

Governing energy

An all-in-one energy management solution

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An ABB energy management system is helping Public Works and Government Services Canada – one of the largest owners and managers of office space in Canada – to improve energy efficiency in its real estate portfolio. When complete, the solution will be one of the largest energy management installations in the country.

Operational excellence

High energy cost is a global reality. Bulk energy users are striving to minimize their energy costs in all avenues of energy consumption. Typical measures include reducing overall energy consumption, improving the efficiency of plant processes, installing variable speed drives and implementing a comprehensive energy management system.

ABB helps its customers in all aspects of energy conservation and consumption optimization by providing unique products and services. The benefits to customers include operational cost (OPEX) savings, energy consumption optimization, asset optimization, integrated energy information systems, and reduced emissions of greenhouse gases.

This article describes how Energy Management and Optimization, ABB's comprehensive energy management solution, helped achieve the energy management goal of the Public Works and Government Services Canada (PWGSC).

PWGSC, a bulk energy user, wanted an up-to-date energy management system that would improve their ability to gather, control and understand their

energy data. With better data, they could implement appropriate consumption reduction strategies to lower their energy costs and actively participate in improving the environment. They found what they wanted in ABB's Energy Management and Optimization (EMO) tool. They recognized that EMO was the one "commercial off-the-shelf software" that could give them a unified approach to energy conservation across their facilities **Footnote 1**.

EMO analyzes energy consumption and helps determine the right energy conservation schemes for different buildings, so they can be operated at maximum energy efficiency while reducing greenhouse gases.

ABB's EMO provides comprehensive energy management, reporting and analysis. It replaces multiple independent systems with one unified system. Because EMO is fully modular, it can respond more quickly to future ex-

pansions and changes across PWGSC. A wide range of options provides scaleable functionality based on the customer's goals and objectives.

In November 2004, PWGSC ordered a small EMO system designed for only 500 data points and 10 concurrent users. This was PWGSC's "system on trial." They wanted to explore its different features to determine if EMO could be implemented at the organizational level.

By the end of 2005, PWGSC had ordered the first extension and by November 2007 several extensions were incorporated to include various National Capital Region¹⁾ complexes and facilities in the EMO. Most recently, PWGSC ordered another extension to include the utilities management operations of the Nunavut Territories²⁾.

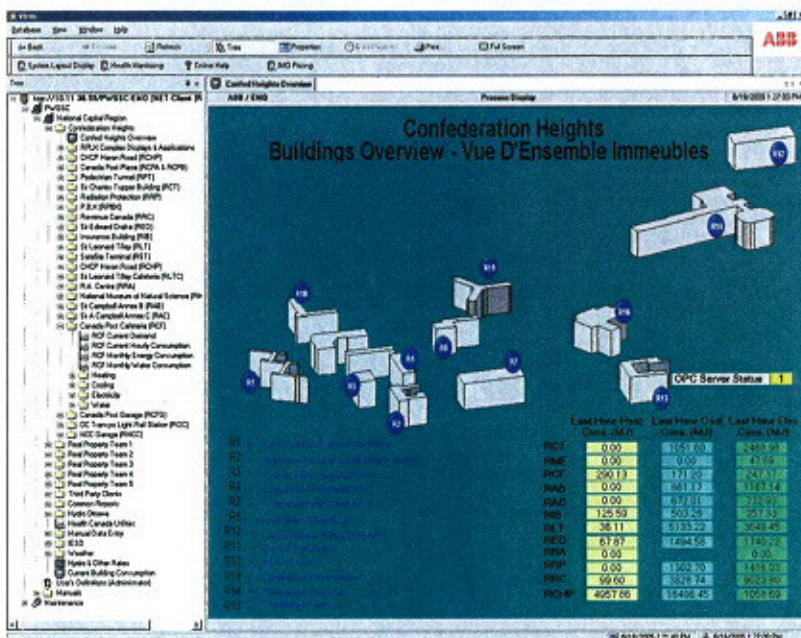
At present, the PWGSC EMO covers the National Capital Region and has 35 concurrent clients. In the future, when it expands to other regions of Canada, it will be one of the largest energy management installations in the country, with 125 concurrent clients across the nation.

Ineffective multiple systems

There are 11 branches in PWGSC that are responsible for providing and managing services for the Government of Canada and for other internal departments. PWGSC is divided into five regional operations – Atlantic, Quebec, Ontario (excluding the National Capital Region), Western and Pacific.

Real Property Branch (RPB), within the PWGSC, is responsible for property management services. It provides work environments for approximately 241,000 federal public employees (in 105 departments and agencies) and manages an inventory of approximately seven million square meters of space. Included in this inventory are national

1 Overview of the Confederation Heights federal building complex in the Canadian capital, Ottawa. Managed by PWGSC, the complex consists of 17 office buildings on a 107-hectare site.



Footnotes

- ¹⁾ National Capital Region is an official federal designation for the Canadian capital of Ottawa, the neighboring city of Gatineau, and the surrounding area. It has a total population of 1.13 million.
- ²⁾ Nunavut Territories is the largest of Canada's provinces and territories, with a land area the size of Mexico.

treasures such as Parliamentary Precinct and heritage assets across Canada.

In the National Capital Region, Utilities Management Services (UMS), a sub-group of the RPB, is responsible for energy management services for all the central heating and cooling plants and their associated high-voltage, water, storm and sanitary sewer systems. UMS is also the custodian of all utility accounts for federal complexes and other government departments managed by the PWGSC [1] [2].

UMS is responsible for delivering, verifying, forecasting and reporting on utilities for all these facilities, and for the following management functions:

- Providing data to assist in the analysis of building energy consumption
- Forecasting and reporting utility consumption

EMO's energy management modules are designed to support both operational and economic perspectives.

These tasks are complicated by the need to deal with different energy suppliers, different energy commodities (such as electricity, natural gas, water and different grades of fuel), and many internal departments and other government departments. UMS found that the multiple budgeting, reporting, billing and forecasting systems in place could not effectively manage all the energy and asset management activities. So UMS put together comprehensive system specifications for a new energy management system.

UMS decided to replace their many different budgeting, reporting and energy forecasting tools with a single state-of-the-art energy management system that would provide conventional energy management features and analyze the total energy consumption data, which were collected from different buildings to determine if those buildings were within expected ranges.

A single ABB system

Instead of using multiple independent systems to perform standard forecast-

ing, budgeting and reporting functions, PWGSC gets all these functionalities from one EMO system. EMO also has the analysis tools and a rich report facility to handle energy consumption and minimum load requirement studies for multiple buildings.

EMO helps optimize energy costs by providing "what-if" scenarios and contract management. It analyzes the cost impact of different combinations of electricity and natural gas purchased from different sources, and provides the information needed to negotiate and purchase various energy commodities directly from the main suppliers and markets. For example, PWGSC can purchase electricity directly from the main electricity market operator Independent Electricity System Operator (IESO) or natural gas directly from the wellheads in Alberta.

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The EMO interface server collects real-time data from different energy markets (such as IESO, and Environment Canada). An audit-trail feature tracks changes in the EMO server database. PWGSC users do not have any language constraints because EMO switches from English to French fol-

lowing the language setting of the user's login station.

EMO system overview

EMO's energy management modules are designed to support the energy business from both operational and economic perspectives. The system has been developed to:

- Forecast electricity, steam and fuel consumption

■ The C.D. Howe Building, Ottawa, is one of the buildings managed by ABB's EMO system



Endbox 1 Energy Management Optimization (EMO)

ABB's Energy Management and Optimization solution aims at improving energy efficiency and keeping energy expenses under control. This is achieved by providing planning tools that:

- Forecast energy and other utility consumption based on production schedules
 - Plan and optimize the scheduling of energy supply
 - Simulate alternative operating and price scenarios
- and by offering monitoring and reporting tools that:
- Control the energy balance between supply and consumption in real time
 - Set targets for energy efficiency, energy consumption and costs, and monitor and

report the actual performance against the targets.

Introduced in 2000, EMO is currently running at more than 40 installations. Examples of EMO users include UPM-Kymmene (pulp and paper), Mayr-Melnhof Karton (carton board), Swiss Steel (steel manufacturing), Giga Energy (foundry), Neste Oil (oil refinery), Helsinki Energy (power utility) and PWGSC (buildings). The aggregate amount of electric power managed in existing EMO installations is approximately 50 terawatt-hours a year, equivalent to more than half the electricity consumption of Finland.

Operational excellence

- Manage electricity and natural gas purchase and sales transactions
- Monitor and control peak loads, energy balance and efficiency
- Support decision-making with simulations and "what-if" analysis scenarios

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PWGSC's EMO comprises the following modules: Forecast, Energy Contract Management, What-if Scenarios, Calculations, Reports, Statistical Analysis, and Revenue Meters & Settlement Statement Verification. Additional modules can be added in the future as needed.

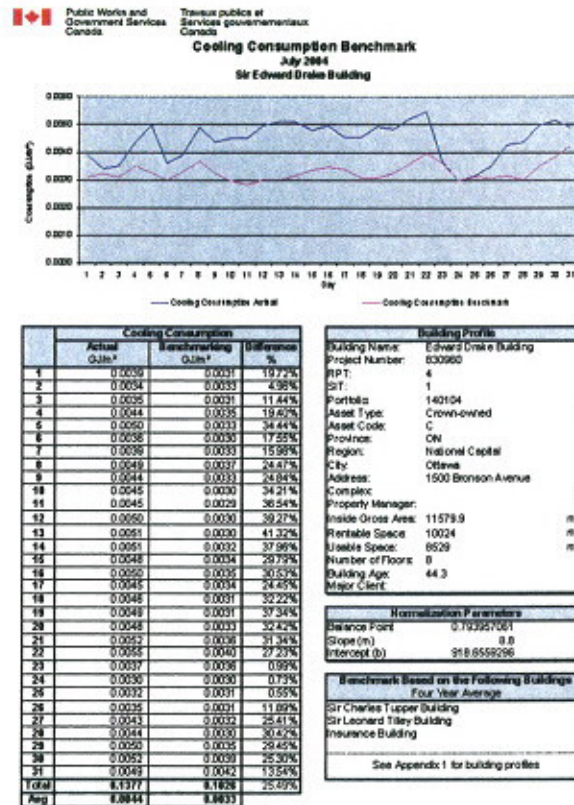
In addition to providing energy management functions, EMO also provides statistical tools for detailed energy consumption studies.

Results of different analyses (eg, benchmarking, data normalization, base-load analysis and load forecasting) are presented in reports [3]. These reports can be modified, copied and

Langevin Block, Ottawa, is the main headquarters of the executive branch of the Government of Canada.



3 Sample benchmark report on cooling consumption at an office building in Ottawa



Factbook 2 Reports for PWGSC

- At present, PWGSC's consumption, energy, load, financial and administrative reports include:
- Consumption report for all utilities per day/month/year by individual meter and by aggregated meters
 - Average energy used for all utilities per day/month/year
 - Energy used per m² for all utilities per day/month/year
 - Total energy cost per m² per day/month/year
 - Temperature and weather correlation report
 - Energy use per building and cost by building
 - Peak load reports for all utilities per day/month/year
 - Average electrical demand per day/month/year by individual meter, multiple meters or building
 - Average daily profile – shows average pattern of demand over a specified period by individual meter, multiple meters or building
 - Aggregate analysis report – totalizes data points and determines peak, minimum and consumption to determine demand-limiting options for all utilities
 - Billing reconciliation report

transferred to various departments. Additional reports can be generated using the pre-defined report templates.

At present, PWGSC's consumption, energy, load, financial and administrative reports include the items listed in [4]. Additional reports were developed for:

- Benchmarking
- Normalization of building consumption against its characteristics
- Peak demand and base-load analysis

Effective energy management

ABB's Energy Management and Optimization (EMO) solution is helping PWGSC establish standardized processes for the life-cycle administration of energy management information and move towards an operating environment that supports data sharing and e-commerce. With the help of EMO, PWGSC will also be able to focus on achieving customer satisfaction based on valuable services

that are timely, responsive, affordable and aligned with the private sector.

The unification of multiple systems (ie, budgeting, reporting, billing and forecasting) improves the energy-management-related functions and helps reduce overall energy consumption and greenhouse gas emissions into the atmosphere.

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