# The problem – finding the problem: Canada's ice disasters lessons for Y2K

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In January 1998, a series of ice storms struck Eastern Canada and parts of neighbouring US states. The ice build-up was so great that branches, trees, telephone and power lines and even steel transmission towers collapsed under the weight. Eventually, 16 per cent of Canadians were left without electric power and Canadian insurance companies paid out $1.44 billion in claims, the largest insured loss in Canadian history. In Eastern Ontario, the damage was so bad that 66 separate municipalities declared a state of emergency, among them 10 of the 11 municipalities that make up the Regional Municipality of Ottawa Carleton, a region that includes Canada's capital city, Ottawa.

The response to the ice disaster involved volunteers, local, regional and provincial governments and utilities and the largest peacetime response by the Canadian Army in its history. That response ran into an unexpected dilemma: the ice storm had not only created problems, it damaged the systems that normally detect these. Finding out what was wrong required a massive commitment of personnel. This may be a portent of what will happen at the start of the year 2000.

In discussing the ice storm, this article focuses on one part of the impact area – the urban-rural Regional Municipality of Ottawa Carleton (RMOC). That is because even before the RMOC shut down its Emergency Operations Centre (EOC), it commissioned a small task force to review its response. That report was finished in six weeks (Scanlon, 1998c) unlike other reports which are still being written or researched. It is the main source of information for this article. However, it was only later that some implications of what happened became evident. For that reason, the issues discussed here were not analysed in RMOC report.

## Setting the scene

The 1998 ice disaster was the result of three consecutive storms during a six-day period. Throughout that period the temperature remained slightly less than 0 Celsius. If it had been warmer, it would have rained. If it had been colder, it would have snowed. Instead, ice from the second storm piled up on top of the ice from the first, and ice from the third storm piled up on top of that. The ice build-up in the Ottawa area was 69.6 millimetres, three times the historic high. It was far worse along the St. Lawrence Seaway, an hour's drive from Ottawa. In some places, the build-up was more than 100 millimetres, five times the record for a six-day period.

The Regional Municipality of Ottawa Carleton (RMOC) is responsible for policing, transportation, health, social services, water, liquid and solid waste and regional roads. The 11 local municipalities in the Region look after their own fire service and several have their own power utilities. In some areas, power is provided by the provincially owned utility, Ontario Hydro. Telephone service and gas is supplied by private utilities. Although the ice storm did not hit the region as severely as it struck other places, 10 per cent of the trees in the Region were destroyed and 70 per cent were damaged. There were telephone and power lines down everywhere. Roads and sidewalks were covered with ice and debris. However, the RMOC had back up generators at all lift stations in the liquid waste system and at the liquid waste processing plant. It also had generators for all its pumping stations and wells in its fresh water distribution system. There were no failures in either system. By working extended overtime, Regional Roads crews also kept the major arteries open. Solid waste collection, however, halted. Plastic garbage bags were frozen in place and roads made movement treacherous.

Although the Regional plan calls for the Region to open shelters in an emergency, all 11 local municipalities opened their own centres before the Region could act. One of the Region's main functions became supplying those facilities. Regional staff collected food and other supplies and shipped them out. The Region also collected and shipped generators, firewood, camp stoves, water, flashlights, batteries, beds, cots, blankets and other supplies to fire halls, which became the main distribution point for supplies. (Some supplies came from federal depots placed strategically for just such emergencies.) Since its own services were functioning, the RMOC became mainly a service centre, assisting local municipalities. It also became the main centre for public information, with its twice-daily news conferences—these were broadcast live— and its superb telephone answering system. A person answers all calls to the RMOC and no callers are forced to leave voice mail unless they choose to do so: calls reaching a recording return to an operator.

The RMOC's response was run from the offices of the Emergency Measures Unit at Regional headquarters. The unit consists of a small secretariat, one office and two meeting rooms. During the disaster, the outer meeting room was used for the Control Group, which included the elected Regional Chair, the Chief Administrator Officer and senior officials including the Medical Officer of Health and the Chief of the Ottawa Carleton Regional Police Service. The inner meeting room—equipped with cubicles and special phones—was used as an Emergency Operations Centre (EOC). It was staffed at first by persons from emergency agencies and OC Transpo, the Regional transit system. Later they were joined by persons from the *ad hoc* groups formed to deal with specific problems and by officers from the Canadian Army.

Communications to and from the EOC generally worked well. The phones, unlike the rest of the phones in the Region, did not require power to operate. They also had no capacity to receive voice mail. That meant no messages were lost. Lost messages did become a problem when some field per—sonnel acquired cell phones and passed these around. Often the person with the phone was unaware that messages were piling up and that messages sent to an earlier user of that phone had never been heard. (There were some problems the evening the state of emergency was declared: the RMOC's cell phone system went down where power went out at the main tower.)

Although the initial staffing of the matched what is usually done for emergencies — present were fire, police, ambulance, health, and social services — the ice storm was an unusual disaster. Since the storm had hit the entire region, there was no site and no need for site control, nor-

mally a police function. Since there were few accidents – the few drivers there were, were very cautious – and little crime, that also reduced the need for police services and the demand for ambulances. In any case, few went to hospital in such treacherous conditions. The busiest emergency agency was fire: its vehicles were continually on the road dealing with downed trees and power lines. As a result, most activity in the EOC was not by emergency agencies but by the *ad hoc* emergent groups hastily put together to deal with generators, food and other supplies and firewood. These groups were run by persons selected by the Control Group and they quickly fitted in with those already at the EOC (Scanlon, 1998a).

Despite the power outages, most residents stayed in their homes. They made do with camp stoves, wood stoves and fireplaces or by piling on extra clothing in the daytime and extra blankets at night. Only a handful elected to sleep at the shelters. Concerned that residents especially the elderly might not realise how risky it was to stay in a cold house in mid-winter, firefighters started going door to door (Scanlon, 1998b). Those checks expanded until house calls were made by teams that included not only firefighters but also Regional police, Health and Social Service workers and military personnel (including medics). Eventually about 300 persons were identified as at risk and persuaded to leave home. Force was never used. (The Chief of Police told the Control Group that in Ontario police do not have the legal power to force persons from their homes.)

## Military assistance

In Canada military personnel are under federal control. However, peacetime emergency response is a provincial responsibility. Thus military involvement in disaster usually occurs only when a province requests the federal government for assistance. While such requests are not uncommon, they rarely come from the largest province, Ontario. Armed forces personnel, for example, provided accommodation, food and transportation when a flash flood hit the Saguenay region of Quebec and helped build levees and patrol flooded communities during the 1997 floods in the Red River Valley. They were called out after two terrorist kidnappings in Quebec and when aboriginals blocked highways and a major bridge in and around Montreal. But Ontario rejected military assistance when a toxic chemical spill led to the evacuation of 217,000 persons in Mississauga and when 14 million rubber tires burned for 18 days in Nanticoke.

In the wake of the ice storms, however, the RMOC and other Ontario communities decided they did not have sufficient personnel to deal with the enormous problems of cleaning up the debris left by the storm. They asked for military help. Those requests went first to the Provincial Operations Centre of Emergency Measures Ontario, then to Land Forces Central Area (LFCA), finally to the 2nd Canadian Mechanised Brigade (2CMBG) at Canadian Forces Base (CFB) Petawawa. As a result of those and similar requests from neighbouring Quebec, 15,000 troops were sent to assist disaster-stricken communities: 4500 of those were sent to Eastern Ontario.

Although it was anxious to assist, 2CMBG ran into problems when it was asked to respond to the ice disaster. First, most of its soldiers were on Christmas leave: it had to recall them. That worked so well that 70 per cent arrived back the same day. Second, the roads between CFB Petawawa and the RMOC were dangerously icy. The RMOC had to divert some of its salt trucks to make the highway passable for the troops. On arrival at Regional headquarters, the 2CMBG advance party received a middle of the night briefing from Regional staff, and then officers toured both the Region and some neighbouring rural areas in police cars. They reported back with two observations: the situation was far worse then they had expected; and it was far worse in the rural areas *outside* the Region than it was in the rural areas *in* the Region. From then on, the Army brought its officers in to Regional headquarters each evening for an up-to-date assessment, meetings that soon provided the best overview of what was happening.

The day after arriving, the Army learned something else: on January 1st a number of boundary changes had taken place in rural areas of Eastern Ontario. Many new municipalities had yet to organise when the ice storm struck in early January. In some areas, there was no municipal government. No new community had an emergency plan. (Things were so confused that the province had had to send police cars to try and locate some local governments.) The RMOC had been sending personnel and supplies to its rural neighbours as soon as it opened its EOC. Now, at the Army's request and with permission from the Premier of Ontario, it sent administrators to help re-establish civilian government. The Army said that was crucial: it had come to assist, not to take over. (Scanlon and Kerr, 1998) The persons sent were all bilingual French-English: residents in the area outside Ottawa are substantially French speaking.

## Monitoring problems

Something else was becoming gradually apparent. That was that a major problem in responding to the ice storm was not *correcting* the situation but *discovering* exactly what was wrong. Like most developed societies, Eastern Ontario relies on sophisticated systems to monitor various activities. When many failed, it was unclear how bad things really were. Determining this required large numbers of personnel.

The RMOC, for example, keeps its roads clear during winter by applying appropriate amounts of salt and sand. The precise mixture is determined not by the air temperature but by the pavement temperature (there can be as much as 11 degrees difference). That is monitored by electric sensors in the pavement. Ice covered those sensors, forcing staff to find bare spots and check the temperature using infra-red guns. Fortunately, Regional roads had the required equipment and the staff to do this.

The system that monitors traffic lights also failed. That made it impossible to tell whether the system alone was down or whether lights were out at intersections. That could be determined only by sending out personnel from the RMOC's Traffic Operations Branch. They found that the lights were out at 80 intersections. They managed to get most lights back in operation during peak hours but had to mark some with warning signs and barricades. Because the branches, trees and lines did not all come down at once, these crews were forced to visit intersections more than once. However, within 24 hours, the situation was restored and these crews could be sent to assist others. (Most have electrical skills and carry portable generators: their services were in great demand.)

The private utilities providing gas ran into problems similar to those with traffic lights. They, too, had failures with their monitoring equipment and they, too, had to send service personnel to see if these reflected failures in monitoring or problems with gas distribution. Their checks, done entirely by their own staff, showed no failures in the entire gas distribution system. Only the monitoring system was having difficulties.

The handling of these problems followed a pattern. Because there were problems in monitoring what was going on, personnel had to be sent to gather data or do individual checks. Sometimes these checks showed action was necessary. Sometimes all was well. Whether or not action was needed, determining that required calling in personnel and sending them out to look. Responding to failures of monitoring

systems, in other words, leads to a labour-intensive response. The need for this became much more evident as the phone company and the power utilities tried to cope with their problems.

## Telephones and power

The systems that provide telephone service and electric power are comparable in the sense both involve complex systems that link various locations, whether these involve satellites or microwave links or huge steel transmission towers. Eventually, however, both connect to individual customers though what might be called automated localised service centres. In the telephone service these are known as remotes, in the power system these are called sub-stations.

If a remote or a sub-station fails, then telephone or power service stops for each individual customer served by that unit. Since both services know how many customers each unit serves, they know how many customers are without telephones or power when one fails. However, the reverse is not true. The fact that a remote or sub-station is working perfectly does not mean that a single customer is getting service. The individual drops or connections that link customers to the system may be down. To put it another way, when these companies restore service at a telephone remote or power sub-station they can't be sure how many customers are back on line.

When there is a partial failure of service, the telephone and power utilities become aware of its extent in two ways. First, their monitoring systems tell them what has gone down. Second, individual customers call in to report loss of service: the pattern and volume of those calls helps pinpoint the location and extent of those calls. Since most Canadian telephones operate even when power is out, the power utilities are usually besieged by phone calls when only the power service fails. The situation after the ice storms was different. First, remotes and power sub-stations were out throughout Eastern Ontario. Second, the connections to thousands of individual customers were also down. Even when the localised service centres—the remotes and the sub-stations—were up and running, customer service was not restored. It was still necessary to check each individual customer and that, once again, required an enormous commitment of personnel. That problem was compounded by the fact that with phones out, many customers were unable to report their power problems. (Despite that the power call-in centre was besieged by phone calls: its phones were jammed for days.)

## Telephone response

The first step the telephone company took to restore service was to round up portable generators and use these to power up the batteries at various remotes. When the only problem was a power failure at the remote itself, that restored service. That alone put about 25,000 customers back in service. There was, however, one difficulty. Although crime rates fell in the wake of the ice storm, the telephone company's generators proved too attractive a prize. So many generators disappeared that the telephone company had to chain them in place and arrange for security guards to do special patrols. Sometimes the guards would go from remote to remote then return to find a generator had disappeared while they were elsewhere. (In most cases, these generators were returned once power was restored.)

Next, by calling in crews from across the province, the telephone company tried to restore service where the problem was not the remote but the 'drop' or individual connection to a customer. Considering this a major priority, the company cut back on new installations and routine maintenance across the province. However, some telephone service depends on lines strung on wooden poles (these are often called 'telephone poles' but they carry telephone, power and TV cable service). Since this restoration work was being done by power crews, restoration of some telephone service had to wait until those crews got poles back in place—a time consuming task since thousands of poles had been dragged down by the weight of ice. During the response, Ontario Hydro alone shipped in 84,932 insulators, 21,151 transformer and 2804 kilometres of wire and cable and no less than 11,647 power poles (Scanlon, 1998c, p. 40)

Since the problems were so great and telephone resources stretched to the limit, the telephone company asked the Army to help, not just to clean up debris and dig holes for new poles but to have soldiers use their technical skills to restore service. At first reluctant to do work normally done by unionised civilian specialists, the Army agreed to assist when it became clear that the situation was a widespread disaster, not a problem that could be handled with by normal response or even with extensive mutual aid.

Although its public affairs staff urged telephone company management to announce where and when service would be restored, the telephone company did not do so. It stated that it was running an all-out 'blitz' with all available personnel and that service would be restored as fast as was possible. The company's rationale was that as soon as you announce that Community A's or neighbourhood B's phones will be restored next, that makes it obvious to other communities or neighbourhoods that they are lower in priority. By not making promises, the company did make anyone feel they were less important than someone else was. Because the media were focusing on the power problems, they never challenged that approach. The strategy paid off when restoration took much longer than expected. By not creating false expectations, the telephone company avoided disappointing customers.

## Power Situation

While telephone restoration went quietly and aroused few complaints, the restoration of power became a highly controversial public issue. There were a number of reasons for this. First, in Eastern Ontario alone, the power system involves 45 different utilities that, to some extent, are in competition with each other. Second, loss of phone service is far less a problem than loss of power. Many persons could communicate with cell phones or use a phone elsewhere. (The telephone company installed banks of free phones by the various shelters though they had to put on controls when some persons made overseas calls.) In any case, losing a phone does not leave you cold or thirsty. Finally, Ontario Hydro kept making public forecasts it was unable to keep.

The first priority for each individual power utility was restoring service to its own customers. Most utilities did that by using their own personnel and by calling for mutual aid from utilities outside the impact area. While all utilities made their own decisions about power restoration priorities, most kept in touch with their local government's EOC to make certain there was mutual understanding about what was going on. That was certainly true for the five utilities within the RMOC – Ottawa, Nepean, Gloucester, Kanata and Richmond Hydro. Nepean, for example, had a liaison officer from the Nepean EOC at its headquarters. Cumberland had daily meetings with Ontario Hydro.

In many urban areas, power was back in hours although in one or two places it took a week. (In one or two neighbourhoods, the overhead power lines are strung behind stately homes on tree-covered properties.) The utilities kept in touch with each other and asked the crews to move on to assist other local utilities once their services were no longer needed. In the urban areas of the Region there were few complaints about the speed or efficiency of restoration of power.

The situation was far different in the rural areas, both within the Region and outside its borders. First, there had been a greater ice accumulation so the damage was far greater. Second, many rural power lines are strung across fields rather than along roads. Accessing them was not easy. Third, customers are much further apart: moving from one place to the next took much longer. Fourth, power is more important to rural residents. In the city, water kept running, as did the sewage system. In rural areas, residents had no water and no sewage – both require pumps – and many dairy farmers were finding it impossible to milk their cows. The Army helped one farmer by sending two soldiers who had grown up on a farm to milk his cows by hand. It was far from enough: in Ontario, an estimated 2000 dairy farmers were forced to dump 10 million litres of milk, worth $6 million Canadian (Lecomte, Pang and Russell, 1998, p. 18).

There was a further problem stemming from the uneasy relationship between Ontario Hydro and the 45 local utilities. As the province's only significant producer of electric power, Ontario Hydro supplies power to all other utilities. It also has its own individual customers. That means that in many areas it is a competitor with the utilities it is supplying with power. In Goulburn township, for example, the power in the town of Richmond is supplied by Richmond Hydro but the power for the rest of the township is supplied by Ontario Hydro. This dual role—wholesaler and retailer—has led to an uneasy relationship between Ontario Hydro and the other utilities. Because of that, some utilities declined to provide information to Ontario Hydro about the extent of their problems (that meant the province had trouble getting an overall picture).

There were also public disputes among the utilities. One arose when Ontario Hydro refused to let crews from Kanata Hydro work with its crews. (Kanata is one of the 11 municipalities in the region.) Kanata Hydro workers informed the media that this was because Ontario Hydro was unionised and its were not: it portrayed the dispute as union resistance to use of non-union workers. There were some problems with Ontario Hydro unions during the response. However, the refusal to accept Kanata assistance stemmed from something else: Ontario Hydro provides detailed safety briefings to all of its crews and contractors every morning. When the Kanata crews arrived, those briefings were finished. Ontario Hydro did not want to anyone in its response operations who had missed the safety briefing.

## Negative reaction

However, Ontario Hydro's real problem was its inability to provide the public with satisfactory information. That stemmed from two things. First, Ontario Hydro spokespersons used jargon: as a result, their announcements were confusing. Second, the situation was far worse than anyone suspected: Ontario Hydro's forecasts were unduly optimistic. The problem with jargon was that Ontario Hydro kept announcing the target date for restoration of power to its *sub-stations.* It would say, for example, that power would be back in 48 hours at the 'Manotick' sub-station. Because the Manotick substation is not necessarily in Manotick the name 'Manotick' did not necessarily mean the community called Manotick. Even if the 'Manotick' sub-station *was* in Manotick that did not mean that once the *sub-station* was back on line, power would be restored to Manotick customers. Each individual customer still had to be re-connected. That might and often did take several more days.

Ontario Hydro's most serious failure was explaining what it was doing and what it hoped to achieve in a way that could be understood ... Ontario Hydro could not seem to understand why this kind of miscommunication left local officials and the public frustrated and enraged. (Scanlon, 1998c, p. 42)

In addition, the situation was far, far worse than anything previously experienced. Over all (there are no separate figures for Ontario) more than 1000 transmission towers and 30,000 wooden utility poles came down (Lecomte, Pang and Russell, 1998, p. 14). Not only the sub-stations but most customers served by those sub-stations were directly impacted. Ontario Hydro had to find ways of determining where service was out. Without that information, it had no idea how long restoration would take. Quite often, that information had to be obtained not from skilled technical personnel—it doesn't require skill to see if a line is broken—but from anyone who could go and look. Military reconnaissance became an essential ingredient in the response.

There was another difficulty. Ontario Hydro has the right to run power lines across fields and—in the wake of the ice storm—got permission to put some lines along country roads. However, in many cases, it does not have the right to reconnect lines on private property. That's the job of an electrical contractor. Ontario Hydro crews would come down a road restoring power and keep going past a home that was still in the dark. That infuriated customers. Later, Ontario Hydro got special permission to make those connections but by then it had already managed to upset many of its customers.

Unfortunately for Ontario Hydro, the decision to keep the public informed—and the fact its announcements were often misunderstood—led to public criticism from local politicians, from Regional government, even from its own personnel. Ontario Hydro eventually agreed to send senior engineers to Regional headquarters to meet with the Regional Control Group. From then on, its public announcements were made as part of the Region's twice-daily news conferences. Ontario Hydro also sent service personnel to the various shelters to meet with individual customers. They called this approach their 'hug a customer' service. By then Ontario Hydro had become the scapegoat.

After the chair of the RMOC told the chairman of Ontario Hydro's Board that he was having trouble getting answers from Hydro, the Hydro chairman told a news conference he was having difficulty getting answers from his own staff. From then on it was open season on Ontario Hydro. (Scanlon, 1998c, p. 43)

## Hydro staff called that news conference the 'news conference from hell'

### Significance of what happened

Initially, problems created by the 1998 ice storm seemed straightforward. Branches and trees were down everywhere, telephone lines and power lines were down. As time passed, it became clear these were only the outward and visible signs of the extent of the emergency. Before the full extent of the problems could be determined, there had to be on-the-spot checks by personnel, not only to see where power was out but also to check on road temperature, gas lines, traffic lights individual telephone and power connections. The problem in responding to the ice storm, therefore, was not just fixing what went wrong, it was finding out what was wrong so that it could be fixed. And that required enormous numbers of personnel.

Governments and business have become increasingly dependent on computer-based systems to monitor what is happening and to warn them if something goes wrong. The 1998 ice storm shows that those monitoring systems can fail. The ice storm, in other words, revealed the sort of problems predicted by Yale professor Charles Perrow in his book *Normal Accidents: Living With High Risk Technologies* (Perrow, 1984). The storm also showed that in addition to multiple failures in *one* system at one time, there could be multiple failures in *many* systems at the same time. It seems

reasonable to suggest that may be an indication of the sorts of things that might go wrong at the end of this century.

In recent years, the Canadian government, like many governments has been cutting back. Private companies have been doing the same. There have been moves towards deregulation, freeing the way to greater competition. As a result, both government and business have fewer spare resources, resources that are vital to an emergency response. This is particularly acute when a wide area is affected—as it was in the wake of the ice storm and may well be at the end of the century. When this happens, mutual aid systems do not fill the gap.

In Canada, during the response to the ice storm, two resources proved to be especially important. One was Bell Canada, which despite deregulation and increased competition was still able to assist many of those who are no longer its customers. (It provided extra support to the RMOC, for example, although the Regional phone and cell phone contracts are both with rival firms.) The second was the Army. That was partly because it had personnel who could do whatever was required. It was also partly because to a considerable extent it was self-sustaining. However, it was mainly because it had reserves of personnel who were capable of finding out what the problems really were, doing in other words what the military called reconnaissance, a term officials at the Regional Municipality of Ottawa Carleton came to appreciate.

## Role of government

One problem that was not resolved in the wake of the ice storm was the appropriate role for government. At the local level, there was considerable discussion between municipalities and power utilities about appropriate priorities for restoration of power. All power utilities including Ontario Hydro responded to municipal suggestions when these were made. This did not happen at either the provincial (state) or Regional level—not because the power utilities resisted suggestions but because those levels of government didn't make any: while provincial and regional government tried to keep track of what was happening they left decision making to the utilities. The task force report on the RMOC's response argued that both levels of government failed in their responsibility by not playing a role in setting priorities. It said that during a disaster government has a responsibility to play a leadership role even in areas where it does not normally have jurisdiction.

Another lesson that needs to be learned from the ice storm is that, in a disaster, the government must step in and take the responsibility for coordinating the response and for acquiring the expertise to do that effectively. That did not happen in Ice Storm '98 when it came to electric power. (Scanlon, 1998c, p. 72)

Given the political climate at the time of the storm, the decision by both levels of government to stay out of power issues may have been wise. The province, for example, has been trying to maintain an arm's length relationship with Ontario Hydro because of some recent problems with that utility. It was better off politically to let the blame fall on Hydro than to start issuing directions and risk being blamed for what went wrong. In the Region, there are suggestions that the local municipalities may be abandoned and integrated into what is known as a one-tier government. If the RMOC had tried to interfere with the local utilities it would have been seen as trying to push ahead with that political agenda:

The task force recommendation that the Region get involved in setting power priorities may have made administrative sense but the Region's approach was more politically sensitive as demonstrated by the fact that the only strong negative reactions to the task force report came from local utilities and the municipalities with such utilities. They saw the recommendation that the Region get involved in setting power priorities as setting the stage for a Regional takeover of electric power. (Scanlon, 1998a)

It is hard to see, however, how such a stand aside position—politically wise or not—could be taken in a similar future emergency, especially one caused by widespread failures in all monitoring systems, such as could happen at the start of the next millennium.

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