Montreal Economic Institute
Ideas for a More Prosperous Nation

ECONOMIC NOTE

April 2007

Subsidies for aluminum producers: benefits that don't add up

On December 14, 2006, the Quebec government and Alcan unveiled an agreement for building an aluminum smelter in the Saguenay–Lac-Saint-Jean region. The smelter is to have an annual production capacity of 450,000 tonnes and to use the new AP50 electrolysis technology under development, intended to cut electricity use by about 20% per tonne of aluminum produced. An order in council setting the conditions by which electricity will be sold to Alcan has just been published in March 2007. Fulfilling this project should result in Alcan investing $2 billion over the next few years and creating 740 highly specialized jobs plus 1,200 to 1,500 related jobs in construction.

This Economic Note was prepared by Gérard Bélanger and Jean-Thomas Bernard, professors in the department of economics at Laval University.

The Quebec government has promised a sizable contribution that is quite difficult to evaluate. It has justified this by pointing to the various benefits that are expected, including the creation of high-level jobs in a regional economy, research and development, business opportunities offered to Quebec equipment producers and keeping Alcan's head office in Montreal. The agreement will have financial, tax and energy implications that are to take effect at various times over the next 50 years. The purpose of this Economic Note is to measure the cost to Quebec society of the government contribution to this project and to see if it is justified in relation to the expected benefits.

Following are the main aspects of government support: a $400-million interest-free loan over 30 years; tax benefits worth $112 million; a new block of 225 MW of electricity[1] supplied by Hydro-Québec at the high-power L rate from 2010 to 2045; extension of a sales contract for 342 MW delivered by Hydro-Québec at the high-power L rate from 2024 to 2045; and extension of Alcan's rights over the waters of the Péribonka River from 2034 to 2058 for continuous power production of 900 MW. As a partner, the Quebec government is to receive royalties on the adoption of AP50 technology by aluminum smelters elsewhere in the world.

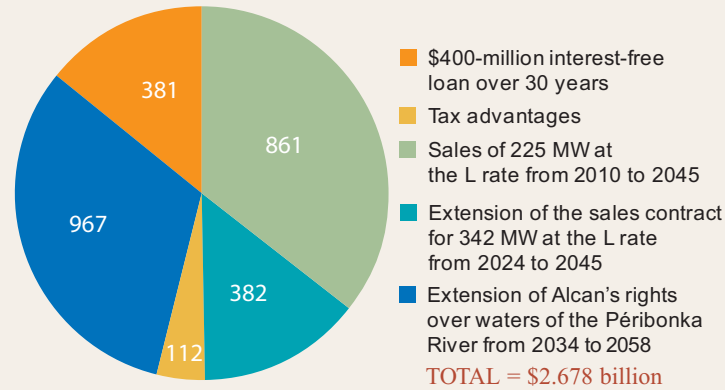
The cost of the agreement to Quebec society

Based on certain hypotheses, it is possible to evaluate the economic cost of this multi-faceted agreement, with implications stretching over 50 years.[2]

The true cost of the electricity provided, whether under contract or by concession of Péribonka River water rights, is based on the opportunity cost of this electricity for the Quebec state. The opportunity cost is equal to the most advantageous alternative use. In this instance, it means the export price available from selling electricity on the market to our U.S. neighbours. According to the National Energy Board, Hydro-Québec obtained an average of 7.98 cents per kilowatt-hour for interruptible electricity sold to the United State in 2006.[3]

1. One megawatt (MW) equals 1,000 kilowatts (kW), while one terawatt (TW) is equal to a million megawatts. These are units of power. A kilowatt-hour (kWh) refers to the use of one kilowatt for one hour; the same applies, with multiples, to megawatt-hours (MWh) and terawatt-hours (TWh), which are units of energy.
2. We calculate the cost in present value in 2008 (the probable date for the start of work) using a real discount rate of 7.5%. This rate corresponds to the yield that Hydro-Québec Distribution must obtain on capital from its shareholder (the Quebec government) according to the Régie de l'énergie (see Régie de l'énergie D-2003-93, R-3492-2002). The real discount rates used by Canadian provincial government are closer to 4% (see R. Basak and D. Sawyer, *Practical Aspects of Environmental Economics in Canada: The Discount Rate and Environmental Policy Decisions*, Environment Canada, January 11, 2002). Because the agreement extends over a long period, the use of a real discount rate below 7.5% would give higher costs in present value. Our estimate is thus cautious.
3. Source: http://www.neb.gc.ca. In a previous study, Gérard Bélanger and Jean-Thomas Bernard, "Aluminium, des subventions annuelles de 336 000$ par emploi pour 30 ans," January 2007, we used 8.9 cents/kWh as the opportunity cost. This is the value published by the National Energy Board for the first 11 months of 2006. In the current study, we are using the value for all of 2006.

Figure 1
Total cost of the agreement between Alcan and the Quebec government ($ million, current value)



Note: See the appendix, *Méthode de calcul des coûts de l'entente entre Alcan et le gouvernement du Québec (14 décembre 2006)*, on the Montreal Economic Institute website. The total takes account of $25 million in royalties received by the government for the new aluminum production technology.

It is very hard to forecast electricity prices over the next 50 years in a region such as the north-eastern United States. Quebec electricity competes at peak periods with electricity generated from natural gas, production of which has already begun to decline in North America. It would thus be surprising if the cost of electricity from this source were to drop over the next decade. Moreover, the adoption in 2009 by the north-eastern United States of a system of exchangeable permits limiting carbon dioxide (CO_2) emissions from thermal power plants will contribute to raising the cost of electricity production from fossil energy sources.

Rather than consider only export-based opportunity costs, we could also look at development costs of Quebec projects already under way, especially those being examined for an extended period comparable in length to the agreement with Alcan. Table 1 shows the unit cost (per kilowatt-hour) of various projects. It is true that the unit costs of existing power plants are very low, as reflected in the rate charged for the "heritage block" of electricity (the first 165 terawatt-hours sold to Hydro-Québec customers), set at 2.79 cents/kWh. However, projects under construction have much higher costs, ranging from 5.0 to 8.3 cents/kWh. For projects under study, the expected costs are in the range of 10.0 cents/kWh, which exceeds the U.S. market price. Our evaluation of the cost to Quebec taxpayers is thus cautious.

The price of electricity sold at the high-power L rate is set at 4.3 cents/kWh. In practice, this price will be lower for Alcan given the rate formula that includes effects related to high usage and to delivery at high tension. Moreover, the 2002 agreement with Aluminerie Alouette includes certain clauses limiting annual electricity price increases. Such clauses may appear in the formal agreement with Alcan.

Figure 1 presents our evaluation of the costs in current value for Quebec taxpayers of various items in the agreement between Alcan and the Quebec government. The total comes to $2.7 billion, whereas Alcan's expected investment is $2.0 billion. The greatest contribution comes from extending Alcan's rights over the waters of the Péribonka River from 2034 to 2058, followed by the sale of 225 MW at the L rate from 2010 to 2045. If we use the cost of projects currently under study, namely 10.0 cents/kWh, rather than the export price, now averaging 7.98 cents/kWh, the evaluation of the cost of this agreement jumps to $3.65 billion.

The total cost of $2.7 billion comes to $274,338 per job per year during 35 years for the 740 jobs in the new plant.[4] If we use the figure of 10.0 cents/kWh, which is the expected cost of new projects under study, the cost per job per year rises to $370,864.[5]

The gap between the government subsidy and the expected investment by Alcan leads us to question the advantages of this partnership with respect to the wealth of Quebec society.

The total cost of $2.7 billion for the government comes to $274,338 per job per year during 35 years for the 740 jobs in the new plant.

4. In a previous study, we estimated that the annual contribution by Quebec society to four aluminum smelters built in the early 1990s, namely Bécancour, Baie-Comeau, Deschambault and Sept-Îles, averaged $260,300 per job (in today's dollars). See Gérard Bélanger and Jean-Thomas Bernard, "Aluminium ou exportation : de l'usage de l'électricité québécoise," *Policy Analysis*, Vol. 17, No. 2, 1991, pp. 197-204, http://economics.ca/cgi/jab?journal=cpp&view=v17n2/CPPv17n2p197.pdf.
5. Electricity from the Péribonka River serves all of Alcan's activities. If the cost of extending rights over the Péribonka River were to be withdrawn, the annual cost per employee of the new aluminum smelter would drop to $175,293 based on the export price and $243,067 based on the expected cost of new projects.

Table 1: Costs of electricity production in Quebec

	Capacity (MW)	Energy (TWh)	Unit cost (per kWh)
1. Heritage electricity block	37,442	165	2.8 cents
2. Projects under construction			
Eastmain-1-A and Rupert derivation	888	8.5	5.0 cents
Medium-sized projects (Mercier, Eastmain-1, Chute-Allard, Rapides-des-Cœurs, Péribonka)	1 035	6.1	6,0 to 8,0 cents
Wind energy	990	3.0	8.3 cents
3. Large-scale projects under study (La Romaine, Petit-Mécatina, others)	4,500	23.6	~10.0 cents

Source: Hydro-Québec, *Strategic Plan 2006-2010*, http://www.hydroquebec.com/publications/en/strategic_plan/2006-2010/pdf/complete.pdf.

Benefits that fail to meet costs

An agreement similar in nature to the Alcan deal was reached in September 2002 to conduct phase 2 of the Alouette aluminum smelter in Sept-Îles: 500 MW sold at the high-power L rate modulated downward plus a $260-million interest-free loan over 30 years. Furthermore, Alcoa has knocked, and is still knocking, at the government's door to obtain assistance for renovation and expansion projects at its Deschambault and Baie-Comeau plants.[6] This is a huge amount provided by the Quebec government, given the pressing demands in other fields such as health care, education and infrastructure.

It should be understood that all spending generates economic spinoffs, whether conducted by government or by the private sector. It is thus false to state that "exported electricity does not create jobs in Quebec".

A number of arguments are advanced by the Aluminum Association of Canada, regional bodies, analysts, academic figures and the government itself to justify public contributions to private projects. There is reason, however, to question the economic basis of these arguments in the new energy context in Quebec.

The argument most commonly used to justify government assistance involves economic spinoffs. The government estimates that the Alcan project will create more than 2,500 direct and indirect jobs, including 740 jobs in the plant, or two indirect jobs for each direct job. Similar analysis is required for alternatives that could be considered. Alcan plans here to invest $2 billion, while the government will be providing at least $2.7 billion by our estimates. The same amount could go, for example, toward improving Quebec's highway network, generating far more direct and indirect economic spinoffs than Alcan's $2 billion. A similar analysis could be applied to other public or private spending. It should be understood that all spending generates economic spinoffs, whether conducted by government (in health, education, income security or other areas) or by the private sector (assuming individuals and businesses end up with greater disposable income due to lower taxes). It is thus false to state that "exported electricity does not create jobs in Quebec" as argued by the Aluminum Association of Canada in an advertisement that ran in several newspapers.[7]

In the same advertisement, the Association estimates that each kilowatt used by Quebec aluminum smelters generates added value of 14.3 cents. Added value corresponds to income earned by employees (wages) and owners (profits, interest and economic rents) during production. It is not a measure of private or public net benefits because it takes no account of the relation between benefits and costs. For aluminum smelters, high value added simply means they use plenty of capital. There are other businesses in Quebec that are fully profitable and that use less electricity per unit of production.

The evaluation criterion most useful in determining a project's contribution to a society's prosperity is not value added but net benefits. Though differences of opinion may exist regarding the real gap between the electricity price paid by Alcan under the agreement of December 14, 2006, and the opportunity cost linked to exports or to the marginal cost of electricity from new projects, the existence of a significant gap is not in doubt. Viewed in terms

6. A previous agreement with Alcoa was cancelled by the government in 2003.
7. Aluminum Association of Canada, *S'ouvrir aux idées*, http://www.aac.aluminium.qc.ca/frameset/pdf/AAC_ENCART_1.pdf.

of contributions to Quebec's wealth, the government counts on various economic spinoffs to cover this gap. Unfortunately, economic logic does not support this sort of justification.

The government's negotiators will never be able to compensate for losses caused by advantages granted to aluminum smelters because, if the government demands too much in spinoffs (representing additional costs for business) in relation to other countries that may be competing, companies will go where the electricity price and other conditions are more favourable than in Quebec. Possible locations certainly will not include New England or New York, where electricity prices are very high. The countries that look most attractive in terms of electricity prices are Australia, Iceland, Qatar and South Africa. These countries, while able to produce electricity at low cost, have to transform it into exportable products because of their distance from markets. This is not the case in Quebec, which is surrounded by regions where electricity prices are two to three times higher than they are here. Quebec has an advantage in location compared to the above countries. It is far more profitable to export electricity directly through interconnections than indirectly through aluminum ingots.

It is far more profitable to export electricity directly through interconnections than indirectly through aluminum ingots.

The scale of Quebec's low-cost hydroelectric development is unequalled in relation to what exists elsewhere in the world: a system that exceeds 40,000 MW and is 95% hydroelectric. The availability of low-cost electricity has affected all sectors of activity, especially the industrial sector that accounts for more than 50% of electricity consumed. The metal casting and refining sector, including aluminum smelters, represents 50% of this consumption. This has contributed to Quebec's industrial development and enrichment for 100 years.[8] In 2003, Quebec aluminum in raw alloys formed 14.7% of world exports of this product.

Two major changes have occurred in recent years. First, there was an increase in the costs of new sources of electricity supply in Quebec, as shown by the information presented in Table 1. It is normal for this to be the case, because the best sites have already been developed and it is necessary to look to ever more distant sites. Thus, in its energy policy submitted in June 2006,[9] the government considered developing La Romaine (1,500 MW) and Petit Mécatina (1,500 MW) that would supply electricity at more than 10.0 cents/kWh. A 1,000-MW wind energy project currently under construction will deliver electricity at 8.3 cents/kWh. The era of low-cost hydroelectric development is thus coming to an end in Quebec. The other change was the opening of the wholesale electricity market in the United States in 1998. Hydro-Québec now can sell electricity directly at the market price.

Whether we consider that the cost of developing new sources of electricity in Quebec or the export market, the low-price sale of electricity to aluminum smelters represents a loss for the Quebec state. The Quebec government's industrial policy does not reflect this new reality. A form of industrial development that contributed significantly to the growth of Quebec's overall wealth is becoming a hindrance to improving citizens' well-being. Recent agreements in the aluminum sector and other agreements being prepared fail to take account of basic economic logic and will harm Quebec's economic development for decades to come, unless the government takes a different path.

8. The work by John H. Dales, *Hydroelectricity and Industrial Development, Quebec 1898-1940*, Cambridge (MA), Harvard University Press, 1957, relates the contribution of hydroelectricity to Quebec's industrialization and emphasizes the role of electricity-intense industries such as aluminum smelters and pulp and paper mills that established links between low-cost electricity and world markets for their products. Technology at that time did not allow for large quantities of electricity to be transmitted over great distances.
9. Ministère des Ressources naturelles et de la Faune du Québec, *Using Energy To Build the Québec of Tomorrow: Québec Energy Strategy 2006-2015*, 2006, http://www.mrnf.gouv.qc.ca/english/publications/energy/strategy/energy-strategy-2006-2015.pdf.

Montreal Economic Institute
Ideas for a More Prosperous Nation

Montreal Economic Institute
6708 Saint-Hubert Street
Montreal, Quebec
Canada H2S 2M6
Telephone (514) 273-0969
Fax (514) 273-2581
Web site www.iedm.org

The Montreal Economic Institute (MEI) is an independent, non-profit, non-partisan research and educational institute. It endeavours to promote an economic approach to the study of public policy issues.

The MEI is the product of a collaborative effort between entrepreneurs, academics and economists. The Institute does not accept any public funding.

One-year subscription to MEI publications: $125.00.

Chairman of the Board:
Adrien D. Pouliot

President:
Paul Daniel Muller

Vice President and Chief Economist:
Marcel Boyer

The opinions expressed in this study do not necessarily represent those of the Montreal Economic Institute or of the members of its board of directors.

The publication of this study in no way implies that the Montreal Economic Institute or the members of its board of directors are in favour of or oppose the passage of any bill.

Printed in Canada

Illustration:
Benoit Lafond

Graphic Design:
Valna inc.