INTEGRATED OPERATING MODEL (IOM)

VENDOR RECOMMENDATION

November 15, 2007

Table of Contents

INTEGRATED OPERATING MODEL (IOM)
VENDOR RECOMMENDATION
November 15, 2007

1. Executive Summary

The Enersource Hydro Mississauga (EHM) Engineering and Operations personnel must work with several different sources of information in order to have a complete view of the distribution system. This impacts not only their efficiency, but their effectiveness in performing their job functions.

Historically, it was believed that many, if not all of the issues facing our operational efforts, could be resolved by integrating the functionality of the AM/FM/GIS and the SCADA systems. However, the technology was simply not available to make this integration a viable option.

Over the last few years, utility companies, and the software companies who provide solutions to the industry, began to focus on resolving these challenges. Sensing this shift, EHM launched the Integrated Operating Model (IOM) Project to research the various technical advances and implement a solution. Representatives from Engineering & Operations, Engineering IT, and Purchasing make up the project team.

Integration efforts, particularly for systems as complex as SCADA and AM/FM/GIS, pose a number of challenges, even with the recent technology advances. In order to mitigate our risk in the implementation of the IOM, it was determined that choosing one of EHM's existing two vendors, SNC-Lavalin ECS (SCADA) or Intergraph (AM/FM/GIS), was the best approach.

A Request for Proposal (RFP) was developed by the project team with the assistance of the consulting firm AESI Inc., and issued to the vendors. The team conducted research, including demos, benchmarks, site visits and conferences. The vendors' proposal responses were carefully analyzed. In parallel, a number of related projects were undertaken to ensure that both systems were as current as possible prior to the integration.

After an exhaustive evaluation process, consensus was reached that Intergraph, who will be partnering with Siemens Power Transmission and Distribution (PT&D) for the IOM Project, will provide the solution that best meets our objectives.

It is estimated that the project will cost $2.8 million, which will include all hardware, software, implementation services, training, documentation, and internal costs. The project will be delivered in two phases, over seventeen months.

2. Project Business Drivers

The AM/FM/GIS and SCADA installations are mature, with a number of applications in use throughout both the Operations and Engineering areas. Many improvements to business processes have been realized over the past several years, and EHM's reliability, safety, and productivity records are excellent. However, continuous improvement is an important corporate objective if we want to continue to be a leader in the industry. Over time, a number of issues have been identified, that once resolved, will allow us to be even more successful.

The EHM Operating personnel must work with several sources of information in order to have a complete view of the details of the distribution system. These sources include the SCADA system, the AM/FM/GIS, and paper schematic maps, all of which are briefly described below:

SCADA

The SCADA system provides remote monitoring and control as well as historical data archiving and trending capability for 68 substations and 176 pole-mounted and pad-mounted automated switches located throughout the electrical distribution system. It also provides remote monitoring of the system status at 10 Hydro One TS's supplying the EHM distribution system. In addition to monitoring, EHM can place Block/ Unblock requests to the Hydro One breakers.

Despite the powerful functionality of the system, the data modeled in SCADA is limited. Therefore, recording of the operational activity consists primarily of events and alarms related to the telemetered field devices. It is difficult to expand the map data set in SCADA, and its high-speed performance depends upon a limited model size.

AM/FM/GIS

The AM/FM/GIS captures both geographical and facility information about EHM's plant in the field. A map of the City of Mississauga showing the streets and lots is overlaid with equipment information reflected in its approximate location. Non-plant items such as municipal addresses and easements are also captured. In total, EHM has information regarding 872,000 items.

An intelligent "connectivity model" is maintained in the system such that each item of plant recognizes its upstream and downstream devices. However, this configuration reflects the normal status of the switches, rather than the real-time status, and as such, represents an engineering planning model rather than an operating model.

Paper-Based Operating Schematics

Although the AM/FM/GIS model is heavily utilized by the System Control Centre (SCC), it does not reflect the real-time electrical network status. SCADA, which

provides monitoring and control of field devices, has a limited data set. Therefore, the SCC utilizes operating schematic maps, which reflect a view of the same equipment already represented in some way, on the other two systems.

There are three drawing classes which make up the schematic map set, and they are maintained using CADD software. Each class of document represents a particular electrical system voltage and detail level.

The drawings are printed and hung on swing panels at which point coloured pins are placed to show the current status of the devices in EHM's distribution system. In effect, the information on the maps becomes real-time with the placement of the pins. If the pin positions are lost, or if the maps are destroyed, re-creation of the real-time status of the network would be difficult and time-consuming, and could pose a risk in an emergency situation.

There are a number of consequences resulting from the need to work with so many data sources. First of all, the inconvenience of working with several map products and systems slows down all aspects of the decision-making process and impacts the efficiency of the SCC. During periods of heavy activity, such as storm conditions, the extra time needed to make decisions may also lead to reliability and safety concerns.

Secondly, the non-integrated nature of the data impacts other departments such as System Planning, Engineering Design, and Construction. When a decision can be made quickly, and with a substantial and accurate data set, the quality of the decision is enhanced. It is reasonable to believe that the multi-step process required for planning and design, is resulting in some planning short-cuts and ultimately, some cost inefficiencies.

A third impact of the multiple data sets is the number of resources that must be assigned to the task of keeping them up-to-date. Along with the obvious inefficiencies this implies, it is certain that over time, the data sets will diverge. More productivity will be lost as end-users of the three map products have to investigate which version truly reflects the field conditions.

The fact that the Operations group does not completely rely on the AM/FM/GIS data impacts the overall quality of that data. If it is not their primary data source, there is less impetus for them to seek out and identify errors in it, and the full benefits of their involvement with the model are not realized throughout the rest of the engineering departments. The significant investment that has been made in data collection and maintenance on AM/FM/GIS should be fully leveraged.

Finally, and perhaps most critically, there is risk of losing the real-time switch status if there is an SCC emergency, or if the building itself becomes inaccessible. The SCC pinned maps cannot be reproduced easily, or updated in real-time at our Backup Site. Therefore, our distribution network information at the backup site is dated. In fact, even the loss of one pin location can create a safety risk for our crews and the public.

These business issues and the determination to resolve them have led to the initiation of the IOM project, the history of which is outlined in Section 3. Its primary objectives are to:

- Establish a single Interface to operate the distribution system, and make this available in both the SCC and at the Backup site;
- Use the AM/FM/GIS connectivity model to build the IOM and for the ongoing updates of the IOM;
- Eliminate the swing board paper maps in the System Control Centre;
- Establish a workflow for accurately managing distribution network information updates.

In order to achieve the objectives, the following functionality is required:

- An initial import of a graphical model of EHM's distribution network from the AM/FM/GIS;
- An initial build of the operating model based on the AM/FM/GIS data combined with the SCADA configuration parameters;
- An ongoing update ability from AM/FM/GIS with change management tools to perform data validation;
- Live/dead conductor colour distinction as well as trace functionality to highlight equipment connectivity;
- An interface to SCADA to provide real-time monitoring and control of field devices;
- Ability to enter the status of manually operated devices such as switches and elbows;
- System Control Operator (SCO) placement of cuts and jumpers on the IOM display, and recognition of these devices by the tracing function;
- Tagging of devices and prevention of control of the device based on certain equipment tags;
- Alarm screens with filtering capability;
- Real-time load flow and alarm(s) when calculated results exceed identified limits;
- Query/reporting and trending capability.

Meeting these objectives will enable EHM's personnel to manage and operate the distribution system more effectively and efficiently. Improved tools for analyzing system conditions will assist the SCO's and the engineering and design departments in their decision-making processes, both under normal and emergency conditions. The resources required to maintain the various map products can be more appropriately deployed. The risk of losing our real-time status information will be eliminated by having the status of devices stored in a database, with an ongoing backup strategy.

3. Project History

It has long been established that in order to further streamline the business processes and successfully implement an IOM, full two-way integration is needed between the SCADA and AM/FM/GIS environments. If the two systems are integrated, it will enable the SCO's to monitor and operate the electrical grid via the IOM displays, leveraging the AM/FM/GIS map information.

The challenge of providing a single environment stems from the complexity of the systems that require integration. SCADA resides on an architecture that can sustain twenty-four hour-a-day availability and must handle continuous communication to/from field devices without error. The AM/FM/GIS system manages spatial data which must correspond to real-world coordinates in order to be effective. In addition to storing a significant quantity of both graphical and database information, the model has the added complexity of a "connectivity model", whereby each item of plant recognizes the devices to which it's connected, both upstream and downstream.

About ten years ago, EHM investigated the integration of these systems, but the technology and architecture were simply not available to support it. Changes to the underlying hardware and software, and advances in supporting technologies, have finally caught up with our long-time vision of an Integrated Operating Model. In late 2005, an IOM project team was formed to review the technological advances, and define in detail EHM's requirements for an IOM. The original team consisted of representatives from Engineering & Operations, and Engineering IT.

It was quickly determined that despite the advances, the project still presented some unique technical challenges in addition to significant process change for the organization. Hence, it was determined that our risk could be mitigated by selecting one of the two software vendors, either SNC-Lavalin ECS (SCADA), or Intergraph (AM/FM/GIS) to supply the IOM. We have a long history with both vendors, with successful ongoing implementations of both systems.

It was also recognized, even before the team was formally identified, that any project where integration is required, requires that the systems be at the latest revisions, and that the data is up-to-date. Therefore, in parallel with the team's investigation, three separate projects were initiated:

Land Base Migration
In December, 2005, EHM embarked on a project to migrate the plant and equipment data to an accurate land base map. The project, which finished in November, 2006, enabled us to move from an EHM-maintained land base, to a commercial land base maintained by the City of Mississauga. It also enabled EHM to purchase other map products, such as aerial imagery, and provide them as a backdrop to the plant and equipment information.

AM/FM/GIS Upgrade

Immediately following the migration project, a software upgrade was performed on the AM/FM/GIS, bringing it to the most current release. This project was completed by December, 2006.

SCADA Upgrade

The last significant upgrade to the SCADA system was done in preparation for Y2K and the system was nearing the end of its life cycle. Additional application requirements were identified, and an upgrade was initiated in June, 2006 to bring it to the current GENe model. This project was completed by March, 2007.

During the course of the projects, a visit was paid to SNC-Lavalin ECS in Montreal to find out more about what they had done with respect to integrating with GIS systems. Team members attended the Distributech conference to research the current technology trends. .

In late 2007, site visits were made to Philadelphia Electric Company (PECO), and Siemens, to further investigate the Siemens real-time applications. PECO has a fully functional Intergraph system, with one-way communication with SCADA.

In parallel with this research, the team selected a consulting firm AESI Inc., to assist in documenting our requirements. The team, which had expanded to include representation from the Purchasing department, issued a Request for Proposal (RFP) in February, 2007 with responses received on April 26 of this year.

4. Vendor Reponses

The solutions proposed by the vendors for delivering an IOM were very diverse and resulted in the vendor selection process being longer than originally anticipated. Each proposal required investigation into separate implementation strategies, third-party software products, and post-project workflows. Following is a brief summary of each of the vendor responses, with more detailed summaries included in Attachment A.

Intergraph Proposal Summary
Intergraph's InService commercial off-the-shelf (COTS) operating model management software provides a fully integrated map-based unified interface for SCADA, Outage Management, Trouble Dispatch, and Mobile Workforce Management. It also provides a tightly pre-integrated interface to their AM/FM/GIS software G/Electric. This application, first implemented in 1999, is installed in twenty-seven utilities.

For the EHM project, Intergraph proposes to configure and install InService, utilizing their I/SCADA software and the industry standard ICCP protocol, to communicate with SCADA. They have recently announced a partnership with Siemens to deliver a system to Oncore Electric Delivery (formerly Texas Utilities, one of the largest privately-owned utilities in the US). The Siemens Load Flow Analysis software will be seamlessly integrated into InService. Many of the deliverables for the Oncore project, including the Load Flow Analysis integration, will be utilized in order to meet the EHM requirements. These functions will then be made available to all Intergraph utility customers as part of their InService COTS product solution.

The AM/FM/GIS data publishing process requires standard Oracle database export tools in combination with modules delivered with InService for importing the data to a test system. Here, tools are provided to check the integrity of the data before promotion to the production environment. These modules have been used successfully at all of Intergraph's twenty-seven InService installations.

Within the InService model, changes required to support the real-world operational state of the electric model can be made, such as the setting and maintaining of abnormal device statuses and the placing of cuts and jumpers. Attribute changes in InService, must be channeled through the AM/FM/GIS in order to maintain data integrity and ensure that the two systems remain synchronized.

Intergraph's proposed project team will be working out of the Mississauga office, and the recommended Project Manager is well-known to the EHM project team. Intergraph is proposing to deliver the project in two phases. Phase I will require seven months, and include a network connectivity model published from G/Electric, one-way communication with SCADA, full switch planning capability, and the ability to maintain the current state of the electrical model through entry of cuts and jumpers.

After Phase 1, the system will be in production for three months before Phase 2 begins. This will allow the enhanced functions contracted to Oncore and also required by EHM, to be completed and merged into the core InService product. This approach will also enhance the change management process, allowing the SCO's to become accustomed to the new workflow in stages.

Phase 2 will require seven months, and include enhancements to network symbology, schematics, tagging, alarming and filtering. Expansion of the SCADA interface will include the ability to issue device control commands to SCADA-controlled devices. The integrated Siemens Load Flow Analysis software will be available through InService.

InService uses a COTS product architecture and is therefore fully maintainable and upgradeable. Since it interfaces to external systems via standard middleware, such as ICCP, no restrictions are placed on external system upgrades. Each version is certified against the current and the last release of Windows. The same approach is used for certification against the Oracle database software. Fixes and feature upgrades for InService and the associated documentation are provided to all customers when they become available.

SNC-Lavalin ECS Proposal Summary

SNC proposes their standard Distribution Management System (DMS) software as the basis for the EHM IOM requirements. The standard DMS products, when added to the existing GENe model of the SCADA system, satisfy a large portion of EHM's operational requirements, with some minor customization. Building on the GENe SCADA interface, the DMS will provide SCADA, Load Flow Analysis, and Switch Order Creation. The only significant customization required is to develop the specific interface to the existing EHM AM/FM/GIS for the import of the feeder displays and network model. SNC has delivered a DMS system with integration to GIS for Thailand Provincial Electric Authority, and Taiwan Power Company.

The DMS applications are a suite of inter-dependent applications that provide assistance to the SCO in analyzing and supervising the real-time operations of the distribution network. A GIS Gateway facility will be developed, for receiving the network model and displays exported from the AM/FM/GIS, and converting these into the format required by the GENe DMS. The SCO will continue to use all the existing SCADA software including Substation one-line displays, tags, alarm lists, and the Operations Journal, after the DMS software is added. However, the alarm displays will now also show alarms generated from the DMS software and the Operations Journal will be configured to capture selected DMS-specific events in addition to SCADA events.

The proposal includes a GIS Gateway that will be used to identify network changes in the AM/FM/GIS, translate these changes into the format required by the DMS and verify the validity of such changes. The GIS Gateway is made up of three modules, an SNC-proprietary tool, and two third-party software products called FME (from Safe Software Inc.) and FastGate (from Osmose Utility Services). The AM/FM/GIS data conversion

process requires that the export of the Oracle database and that of the graphical displays be done in two phases. After the initial model build, a full export/import will be done infrequently. Field construction and network extension activities will be brought through to the IOM via incremental updates. To support the DMS applications, SNC is proposing to model the network from the feeder breaker of the Hydro One Transformer Station down to the distribution transformer.

SNC's proposed project team will be working out of the Montreal office, and the project plan calls for a twelve month schedule.

Software releases include minor changes to the source code to correct known issues. Each release is specifically tailored for the site and tested prior to installation. An update normally corrects a known deficiency without changing the underlying technical specification of the affected subsystem. Installation of this release would require the services of SNC's support team. A one week annual site visit is included in the maintenance program and is typically used to install the upgrade. A significant software upgrade which includes enhancements to the various subsystems, would need to be purchased by the customer, and is not included as part of the maintenance program.

5. The Evaluation Process

The written proposals were followed first by general proposal presentations, and then detailed Benchmarks by each vendor. These presentations were attended by members of the SCC, the Operations department, Engineering IT, Corporate Mapping, as well as Purchasing. Several formal questions were asked and answered in writing, and further meetings were attended to ask more detailed technical questions in order to ensure a complete understanding of the vendor solutions.

The team compiled an Evaluation Table, utilizing the original RFP compliance table as the base for its structure. The criteria evaluated included:

- Bid Completeness
- IOM Hardware/Software:
  - IOM Model Update Strategy
  - Graphical User Interface
  - SCO Software
  - IOM Database
  - Reports
  - IOM Support
  - IOM Hardware Configuration
- Pricing
- Implementation Strategy
- Product Commitment

Each member of the technical team independently weighted the sub-sections and scored the two vendors. Once completed, the team, including Purchasing, met to review the outcomes. Each individual approached the scoring slightly differently in terms of weighting, and had different areas of in-depth knowledge to support their scores. However, when the final scores were compared, there was consensus from the team that Intergraph was the preferred vendor.

6. Recommendation

Attachment B contains the Evaluation Table, including the scoring and comments from each member of the technical team. Some of the highlights of why Intergraph was selected as the preferred vendor are outlined below.

The SmartGrid Vision

Intergraph's vision of an integrated operating model, has been developing over the last few years, culminating in a plan for their InService product called SmartGrid. The SmartGrid long-term plan not only encompasses what we have envisioned for our IOM, but in fact exceeds it. There is still development work to be done to bring the full SmartGrid vision to fruition. However, our long-term relationship with Intergraph has allowed us to witness first-hand their ability to lead the industry in bringing cutting-edge technology to market. Attachment C is a white paper recently published by Intergraph, entitled "InService SmartGrid: Embracing the Technology Trends for Intelligent Electric Networks", which summarizes their strategy.

SNC is very responsive to their customer requirements, and will be able to provide the IOM as specified. However, by partnering with a leader in the field rather than one who is responding solely to our immediate needs, we will be exposed to the ideas of a forward-thinking customer base. This will provide EHM with a more innovative long-term strategy then we could possibly develop in isolation.

COTS Versus Customization

The Intergraph InService application has been a commercial product since 1999 and the generic SCADA interface, and the interface to G/Electric are also COTS products. All three applications are guaranteed to be certified against the latest two versions of both Oracle and Windows. This ensures that maintenance and upgrades are as simple as possible for the customer since the responsibility rests with Intergraph to keep all products synchronized.

Intergraph's Maintenance Agreement gives each customer the ability to open product change requests and provides access to the complete customer change request list. The customer is issued a number of "voting dollars" and can use these to vote on the open change requests whose implementation would be most beneficial to them. Additionally, a Technology Summit takes place on a yearly basis, where customers are invited to meet with product developers to discuss their business issues. These are two of the mechanisms that assist the vendor in deciding what is built into the COTS application. Software upgrades are available to all customers without additional costs beyond their annual maintenance fees. The annual maintenance fees for the InService modules average 14% of product list price, which is consistent with industry standards.

Despite the COTS nature of the InService product, the open nature of the architecture, and published interface programs allow the customer to extend the application to meet any unique requirements. If established software development protocols are followed, these extensions can be upgraded along with the COTS.

To explain the nature of the proposed SNC IOM, it is first necessary to examine that of SCADA systems in general, and more specifically, the GENe SCADA. Implementation and support activities for GENe are approached very differently than for a typical COTS installation. The product is tailored uniquely to suit each customer, including in some cases, substantial customization. All software development and most configuration control is performed by SNC in Montreal. There is a strong support team for the SCADA system at EHM, but database structure changes and software development activities are done through SNC. The pricing model for an annual maintenance contract is much higher than that of a COTS product, which in itself implies an anticipated higher level of vendor support. This model is very common in the real-time system arena, where historically, the complexity of providing 24 x 7 uptime and flawless field communication required rare skills and very tight controls. SCADA systems change infrequently, usually in response to periodic field device expansion activities. It is not uncommon to outsource some of the activities for SCADA installations that, for other applications, would typically be handled by internal IT Programmer/Analysts.

The DMS applications proposed for the IOM are founded on the GENe SCADA system and the support structure that was proposed was very similar to that of SCADA. This raised some concerns. Frequent change is undesirable on the SCADA system, but the IOM will undergo frequent change because of its dependency on the AM/FM/GIS, which is modified regularly in response to requests from its large user group. Concerns were expressed to SNC about the similarity of the DMS support model to that of the SCADA model as documented in their proposal. They responded by indicating that EHM would have access to configuration tools, at least for the GIS Gateway. However, with an underlying seamless integration to SCADA, to which we have no access, the flexibility will necessarily be restricted.

With respect to the GIS Gateway, it will be completely unique to us. At this time, there is no commitment to create a COTS interface for G/Electric and in fact, SNC has only delivered two GIS Gateways to date, both unique. The GIS Gateway software is dependent upon two other third-party software products in order to function. The upgrade process will present challenges given the dependencies on different third-party software components, all of which are upgrading on their own cycles. Once again, the ability to modify the AM/FM/GIS may be jeopardized if the changes necessitate customized modifications to the GIS Gateway.

To quantify the amount of customization required, or the complexity of the configuration effort, we need only compare the cost of the services required to deliver the solution, compared to the value of the overall software. The amount of configuration services quoted in the DMS IOM solution represents 3.4 times that of the software being installed compared to 1.4 times that of the Intergraph solution.

The AM/FM/GIS Export/Import Workflow

It is EHM's belief that in order to protect the integrity of the IOM data, all model changes must be channeled through one system, even in emergency situations. It is further maintained that the workflow easiest to support is one whereby the entire data model is exported/imported, with tools available for identifying and approving model changes and resolving conversion errors. It is believed that an incremental export/import process will be more complicated to manage and therefore difficult to sustain over the long term. On the other hand, there is immediacy and sometimes even urgency in the SCO need for updated information, so an export/import of the entire data model must be one that can be done quickly. In short, there is a conflict between the need for immediate information and the requirement for ease of change order management.

The InService application has resolved this conflict. It provides a COTS interface to the G/Electric AM/FM/GIS for import, and uses standard Oracle database tools for export. The data is exported/imported in it entirety each time, and the tools provided are relatively fast and simple to use. There are other tools available for configuration of the features and attributes to be exported from the AM/FM/GIS model, and reconfiguration of the export can be done easily as our requirements change.

The SNC GIS Gateway is considerably more complex to manage. The data from the AM/FM/GIS is exported in two steps, one for the graphics and one for the database component of the model. The three applications making up the Gateway are affected if there is a requirement to change the export configuration. The graphics export process is particularly onerous and error prone, since the geometry for the features on AM/FM/GIS is stored in an Oracle database and must be converted to a graphics format. This will place a burden on support personnel and may make a full refresh of the IOM model an unviable option. The challenges with the graphics export/import are likely to result in a compromise as to the quantity of data made available to the IOM.

The flow of information to the IOM from the Gateway is done via an incremental change order/approval process, which may result in a backlog and ultimately confusion for the data management team. Substantial editing tools are available in the Gateway which means that EHM would have to rely solely on business rules to protect the model and ensure that the AM/FM/GIS and the IOM stay synchronized. In an emergency, temptation will exist to update the Gateway quickly for import into the IOM, rather than correct the problem in the AM/FM/GIS.

Data Availability

The challenges with SNC's graphics export/import process, and the resulting compromise as to the amount of information provided to the IOM, in turn impact the number of applications that can be run against the data, and the quality of the analysis results.

SNC recommends export from the AM/FM/GIS model downstream to the distribution transformer level. SNC believes that the performance of the IOM may be impacted if secondary services and other information are included in the model.

Intergraph allows a complete export of the data model from the Hydro One equipment down to the customer meter without impacting performance. This will give us a more complete data model for analysis, and will potentially enable us to more fully use the system through reporting and add-on applications.

Expandability Potential

InService, in addition to providing all of the IOM functionality, is an Outage Management System (OMS), and with some additional configuration, the full outage restoration management features could be implemented. InService also has a full suite of Mobile Workforce Management tools which would allow EHM to easily extend the product to the field personnel. These tools support automated dispatch and mobile computing solutions for a wide variety of service work including routine, trouble and maintenance. One of the COTS modules allows GPS tracking of field crews on the InService map. Another module supports the import of trouble calls and the return of outage status information to call-taking systems such as a CIS or an IVR system. Integration to AMR systems is part of Intergraph's SmartGrid vision and the majority of the components to make up the interface are already in place.

SNC has an OMS module that can be added to the SCADA and DMS applications. However, as discussed earlier, the data model to support the application will only include information from the Hydro One Breaker to the distribution transformer, so the flexibility of the system will be less than if a full secondary connectivity model could be maintained. Service Order Management is included as part of the OMS whereby service orders can be created for different purposes, for example routine work or maintenance work. Crews may be assigned, dispatched and tracked via manual entries in the database. However, these are not automated workflows and there is no extension of this application to the field. There are no standard tools available for integration with outside systems such as CIS or AMR.

7. Gap Analysis for the Intergraph Solution

The Intergraph proposal was deemed by the team to offer the best overall solution for EHM. However, there were a number of gaps in the offering that must be addressed:

1. The data historian methodology proposed may not completely meet EHM requirements, and therefore EHM is considering the integration of a product called PI Historian into the overall solution. Budget for the PI Historian software must be included in the event that it is required.

2. A calculation analysis tool is not available in InService and therefore all calculations must continue to be done in SCADA. Additional communication with SCADA and depending upon our detailed requirements, a small extension to the COTS interface, may be needed. Implementation of calculation analysis functionality must be built into the overall project plan.

3. Trending software, which is required for EHM's system, is not a function of either the current InService product or the planned enhanced product, and therefore it will need to be purchased and implemented. Implementation of trending functionality must be built into the overall project plan.

4. Delivery of the Phase 2 functionality depends upon the relationship between Intergraph and Siemens. Letters of intent have been issued by both parties indicating commitment to the partnership. A more complete review of the documentation of this relationship is needed as part of the contract negotiations. A mitigation strategy in the event of dissolution of this partnership must be presented by Intergraph.

8. Projected Costs

The estimated costs for the project are as follows:

Intergraph/Siemens Software:	$ 511,446
Implementation Services:	1,114,463
SISCO Software:	27,540
PI Historian:	120,626
Oracle/IBM WebSphere Software:	79,461
Hardware:	114,170
Internal Costs:	479,863
SCADA Software:	11,016
SNC-Lavalin Services:	80,000
Contingency (10%):	255,667
Total:	**$2,812,343**

9. Conclusion

The Enersource Hydro Mississauga (EHM) Engineering and Operations personnel must work with several different sources of information in order to have a complete view of the distribution system. This impacts not only the efficiency and effectiveness within Operations, but in the System Planning, Engineering Design, and Construction areas as well. Further, there is a potential impact on both reliability and safety if the issue of multiple information sources is not addressed.

Many of the issues facing EHM could be resolved by integrating the functionality of the AM/FM/GIS and the SCADA systems however, this was not a viable option until recently. The Integrated Operating Model (IOM) Project was initiated to research recent technical advances and to implement a system. The IOM team is made up of representatives from Engineering & Operations, Engineering IT, and Purchasing.

Integrating the two systems is still a technically challenging task and there is a resulting requirement for significant business process change. Therefore, the team determined that the best approach would be to choose one of EHM's existing two vendors, SNC-Lavalin ECS or Intergraph to provide the solution.

An RFP was issued to the vendors and a thorough investigation of their proposal responses was undertaken. In parallel, a number of related projects were completed to ensure that both systems were as current as possible prior to the integration.

Consensus was reached that Intergraph, who will be partnering with Siemens Power Transmission and Distribution (PT&D) for the IOM Project, will provide the solution that best meets our objectives. Intergraph's project plan calls for a two-phase project, delivered in 17 months. It is estimated that the project will cost $2.8 million.

ATTACHMENT A

DETAILED PROPOSAL SUMMARIES

ATTACHMENT B

EVALUATION TABLE
INTEGRATED OPERATING MODEL (IOM)
PROPOSALS

ATTACHMENT C

INTERGRAPH WHITE PAPER

InService SmartGrid:
Embracing the Technology Trends
for
Intelligent Electric Networks

ATTACHMENT D

PROJECTED COSTS