



The National Research Council of Canada: Energy Efficiency Pioneer

1 Background

The National Research Council, Canada's most comprehensive science and engineering research organization, has earned an international reputation for excellence. It has also been honored as a pioneer in the efficient use of energy, winning eight awards over the past 11 years.

The nature of its operations makes the National Research Council a heavy consumer of energy. Wind tunnels, compressors, exhausters, ventilators, environmental chambers, clean rooms, lasers and magnets all use large amounts of electricity. So, in the late 1980s, as hydro rates went up and budget allocations went down, the Council faced an energy crisis. It had to find a way to update its facilities to conserve energy, but could not afford the necessary improvements.

The National Research Council collaborated with Natural Resources Canada and found a way – energy performance contracting. This relatively new method of implementing energy efficiency improvements did not require an up-front investment. Hence, the National Research Council became the first federal organization to enter into an energy management agreement with a private sector firm.

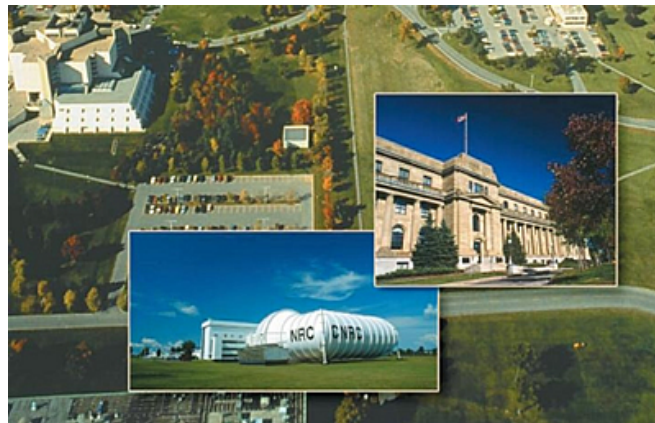


Figure 1. Canada's National Research Council.

In 1989 the Council signed a 5-year, \$1.6-million contract with Rose Technology Group Limited (RTG) (now Vestar). Under the terms of the contract, the National Research Council did not have to put up any money. Instead, the energy service company would finance the needed improvements and later recoup its investment from the resultant savings in energy.

The project focused on four buildings with a total floor space of 61 000 m² (657 000 sq ft). As part of its service, RTG first conducted an energy audit. By reviewing 3 years of utility bills (adjusting for weather and occupancy) before undertaking the retrofit, the company established an energy-use baseline for the buildings.

The most important improvements involved installing a centralized energy management control system, improving the lighting in buildings and retrofitting air-handling units. RTG, in collaboration with project manager Subash Vohra, specified and commissioned all the new equipment and trained National Research Council staff in its use.

Mr. Vohra, Director General of the Council's Administrative Services and Property Management Branch, says he was intrigued by the concept, but was not sure if the arrangement would work. He now describes it as a “smashing success.” The improvements led to savings of \$400,000 a year, and



the project had paid for itself even before the contract expired. For his leadership in the initiative, Mr. Vohra received the first Canada's Energy Efficiency Award.

2 Building on Success

Today, the National Research Council occupies three sites in the National Capital Region: the Montreal Road Campus, the Uplands Campus and 100 Sussex Drive. These locations include 80 buildings with a total floor area that exceeds 232 250 m² (2.5 million sq ft). Many of these buildings were constructed 50 to 60 years ago, when energy costs were very low and conservation was not a priority.

“As custodians responsible for these facilities, these days we have to do more with less and less,” explains Mr. Vohra. “Given current fiscal restraints, we must maximize value for money in service delivery by continually reviewing operations and exploring cost-effective ways to cool, heat, and ventilate.” When the Council hired a full-time energy management engineer in 1991, Mr. Vohra told him: “Your salary will come from the energy savings.”

Since its first successful project in 1989, the National Research Council has undertaken a dozen other energy efficiency initiatives. These projects have been self-financed, undertaken with financial incentives from utilities, or achieved through energy performance contracts using third-party financing.



Figure 2. Custodian inspects heating unit.

The National Research Council has since financed many successful projects through energy performance contracts.

- The Council installed a 4.5-megawatt gas turbine cogeneration unit at the Montreal Road campus for \$6.7 million, with a \$1-million incentive from Ontario Hydro. The unit's heat-recovery boiler generates steam that is used for heating in winter and, with an absorption chiller, cooling in summer. The \$1 million saved in energy costs each year means that the price of the project was paid for in less than six years. Mr. Vohra received an award from Treasury Board for this exemplary contribution to the National Research Council and the Federal Real Property Community.
- In response to the rising cost of purchasing steam from an outside supplier, Honeywell converted the heating systems in four buildings at the Uplands Campus from steam to gas-fired hot water boilers. The \$286,000 project saved \$120,000 in its first year of operation and paid for itself in less than 3 years.
- One innovative project took advantage of pipes that had been installed specifically to supply chilled water for cooling in the summer. Now, in the winter, a new pump recycles water through a cooling loop and harnesses the winter cold, providing condenser water for three five-tonne refrigeration units. An added bonus is saving 57 litres (15 gallons) of city water per minute for an annual saving of more than \$11,000. The project was paid for in less than 2 years.
- One project made possible through a contract with RTG and an incentive from Ontario Hydro retrofitted 14 000 light fixtures in four Ottawa buildings and upgraded air-handling systems in one of them. The annual savings of \$295,000 cover a payback period of 5.2 years.



The National Research Council has also used energy management service contracts in its regional facilities. For example, Johnson Controls Ltd. upgraded the heating, ventilation and air-conditioning (HVAC) systems at the Council's facilities in St. John's, Newfoundland. As well, Siemens Building Technologies, Ltd. completed a HVAC and lighting upgrade project in facilities in Halifax, Nova Scotia. Both projects have 5-year payback periods.

Through these and other energy efficiency improvements, the National Research Council now saves more than \$2.25 million a year in energy bills. "Searching for new projects that will save energy and costs is an ongoing business at the National Research Council," says Mr. Vohra, "and we are confident that, with the help of third-party financing, we can achieve more with no up-front costs. At the same time, this will also help us reduce greenhouse gas emissions."

3 Incentive and Inspiration

Mr. Vohra says that energy performance contracting has made a big difference to the National Research Council. "If this incentive had not been there, we wouldn't have even thought of those projects. The biggest advantage is that it's a source of capital that we didn't have before."

The Federal Buildings Initiative has also been a source of ideas. "It has actually given me food for thought and made me realize that there are a lot of places where we could save energy," says Mr. Vohra. He learns from working with private energy service companies. "When their role in a particular project is over, I can apply the same energy-saving principles to other buildings."