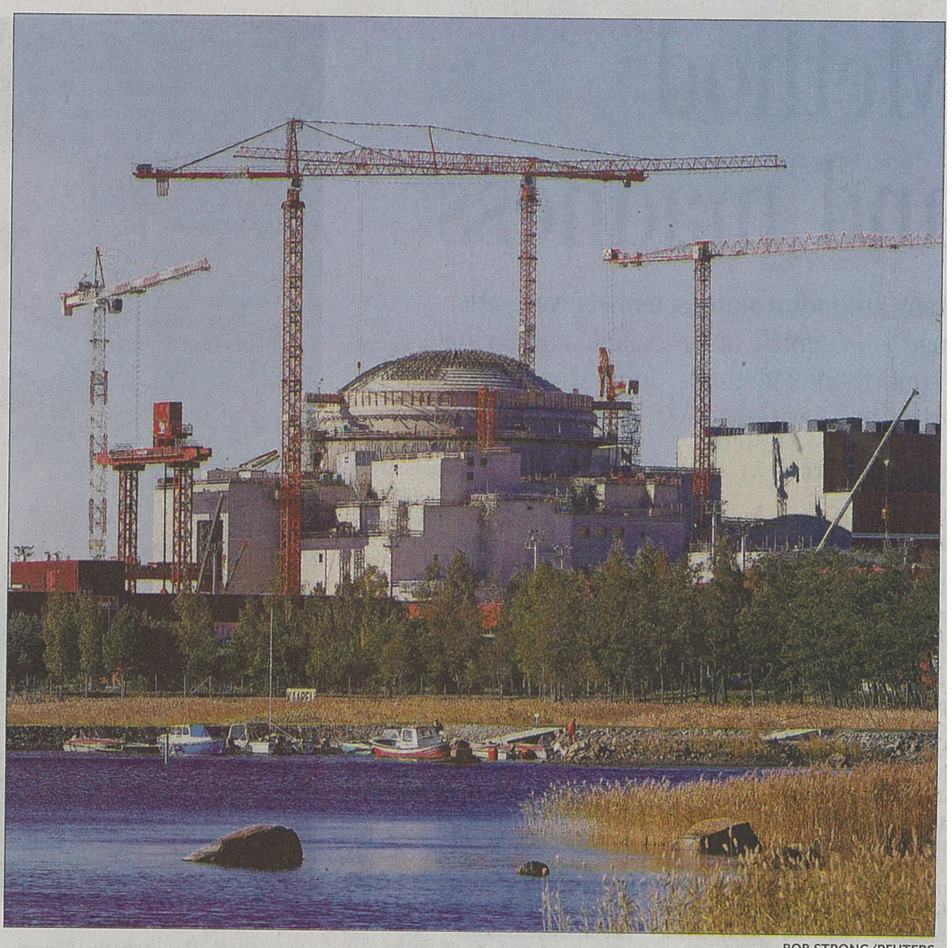
FUTURE POWER

Beyond the stigma of nuclear



BOB STRONG/REUTERS

Construction cranes rise over the reactor dome of the Olkiluoto 3 nuclear power plant, which is being built on Finland's west coast near Rauma, about 220 kilometres northeast of Helsinki.

ENERGY from IN1

Nuclear's heritage is one reason for its bad rap. Without the warm, friendly narrative that wind and solar proponents love to espouse, it isn't easily embraced by the public. By the time it was introduced to produce electricity on a commercial scale in Canada in the 1960s, it was already stigmatized by an association with bombs and weaponry.

A partial meltdown in the United States at the Three Mile Island power plant in 1979 and the Chernobyl catastrophe in 1986 were real-life reminders of nuclear's uncomfortable potential for cataclysm in a peaceful, civilian setting.

Paradoxically, nuclear's failure to fulfill its heroic early expectation in public consciousness probably contributed just as much to its negative image. "It was going to produce power too cheap to meter, and there would be nuclear-powered cars you'd refuel once a year," says energy consultant Tom Adams. "It was sci-fi stuff that got us pumped up, then fell flat."

The Pickering generating station, which opened in 1971, exemplified the misunderstanding. Technology capable of turning unenriched Canadian uranium into electricity for next to nothing (if one overlooked the cost of the plant) was complex, and even a little menacing, according to nuclear's foes. The impression persisted among most Ontarians that Niagara Falls, whose power-generating might was simple to grasp, provided all the free electricity that was needed.

THE ISSUE of dealing safely with radioactive nuclear waste has also kept alive concerns over nuclear power. In fact, the problem is probably solvable through underground storage, says Jan Carr, an electricity industry executive and former head of the Ontario Power Authority.

But the idea of burying spent fuel for centuries is the kind of issue that feeds anti-nuclear sentiment, says Carr. The more complex a technology, the easier it is to generate a negative mythology around it, based on false fears that are easier to grasp than facts backed up by scientific evidence. Carr says the phenomenon is "particularly acute in the case of nuclear power."

Governments, despite having all the facts, and despite acknowledging nuclear energy as the best emissions-free source of electricity, nonetheless regard anything nuclear-related as a third rail — perhaps with some justification.

Electricity decisions essentially boil down to forecasting demand a decade or more in advance. But missteps while trying to persuade current consumers to foot part of the cost of fulfilling long-term objectives, however worthy they might be, can have impressively dramatic short-term political impact.

The Darlington plant, for which Ontario is seeking two new reactors, has scorched enough political fingers throughout its history to justify wariness by the McGuinty government. An epic construction debacle that began in 1981, Darlington was instrumental in ending 42 consecutive years of Conservative government in Ontario.

Both the ensuing Liberal government of David Peterson, and Bob Rae's NDP government after that, proved just as inept at containing the project. Darlington contributed to the defeat of both.

It also earned nuclear a reputation for being horrendously expensive. Originally projected at about $7 billion, the bill by the time it went into service in the early '90s had more than doubled to $14.4 billion.

But invoking Darlington as a reason for eschewing nuclear power is a red herring in Carr's view. He blames political interference and project mismanagement for the plant's problems. "Darlington was stopped and started at least three times," he says. "At the time, the prime rate was 15 per cent and occasionally higher. Interest on several billion borrowed at that rate accounted for about $4 billion of Darlington's capital cost."

Neil Alexander is president of the Organization of Candu Industries, a lobby group representing about 150 companies that employ 30,000 workers. He acknowledges the Darlington fiasco, and cost overruns for overhauls of nuclear reactors elsewhere, have done little to burnish the reputation of Candu reactors. But he says nobody pays much attention when a reactor and its installation surpass expectations, as Candus have in two instances.

"Units in China were actually 42 days and 112 days ahead of schedule. Each unit produces about a $1 million worth of electricity a day, so you can understand that the customers are pleased."

Ontarians, though, won't necessarily be as happy in the long term if the province opts for Candu 6 models as its new reactors, according to Adams. He concedes that nuclear power is essential to the province's mix of energy sources. But he sees Candu technology as an out-of-date technological dead end.

The initial performance of Candu-powered plants, he says, is offset by expensive maintenance problems later. As well, he maintains that diminishing performance late in their life cycle makes them uncompetitive with newer U.S. or French reactor technology.

An example is AECL's refurbishing of the reactor at New Brunswick's Point Lepreau. It began in 2008 and still isn't finished. In the meantime, the province is threatening to sue Ottawa and AECL to recover costs running at $1 million a day while the plant is down. "Unlike some other designs, Candu has aged gracelessly" Adams says. "It's time Ontario looked at credible options in nuclear."

MONTREAL-BASED SNC Lavalin is involved in researching one possibility — clustering a number of less expensive mini-reactors, adapted from proven designs used on aircraft carriers and submarines. Their modularity would enable new units to be added as demand required and be located close to users. However, the technology is at least six or seven years from commercial viability.

In the meantime, the fate of AECL's Candu division is tied up in an almost sophomoric test of wills between the Harper government and Dalton McGuinty's Liberals that has festered since Ottawa announced the sale of AECL.

Ontario blames Ottawa's timing of the announcement for the dispute. At the time, the province — AECL's biggest reactor customer with 20 Candus — was accepting bids for two new reactors. The province preferred to buy from AECL and it was, in fact, the only bidder that met the province's specifications.

A confluence of events prompted Ontario's then-energy minister George Smitherman to suspend the procurement process. At the time he was preoccupied with drafting what he regarded as a seminal Green Energy Act. As well, the economic downturn reduced demand for electricity, while depressed natural gas prices offered an alternative generating fuel.

The province's capital budget for nuclear energy over the next 20 years is $33 billion. That covers refurbishing existing reactors and extending the lives of others, as well as two new reactors. If Ontario paid AECL's reported asking price of $26 billion for two Advanced Candu Reactors (ACRs), there wouldn't be much left in its nuclear kitty.

Brad Duguid, who inherited Smitherman's portfolio, claims Ottawa, however unintentionally, disrespected the province. "We think the federal government was insensitive to the needs of Ontarians in putting AECL up for sale while we were involved with it in a bidding process," he says.

Although he's still interested in purchasing Candu reactors if Ottawa can deliver at a price Ontario can live with, he admits the sale of the Candu division has complicated matters.

Jathan Nathwani, a long-time electricity sector observer and ex-

Going nuclear

The global economic downturn that began in 2008 lowered demand for electricity in most countries around the world, and prompted governments to postpone decisions on new generating capacity. But as the world emerges from the recession and demand grows, many nations will be seeking clean sources of electricity generation.

While renewable sources are touted as likely to make gains, nuclear power is also expected by many to become a logical solution.

In fact, it is already a major source of electricity supply in a wide range of countries. This table depicts its role in percentage terms and in absolute terms for select nations. Most rely on nuclear power for more than 14 per cent of their electricity, and France relies on it for 76 per cent. Although nations such as Belgium, Finland, Sweden and Switzerland aren't typically regarded as nuclear intensive countries, all exceeded the world average for nuclear powered electricity.

China's relatively low percentage of nuclear-generated electrical output is largely due to its large percentage overall that is produced by other means, primarily coal-fired plants and hydro. In any case, it is sure to rise when the reactors under construction come on stream. Nuclear output of South Korea and India is expected to grow for the same reason.

Note that only China and India among the countries in the table rely on nuclear power for a lower percentage of their electricity generation than Canada does. — WAYNE LILLEY

Country	%age Nuclear	Power billion kWh	Number of reactors	Note
Belgium	52	45	7	
Canada	**15**	**85**	**20**	**18 operating**
Czech Republic	34	26	6	
China	2	66	13	27 under construction
Finland	33	23	4	1 reactor under construction
France	76	392	58	1 reactor under construction
Germany	26	128	17	
India	3	14	19	6 under construction
Japan	29	263	55	2 under construction
S. Korea	35	141	21	5 under construction
Russia	18	153	32	
Spain	18	51	8	
Sweden	35	50	10	
Switzerland	40	26	5	
Ukraine	49	78	15	
United Kingdom	18	63	19	
USA	20	799	104	
World	**14**	**2,560**	**442**	**63 Under construction, 156 planned as of Jan. 2011**

SOURCE: World Nuclear Association. Figures apply to end of 2009. TORONTO STAR GRAPHIC

ecutive director of the University of Waterloo's Institute of Sustainable Energy, says Ottawa's clumsy handling of the proposed Candu sale and cavalier treatment of Ontario — Candu reactors' best customer by far — may wind up costing the federal government money.

An order from Ontario on AECL's books would be just the dowry needed to attract suitors, Nathwani says. Without it, he doesn't expect bids that Ottawa will find acceptable. "The feds used a poor strategy, advertising, 'I have the ugliest daughter and I want to get rid of her,'" says Nathwani.

While it might take more than a little lipstick to dress it up, Carr says, Canada's Candu-based nuclear technology has more prospects than might appear. For one thing, it supports a Canadian nuclear industry worth about $6.6 billion that employs about 30,000 and has export sales of $1.5 billion.

For another, says Carr, Candu technology is not only still valid but also has unique features for some markets. Candu reactors, he notes, use unenriched uranium, which is cheaper and poses less risk than enriched uranium of weapons-grade material, so Candus can be sold without violating Canada's non-proliferation policy. They can also use thorium, a fuel more prevalent and cheaper than uranium.

CARR BELIEVES the Candu division may benefit from being uncoupled from AECL. As a privatized entity, it will be better able to compete internationally through arrangements such as joint ventures. "It will be able to operate more businesslike with respect to raising financing than as a government organization," he says.

Christian Paradis, the federal minister of natural resources, cautiously pleads commercial confidentiality to avoid most questions related to AECL restructuring and the reactor division sale. He insists Ottawa was motivated to restructure AECL to "position it to retain high-skilled jobs and seize domestic and international opportunities," as well as "to reduce the financial risks carried by Canadian taxpayers."

Whether Ottawa achieves those goals through restructuring won't be known until the Candu division is sold. But consensus in the industry is that the only two serious bidders — SNC Lavalin and Bruce Power, an Ontario power plant operator — aren't likely to meet government terms, conditions and price. As well, both are believed to be more interested in servicing existing Candu units than in selling and building new ones.

If all that suggests the Candu business would be well-positioned to take advantage of a nuclear renaissance, the jury is still out on the potential of one actually occurring.

ONTARIO STILL wants to buy the two new reactors, but Alberta and Saskatchewan have not committed to a purchase, despite expressing an interest in nuclear power.

In the U.S., the industry is privatized and power utilities rely on federal loan guarantees to finance the massive capital costs of nuclear plants. The Obama regime has promised support, but the industry has balked at the terms. As in Canada, the economic downturn has lowered electricity demand, and a surplus of natural gas, partially brought on by new production techniques, has made it affordable.

A joint venture between Japan's Hitachi Ltd. and U.S.-based General Electric — formed four years ago in hopes of snaring construction contracts for some 30 proposed nuclear plants — now doesn't foresee a new U.S. nuclear plant being built in the next decade.

Still, there is enough nuclear activity around the world to indicate that nuclear energy remains a viable industry. There are 58 nuclear plants under construction in 14 countries. The International Atomic Energy Agency says there are 436 existing nuclear reactors in 30 countries. If a privatized Candu division managed to get even a small share of that business, it would justify keeping it as a going concern.

In fact, the jobs lost if the Canadian nuclear industry were allowed to shrivel is probably the strongest argument for predicting that the province and Ottawa will eventually come to some agreement, according to Nathwani. "We'd be going down a path that saw us selling uranium mined in Saskatchewan, and the Koreans or somebody would be selling us back the Candus that they'd be making," he says.

Ultimately, Nathwani expects jobs and export sales, combined with Ottawa's eagerness to off-load AECL, will compel the feds and Ontario to reach agreement. "It makes more sense to preserve nuclear technology and 30,000 jobs in the industry than to try to attract Samsung to build solar panels or windmills that anyone can make."