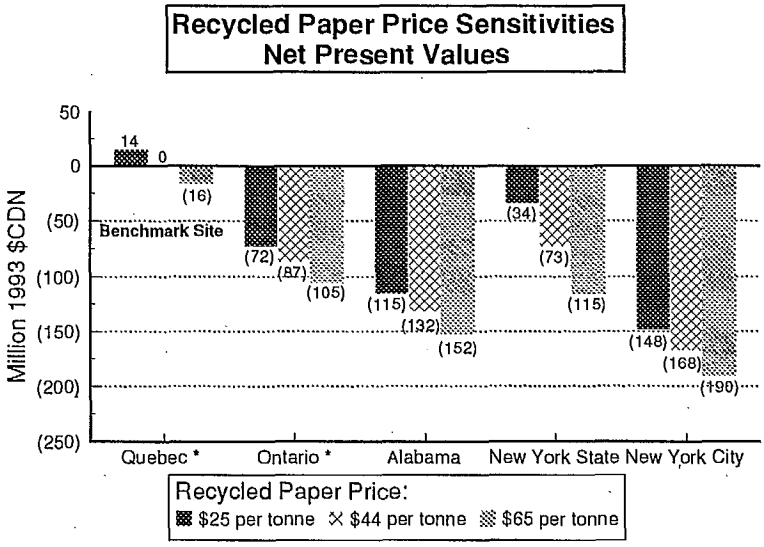
¶ <u>All Canadian sites suffer from a cost-of-capital disadvantage compared to their U.S. counterparts</u>

¶ Recycled Content requirements have differing consequences on mill performance.



* Based on a 1.64 percent higher WACC.

¶ The price of scrap paper has an inversely proportional impact on the NPV of all the projects, however, the Quebec mill will remain the benchmark even if prices drop to $25 per tonne.



* Based on a 1.64 percent higher WACC.

5.0 IMPLICATIONS

- The results of this analysis suggest that Eastern Canadian locations are attractive sites for new newsprint investments when compared to new investments in the U.S. south and with large and small recycling operations in New York state.

- These conclusions are robust over a significant range of exchange rates, recycle contents, and recycle fibre prices.

- However, the newsprint prices necessary to justify any new investment ($600 to $700 US per tonne) exceed significantly today's market prices (about $500 US per tonne). Thus, the question arises regarding whether this benchmark analysis represents the true measure of competitiveness in the foreseeable future.

- The above uncertainty can only be addressed by examining the true incremental cost of newsprint production at the existing "stock" of mills in Eastern North America. To our knowledge, this latter analysis has not been undertaken. Although there is some work ranking mills by their operating costs, the true basis for comparison would be incremental cash costs (operating, capital and debt).

- Hence, what is now needed is a rigorous analysis of the incremental costs for a sample of Canadian and U.S. mills. This analysis would focus on the summation of: operating costs; capital costs (including a detailed capital budget by mill); and debt costs (reflecting the allocation of an appropriate percentage of debt for each mill).

- The latter analysis would be most useful under any scenario. If the results proved that the rejuvenation of the brownfield sites was indeed the low cost scenario, then this case would represent the appropriate long run marginal costs and hence be the basis for developing an industry strategy. If, however, the new mills analyzed in this report were found to be the true long run marginal costs, then the analysis of the existing mills would represent very important data for adjustment purposes.