

Power and Carbon

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It should come as no surprise that renewable energy is the most carbon-efficient form of power produced in Canada. Canadian energy utilities are well versed in the carbon efficiencies of their energy portfolios—yet the discrepancies in carbon emissions amongst these players is staggering.

Hydro-Quebec tops our list with a 0.61 kg/mWh carbon efficiency. This is primarily due to the utility's heavy hydropower use (97 per cent of energy output in 2007). The remainder is comprised of nuclear, wind, biogas, and waste energy reclamation.

Hydro-Quebec conducted a life cycle energy analysis in 2003 showing that run of river hydropower, wind, and nuclear power have the lowest life-cycle emissions. But the study noted that currently, these options cannot be modulated to meet peak demand, and fossil fuels are often needed to support these options. Hydropower with reservoirs does not require fossil backup, but has a slightly higher emissions rate than run of river, wind, and nuclear.


SaskPower, Nova Scotia Power, and ATCO, which sit at the bottom of our carbon-efficiency list, rely on coal-fired power

plants. Coal has the highest emission factor of all existing technologies, only exceeded by heavy oil from oil sands.

Of course, these utilities benefit from the availability of their in-province natural resources. Quebec has abundant hydro opportunities that Alberta and Saskatchewan lack. A large impediment to tapping more diverse, low-carbon energy is the state of Canada's electricity grids. Their absence in many parts of the country strands many of the most potent wind and hydro resources. Smarter grids, such as Cisco's Smart Grid Solutions, help utilities to optimize grid efficiency through better correlation of power supply and demand, reduce energy network outages and disruptions, and increase the resiliency and security of the power system. This would make it easier to tap the abundant geothermal, wind, solar, tidal, and cogeneration opportunities that are available: an enhanced grid structure would make it possible to access 163,173 mWh in additional hydropower and 175,000 mWh in additional wind power, according to the Canadian Wind Energy and Hydropower Associations.

The cheapest opportunity to reduce the carbon emissions of our energy mix across

the board is energy efficiency, which costs three cents per kWh, against 21 cents per kWh for new nuclear.

While Quebec is the country's biggest producer of low-carbon energy, it is also the biggest electricity hog, with per capita consumption double that of Ontario. Herein lies an opportunity, says Jack Gibbons, Chair of the Ontario Clean Air Alliance. One of best ways for Quebec and Ontario to reduce carbon emissions is for Quebec to invest in energy efficiency at three cents/kWh, thus freeing up heritage hydro facilities to export to Ontario and displacing carbon-heavy fossil fuel generation. Freeing up this great water power in Quebec is also quite profitable, as hydro imports go for nine cents per kWh. In other words, investing one dollar in long-term efficiency can reap an annual dividend of \$3. Now that Ontario has suspended the procurement process for nuclear on account of the sticker shock induced by capital costs that came in 3.7 times higher than nuclear lobbyists had promised, this could, to borrow a line from Casablanca, be the beginning of a beautiful friendship. 

Total Direct Emissions*

COMPANY**	MWH	EMISSIONS (TONNES OF CO ₂)	KG/MWH
Hydro-Quebec	206,012,000	125,615	0.61
BC Hydro	99,932,000	228,871	2.29
Manitoba Hydro	35,366,000	475,471	13.44
Newfoundland and Labrador Hydro	39,230,000	1,012,280	25.80
OPG	105,100,000	28,667,470	272.76
NB Power	18,180,000	6,442,000	354.35
SaskPower	18,744,000	14,009,886	747.43
Transalta	37,173,000	29,405,070	791.03
Nova Scotia Power	11,862,000	10,062,081	848.26
ATCO	8,020,263	9,523,948	1,187.49

Emissions Source: www.ghgreporting.gc.ca (2007)

*Emissions are not based on a lifecycle calculation, as comparable data was not available.

**EPCOR, now Capital Power and EPCOR, had total Canadian emissions in 2007 of 9,548,206 tonnes of CO₂, but the company's Canadian production was not readily available.

- Irving Oil and the Huntsman Marine Science Centre in St. Andrews, New Brunswick have teamed up to research tidal power in the Bay of Fundy, and in September, the first of three turbines went up as a part of a demonstration project.
- Nova Scotia has also committed to sourcing 18.5 per cent of its total electricity needs from renewable sources by 2013.
- Ontario's Hydro One has committed to investing \$2.3 billion in 20 transmission projects that over the next three years are expected to create 20,000 jobs.