

London Health Sciences Centre: Energy Management

Project Objectives, Solutions and Achievements

London Health Sciences Centre (LHSC) is responsible for the operation and maintenance of the power plant and energy systems at 3 hospitals and 4 medical centres in the London, Ontario area. LHSC updated their manual data collection, paper documents and reporting processes through the implementation of e.RIS (Eramosa Reporting and Information System) as the data management and visualization solution for their power plant and energy systems. Through the utilization of e.RIS, LHSC has restored data integrity through the elimination of previous manual, error prone tasks and the integration of multiple previously disparate data sources.

In order to inform operational efficiency at the power plant and utilize energy systems information, LHSC requires timely, accurate data to be collected, validated and presented in a clear, concise format. This is critical as LHSC utilizes the energy data for the following major tasks:

- Energy Procurement of Natural Gas and Electricity.
- Regulatory Compliance (Green Energy Act O.Reg 397/11, GHG Emissions Reporting O.Reg 452/09, Cap and Trade O.Reg 144/16).
- Monthly Utility Billing of electricity, steam and chilled water to customers.
- Reporting to Internal and External stakeholders, including Senior Leadership, Statistics Canada and the Ontario Hospital Association.
- Economic Advisory to the Power Plant operation & when/how to run equipment based on market price of gas/electricity.

In light of these responsibilities, data integrity is extremely important for LHSC to reliably, effectively and efficiently meet their operational needs and requirements. Previously, the data collection and reporting process was a highly manual, labour intensive process often utilizing paper documents. The data sources utilized by LHSC included utility websites, monthly bills developed on an Oracle web application, manual entry sheets from power plant operators, excel spreadsheets maintained by power plant staff and Building Automation Systems.

In some instances, manual readings were observed from field instrumentation and displays at the facilities and recorded on paper, which were then later manually entered into the master reporting spreadsheet. In other instances, manual readings were recorded from standalone SCADA systems and/or utility bills and then later entered into the master reporting spreadsheet. The data collection and reporting process involved paper sheets, excel sheets, online .pdf bills, downloadable .csv files, website data requiring copy/paste into Excel, copy/paste historical data from Building Automation Systems and manual meter readings from electricians.

The process was labour intensive and error prone do to transposing errors when recording the data and re-entering into the master reporting spreadsheet and due to illegible recordings. This often resulted in effort to verify the data and re-checking the accuracy of the data through

additional field verification. Due to the missing and/or incorrect data, the absence of a vehicle or tool to easily review trends of data, and a general lack of confidence in the data, this led to an increased probability of errors in the energy reports thereby leading to the inability to make educated decisions. Approximately 40% - 50% of the Energy & Utilities Specialist's time was spent working with the energy data in this format.

The ultimate goal of LHSC was to re-establish integrity of the data being utilized for the energy procurement, reporting and management tasks. Secondary goals were to automate manual data processing and house all data in one system instead of having to manually extract data from multiple systems as well as to have a near real-time reporting and data visualization tool established to allow LHSC to make better operational decisions. LHSC retained Eramosa Engineering Inc. (Eramosa) to develop a solution to achieve these goals.

The implementation of e.RIS allowed LHSC to restore data integrity, through the elimination of previous manual, error prone tasks and the integration of multiple previously disparate data sources. All pertinent energy data was brought under one umbrella and provided LHSC the flexibility to manage the data on their own without requiring assistance from the Utilities or Vendors.

By using e.RIS as the data management tool in place of the manual method of collecting and reviewing data, LHSC reduced the time previously required for collecting, collating and reviewing the power plant and energy data by 20% - 30%, resulting in an approximate cost savings of \$40,000 per year.

Level of Complexity and Project Challenges

This project presented a number of unique challenges in terms of complexity and difficulty. To facilitate the execution of the undertaking, the project was broken into three (3) phases:

- Discovery
- Development and Implementation of a Data Architecture
- Development of Calculations, Reports and Dashboards

Once the existing data sources were identified and mapped out determining the individual source collection times – the polling period – and date formats was a challenge. There was no consistency between the various data sources and for each custom interfaces had to be developed to convert the date stamp to a common format and implement persistent data requests to provide near real-time updates. In addition, once connections to the various data sources was established, sifting through the reams of data to determine the relevant data for the project was an additional challenge that needed to be overcome. These challenges were overcome by the project team through coordination with the utilities, development of custom Application Programming Interfaces (APIs) and effective teamwork.

Technical Excellence and Innovation

The Discovery Phase was used to identify and document the existing data sources and current methods of data exchange. Once this phase was completed, a better understanding of how to address the second phase to the project could be undertaken. From the discovery phase, the existing data sources were identified as:

- Power Plant SCADA Systems
- Honeywell Enterprise Buildings Integrator (EBI) Systems
- Sub-metering
- Independent Electricity System Operator (IESO)
- Union Gas
- London Hydro

The goal of the Development and Implementation of a Data Architecture Phase was to develop and utilize an architecture that would allow automation of the collection and aggregation of the numerous disparate data sources. For this phase, Ignition from Inductive Automation was utilized to connect to the existing Programmable Logic Controllers (PLCs) and standalone SCADA systems utilized throughout the facilities for data retrieval and archiving thus providing a mechanism for e.RIS to access the data. e.RIS connectors were developed by Eramosa to connect to and automatically retrieve usage data from London Hydro through the Ontario Green Button portal API, Union Gas through the myUnion Line API and the Honeywell EBI systems installed at the LHSC facilities. The successful development of the e.RIS connectors presented a challenge in that the Eramosa team had to work with the utilities to accurately interface with the APIs for data exchange. In some instances, the Utilities only allowed data to be pushed to e.RIS at a set interval as opposed to on demand. e.RIS web data services was used to collect IESO and Ontario Energy Board data to allow real time energy market demand and pricing.

Once the data exchange architecture was developed and implemented, access to the data sources through e.RIS was available and the Development of Calculations, Reports and Dashboards Phase was undertaken to replicate the calculations embedded in the existing Excel spreadsheet into e.RIS. These calculations are utilized by e.RIS for use in reports, data queries and dashboards within the e.RIS application and provides LHSC the ability to visualize all power plant and energy data sources in a common interface.

The project was successfully completed by the project team. Through the utilization of e.RIS, LHSC has restored data integrity, eliminated previous manual, error prone tasks and merged 7-8 previously disparate data sources.

Contribution to Economic, Social and/or Environmental Quality of Life

The project was successfully completed and met the goals set out by LHSC. By using e.RIS as the data management tool in place of the manual method of collecting and reviewing data, LHSC was able to reduce the approximate 40% - 50% of the Energy & Utilities Specialist's time previously required for collecting, collating and reviewing the power plant and energy data to approximately 20% - 30%. This reduction in time has resulted in an approximate cost savings of \$40,000 per year. As LHSC continues to build additional e.RIS calculations and reports, the time reduction and cost savings is expected to improve further.

With e.RIS and direct access to all data sources, LHSC has also has better decision making tools on hand. By now being able to view the cost to produce electricity from their own power plants against the Hourly Ontario Energy Price (HOEP) as published by IESO, LHSC can now make better decisions on when to increase power generation, export energy to the energy grid or reduce power generation and operate on utility power.

The next phase of the project is to build additional tools, calculations, reports and dashboards in e.RIS to further automate and optimize the system with the goal to be able to make better operational decisions related to energy management to reduce operational costs. LHSC is also testing and considering the e.RIS electric log books that could replace or supplement the current paper log books. This would allow power plant operators to quickly find historical information related to maintenance, power outages, contractor visits, equipment issues etc.