DRAFT

Gas Industry Standards Board

XML Subcommittee Report

to the

Executive Committee

August 22, 2000

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EXECUTIVE SUMMARY

At its February 2000 meeting, the GISB Executive Committee, acting on Request R00002, chartered the XML Subcommittee to revisit XML, to determine if the technology was suitable for inclusion into the GISB Electronic Data Mechanism (EDM). The XML Subcommittee was requested to report back a recommendation to either defer further consideration of XML, or to go forward with a more extended exploration of how it could be used.

In preparation of this recommendation, the XML subcommittee has met monthly since April, 2000, to ascertain the current state of XML and, how it is being implemented by other industry groups.

While members of the XML Subcommittee have differing opinions on what the next step(s), (such as a pilot project) should be, they are in agreement that GISB should continue to explore the incorporation of XML into EDM. GISB should also consider working with other industry XML work groups, like UIG XML, to see if any synergies could exist for the development of XML standards. Going forward, this group could provide a plan on how XML could work within the existing GISB standards framework.

To support the above recommendation that GISB continue to explore the use of XML, it is important to summarize some important basic features of the XML technology:

- XML can support format-independent, plain-text transfer of structured data.
- There are implementations of the underlying standards where the technology is open-sourced, non-proprietary, and free.
- XML supports cross-system portability.
- XML is network transparent.
- XML technology is Internet based.
- XML resources can be globally distributed.
- Browsers can be either open or proprietary; proprietary browsers can use proprietary implementations of XML.
- URL based resources are not necessarily guaranteed.
- XML is controlled by international standards bodies.

1. OVERVIEW

Electronic Business Transactions (EBT) between Trading Partners are often complex, data-intensive communications that are costly to establish and maintain. Currently, EDI is extensively used for Business-to-Business electronic process integration. EDI has had many years to perfect its structure and it works well for existing transactions. However, from an industry perspective, it is easier, quicker and less political to define and maintain data structures in XML than in EDI.

XML[1] offers the following features relevant to our use:

[1] The glossary is provided in section 5 to describe several of the terms and acronyms used in this paper.

- XML is designed for compatibility with the Internet.
- XML has opened new opportunities for management of data access and processing.
- Application programs can optionally read and write XML natively for real-time needs.
- Translators are an option with XML, not a requirement as with EDI.
- XML encourages the formation of Trading Partner communities as a result of its growing acceptance across many industries.
- XML provides a simple, cost effective, standard framework to transfer data and display documents over the Internet; XML is designed to be readable by people and easily parsed by computers. Both of these design features help reduce development and quality assurance costs.
- Software, development tools and parsers for XML parsers are inexpensive and are becoming a familiar tool to systems developers.
- XML separates the data from display elements, thus allowing more flexibility and easier manipulation of both data and presentation. This means that the display of data may be customized to Client specific requirements and displayed via web browsers.
- Documents can be custom-formatted through the use of style sheets. This allows the business User community to view (via browser technology) XML documents in a language they understand while application servers simultaneously process this file in a language they understand. Additionally, XML documents can be intelligently searched with standard browser tools.

On the other hand, the following items are issues that GISB will have to address prior to adoption of XML:

- XML document standards are either not established or not in wide use today. Although other industry groups are reviewing the use of XML and some are developing standards for their use, as of today, XML is sparsely used.
- Today most applications do not speak XML natively.
- In addition to “EDI experts and specialized translation software” there will also be a need for companies to have “XML experts and specialized parsers.”
- "Back end systems" will be required to interface with an XML transformer, just as EDI uses a translator.
- XML transition planning by implementers will be required to affect a technology change.
- XML as an alternative for communicating data exchange may require the conversion of current data formats and languages resulting in costs and technical resource commitments.
- XML industry standards bodies must keep pace with this rapidly expanding technology. Standard business data structures across horizontal and along vertical business domains must be established for XML to truly reach its potential.

- Data tag and schema standards are in various stages of development by some industries. There is no "transaction standard" or not one in wide use as there is in EDI. If GISB is to adopt XML, it should do it as part of a common effort to avoid duplication of work with other industry groups.
- Repositories are used to provide a standard reference point for XML content documents and processes. As standards develop and common schemas/ DTDs are frequently required by vertical communities, a number of online repositories to house such documents will be developed. GISB would have to control these DTD's or schemas as a way to ensure the XML documents are maintained to the "GISB standard".

2. THE POTENTIAL THAT XML HOLDS FOR GISB

XML could be applicable to GISB in the following areas:

- As an alternative (standards based XML could provide an alternative for ANSI X12 EDI, and potentially could replace it as XML technology develops)
- As a new file download format (instead of or as an alternate to comma-delimited files)
- As a means of enhancing the Web page
  - Display basis
  - Data exchange

As an alternative:

XML files may be easier and cheaper to produce than ANSI X12 EDI files. As a result, there may be less resistance to the implementation of XML batch files than there is to EDI flat files.

As a new file download format:

XML files could be used as an alternative to GISB's comma-delimited flat files. In the near future, XML may be a more useful format for our users, since it is anticipated that many tools will be able to render XML in a format suitable to the tool. For example, both spreadsheets and word processors may be able to present XML files in a more readable fashion than comma-delimited files. This is because these tools will have label information for each piece of data that can be used to determine how to lay out the data for human readability.

As a means to enhance the Web Page – Display Basis:

If XML were used for the display of Web pages such as GISB Informational Postings, it would likely improve the consistency of the data presentation from TSP to TSP. This would be most likely if the XML is used in conjunction with style sheets which describes how to render the data. While GISB has done a good job of describing how data should be laid out, the use of XML may offer the opportunity to do it even better.

As a means to enhance the Web Page – Data Exchange:

The use of XML for data exchange is mainly applicable to the GISB Customer Activities data entry forms. Data that is collected from the form could be put into the XML format for sending to the server when the user clicks the 'Submit' button. That way, the input for, say, a nomination would be formatted the same as it would be in the batch (EDI) scenario. This would allow the receiver of the transaction to have a single back-end "engine" capable of processing input from either batch or on-line sources. This could

help to reduce the amount of program code to be maintained. Furthermore, this improves the chances that this data is in a format which may already be in use for internal data exchange between applications.

3. WHAT IS XML?

3.1 XML Defined:

XML is a tag-based framework used primarily to exchange data in a universally understood format. XML is a subset of the Standard Generalized Mark-up Language (SGML.SGML was used to create HyperText Markup Language (HTML). In so doing, a finite set of tags were assigned as formatting instructions for browsers that render an HTML document. The choice of tags is not limited in XML as it is in HTML, and so these tags can be used for much more than formatting the display of information. An inventory transfer record for a laptop computer might look like (example from Charles F. Goldfarb's *"XML In an Instant"*):

```
<PRODUCT>
        <MODEL>P266 Laptop</MODEL>
        <DEALER>Friendly Computer Shop</DEALER>
        <PRICE>1438</PRICE>
</PRODUCT>
```

In this example, the tags are used to describe the data, and a hierarchy, or tree structure can be built, much the same as is done using loops, segments and elements in an ANSI X12 dataset. According to the XML specification, the choice of tags, and how they are used can be controlled by reference to a Document Type Definition (DTD) or schema. An obvious difference between an XML document and an EDI document is that the XML document includes the metadata, or description of the data right in the document, whereas an EDI document infers this information from the document type and data position. Thus the XML document is almost human-readable whereas EDI documents are quite cryptic. On the other hand, XML documents take up a lot more space.

3.2 XML Standards

The World Wide Web Consortium (W3C) is an organization with more than 400 Member organizations from around the world, devoted to developing common protocols, and ensuring the interoperability of the World Wide Web. XML has been developed by the W3C, and currently has adopted XML 1.0 with a "Recommended" status. To get to this stage, XML has gone through the following steps:

Working Draft: A Working Draft represents work in progress and a commitment by W3C to pursue work in this area. A Working Draft does not imply consensus by a group or W3C

Candidate Recommendation: A Candidate Recommendation is work that has received significant review from its immediate technical

community. It is an explicit call to those outside of the related Working Groups or the W3C itself for implementation and technical feedback.

Proposed Recommendation: A Proposed Recommendation is work that (1) represents consensus within the group that produced it and (2) has been proposed by the Director to the Advisory Committee for review.

Recommendation: A Recommendation is work that represents consensus within W3C and has the Director's stamp of approval. W3C considers that the ideas or technology specified by a Recommendation are appropriate for widespread deployment and promote W3C's mission.

XML 1.0 achieved "Recommendation" status in February 1998. Although improvements have been considered by the W3C, the organization has concentrated on areas that impact XML deployment, and has chosen to not update XML itself. Thus, the base platform for XML development is stable.

XML is also subject to an official International Standards Organization (ISO) standard. Support of ISO standards is essential to the implementation of XML, ensuring simple and consistent behavior across a broad range of systems and Trading Partners.

3.3 XML Infrastructure

Following is a list of some of the important XML extensions that the W3C has standardized or is working on, which further develop the XML infrastructure:

- Associating Style Sheets with XML documents Version 1.0
  Recommendation -- W3C [June 29, 1999]
  Standardized syntax for using an xml- stylesheet processing instruction to associate an XML document with an XSL or CSS stylesheet.

- Authoring Tool Accessibility Guidelines Version 1.0
  Recommendation -- W3C [Feb. 3, 2000]
  Guidelines for web authoring tool developers to assist in the design of authoring tools that produce accessible Web content and in the creation of an accessible authoring interface.

- CSS1
  Recommendation (Revised) -- W3C [Jan. 11, 1999]
  CSS1 is a simple style sheet mechanism that allows authors and readers to attach style (e.g. fonts, colors and spacing) to HTML documents.

- CSS2
  Recommendation -- W3C [May 12, 1998]
  Level 2 of the Cascading Style Sheet mechanism

- DOM Level 1
  Recommendation -- W3C [Oct. 1, 1998]
  Document Object Model Level 1

- PICS
  Recommendation -- W3C [May 27, 1998]
  Standard format for making digitally-signed, machine-readable assertions about a particular information resource

- PICS Rules
  Recommendation -- W3C [Dec. 29, 1997]

- RDF Model and Syntax
  Recommendation -- W3C [Feb. 22, 1999]
  A foundation for processing metadata; it provides interoperability between applications that exchange machine-understandable information on the Web.

- XHTML 1.0
  Recommendation -- W3C [Jan. 26, 2000]
  A reformulation of HTML 4 as an XML 1.0 application and three DTDs corresponding to the ones defined by HTML 4.

- XML Path Language (XPath) Version 1.0
  Recommendation -- W3C [Nov. 16, 1999]
  Provide a common syntax and semantics for querying and addressing the contents of XML documents that could be used by XSLT (XSL Transformation Language), XLink, and Xpointer

- XML v. 1.0 DTD
  Revised XML Recommendation DTD -- W3C [Sept. 10, 1998]
  A revised version of the XML Recommendation's DTD.

- XML XPointer Requirements
  W3C [Feb. 24, 1999]

- XSL Transformations (XSLT) Specification Version 1.0
  Recommendation -- W3C [Nov. 16, 1999]
  A language used to "transform" (or reconstruct the structure of) the data structures contained within XML documents.

- XInclude
  Inclusion Proposal (proposed for XML version 2.0)
  Fragments of content from external resources are included in a documents content along with the content residing at the actual URL being accessed (sort of like a server-side include).

4. XML INITIATIVES

4.1 Solution Providers

Although the standards-making process for XML has been fairly orderly, the implementation of those standards to enable business-to-business communication has been chaotic. Following is a list of some of the major efforts underway to “standardize” XML-based B-to-B applications:

- **RosettaNet**

  RosettaNet is an industry coalition of organizations from all segments of the computer industry including chip manufacturers (e.g. Intel), computer manufacturers (e.g. Dell), distributors (e.g. Ingram Micro), solution providers (e.g. Microsoft), and others. The group mission is to produce a set of industry-wide electronic business interoperability standards.

  RosettaNet uses XML to define the format and structure of business documents used in supply chain operations. The original concept was to utilize existing EDI data element names, definitions and structures, within a XML document,

effectively creating an XML document with tag names based on EDI element names. This approach proved difficult to implement and was abandoned in favor of a new dictionary of XML tag names, document structures and process definitions (PIP's).

The first production deployment following the RosettaNet specifications occurred on February 2, 2000. Version two of the RosettaNet specification (RNIF V2) is under development, and these efforts are in close coordination with the ebXML efforts to define a global E-Commerce standard.

- **ECo Framework (CommerceNet)**

  The primary focus of eCo Framework Project is to demonstrate the value of the integration of three common components-based electronic commerce services. These services are semantic integration of multiple database types with multiple data constructs and data libraries; trusted open registries; and agent-mediated buying. These core services will provide the interoperability among many commerce services and serve as a foundation to operate web based trading communities. XML is one the tools used in this integration project. The working group of eCo includes 35 different companies from various technology industries such as 3 Com, American Express, Berkeley National Lab, Cisco Systems, Compaq, GEIS, HP, IBM, Intel, Microsoft, Novell, Netscape, Royal Bank of Canada, Sun, NEC, etc.

- **Commerce XML (cXML)**

  Ariba, Inc. developed cXML version 1.0 to provide a simple XML-based protocol between entities engaged in Business-to-Business eCommerce transactions or the Internet. Ease of implementation is the focus, together with emphasis on prototype implementation to discover remaining issues. The documentation claims to contain all the information needed to implement any of the supported transactions from either the client or server system perspective. Protocol specifications indicate it primarily deals with request-response type transactions.

- **Distributed Management Task Force**

  DMTF is the industry organization that is leading the development, adoption and unification of management standards and initiatives for desktop, enterprise and Internet environments. They work with key technology vendors and affiliated standards groups to enable a more integrated, cost effective and less crisis-driven approach to management through interoperable management solutions. They claim to pioneer the use of XML as the transport encoding for their Web Based Enterprise Management (WBEM) initiative.

- **Open Applications Group**

  The Open Applications Group is a non-profit consortium focusing on best practices and process based XML content for eBusiness and Application Integration. It is the largest publisher of XML based content for business interoperability in the world. This groups members have over 5 years of extensive experience in building this industry consensus based framework for business software application interoperability and have developed a repeatable process for quickly developing high quality business content and XML representations of that content. It does this by leveraging XML, best practices in integration technology and architecture, and by providing an impartial forum for all stakeholders to work together to accomplish common goals.

- **BizTalk Frameworks (Microsoft)**

  BizTalk is an industry initiative championed by Microsoft and supported by a wide range of organizations, from technology vendors like SAP and CommerceOne to technology users like Boeing and BP/Amoco. BizTalk is not a standards body. Instead, it is a community of standards users, with the goal of driving the rapid, consistent adoption of XML to enable electronic commerce and application integration. They are defining a set of guidelines for how to publish schemas in XML and how to use XML messages to easily integrate software programs together in order to build new solutions. The design emphasis is to leverage what exists today - existing data models, solutions and application infrastructure - and adapt it for electronic commerce through the use of XML.

- **ebXML**

  The United Nations body for Trade Facilitation and Electronic Business (UN/CEFACT) and the Organization for the Advancement of Structured Information Standards (OASIS) have joined forces to initiate a worldwide project to standardize XML business specifications. UN/CEFACT and OASIS have established the Electronic Business XML (ebXML) initiative to develop a technical framework that will enable XML to be utilized in a consistent manner for the exchange of all electronic business data. Industry groups currently working on XML specifications have been invited to participate in the 18-month project. A primary objective of ebXML is to lower the barrier of entry to electronic business in order to facilitate trade, particularly with respect to small- and medium-sized enterprises (SMEs) and developing nations.

  - ebXML Value:
    - Provides the only globally developed open XML-based Standard built on a rich heritage of electronic business experience.
    - Creates a Single Global Electronic Market enabling all parties irrespective of size to engage in Internet-based electronic business.
    - Provides for plug and play shrink-wrapped solutions.
    - Enables parties to complement and extend current EC/EDI investment expand electronic business to new and existing trading partners.
    - Facilitates convergence of current and emerging XML efforts.
  - ebXML delivers the value by:
    - Using the strengths of OASIS and UN/CEFACT to ensure a global open process.
    - Developing technical specifications for the open ebXML infrastructure.
    - Creating the technical specifications with the world's best experts.
    - Collaborating with other initiatives and standards development organizations.
    - Building on the experience and strengths of existing EDI knowledge.
    - Enlisting industry leaders to participate and adopt ebXML infrastructure.
    - Realizing the commitment by ebXML participants to implement the ebXML technical specifications.

- **ANSI ASC X12 Committee**

  Data Interchange Standards Association (DISA), the ASC X12 Secretariat, publicly announced its support for the ebXML effort in a press release dated 10/18/1999. There is an ongoing active effort within the X12 committee with the ebXML group.

4.2 Industry Initiatives

Following are samples of work in progress on XML development by other industries:

- **Utility Industry Group**

  The Utility Industry Group (UIG), an industry action group dedicated to the advancement of electronic commerce within the electric, gas, and combination utility industry, has published a white paper on XML (http://www.uig.org/xml.htm). The UIG understands the importance of XML, and has determined the need to create utility standards for XML. They are currently developing standards and a repository.

- **Travel (Open Travel Alliance)**

  The Open Travel Alliance (OTA) will produce a standard capable of exploiting the low-cost, fast communications that have arrived with the Internet. To use the Internet along with established channels, the industry needs a common standard for the communication of information. The OTA is building an industry standard that provides a format for communicating data between travelers and travel-related businesses, as well as among the businesses themselves. This standard will encourage development of systems that can help create new collections of services to better meet the demands and expectations of travelers and the travel industry. When implemented, the standard will encourage the exchange of trip-centric information between all industry participants, regardless of how connected.

  Companies currently participating in the OpenTravel™ Alliance are: Alaska Airlines, American Airlines, Continental Airlines, Delta Air Lines, Midwest Express, Northwest Airlines, Trans World Airlines, United Airlines, Vanguard Airlines, Bass Hotels and Resorts, Hilton Hotels, Hyatt Corporation, Marriott International, Sterling Hotels, Swissotel, Alamo Rent A Car, Avis Rent A Car, Budget Rent -A-Car, Dollar Rent A Car Systems, Inc, The Hertz Corporation, National Car Rental, and Thrifty Car Rental.

  The final product of the alliance is a dictionary of common usage terms used through out the industry. This dictionary of terms will then be compiled and put into XML standard transactions.

  OTA is participating in the development of global E-Commerce standards through the ebXML initiative.

- **Healthcare (Health Level 7)**

  Health Level Seven (HL7) is one of several ANSI-accredited Standards Developing Organizations (SDOs) operating in the healthcare arena. HL7's domain is clinical and administrative data. Headquartered in Ann Arbor, MI, HL7 is a not-for-profit volunteer organization. Its members include providers, vendors, consultants, government groups and others who have an interest in the development and advancement of clinical and administrative standards for healthcare. HL7 has launched an effort to create XML based standards for Patient Medical Records.

  Mayo Clinic, Rochester, Minnesota has made a substantial commitment to the use of XML in the development and implementation of key components of its electronic medical record, locally referred to as Mayo Integrated Clinical Systems (MICS). Mayo Clinic is a large group practice with over 1500 physicians in

Rochester, Minnesota. The practice sees over 300,000 outpatient registrations per year and has approximately 2000 inpatient beds. To date, the XML use focus is the domain of Clinical Document Management. The XML-mediated MICS Clinical Documents work consists of two project groups: CDM Reports and MICS Clinical Notes-II, both managed by a common oversight body and sharing development and support resources.

Mayo is committed to participating with the HL7 body to help define and support this important standard, with the intent of being close enough in our initial software releases to support the HL7 PRA and XML medical document standards in future releases.

5. GLOSSARY

CSS: Cascading Style Sheets—a standard that provides formatting control.

DOM: Document Object Model—a means of addressing elements and attributes in a document from a processing application or script.

DTD: Document Type Definition. A description of the content of an XML document that can be industry, application, or business-specific.

EDI: Electronic Data Interchange. Computer-to-Computer transfer of business transactions using standard message formats.

HTML: HyperText Markup Language. A suite of markup symbols, embedded with a Web page file.

HTTP: HyperText Transport Protocol. An application protocol that defines how information is exchanged on the World Wide Web.

Markup Language: Commands that define how the contents of a file are displayed or printed and how individual data elements within a file are to be processed.

Namespace: Used in XML documents to ensure that element and attribute names are used unambiguously.

PICS: Platform for Internet Content Selection

RDF: Resource Description Framework—a standard for storing metadata.

Schema: Provides structure definition and validation capabilities similar to those provided by DTDs.

SGML: Standard Generalized Markup Language. The parent language used to describe tag-based, structural document languages, such as HTML.

XML: eXtensible Markup Language. An emerging data format developed by the W3C that separates data content from business rules therefore making it easier for independent computer systems to communicate with each other.

XSL: eXtensible Stylesheet Language. A proposed standard that allows Web developers to apply formatting rules to XML documents to display by a browser.

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7. APPENDICES

This section contains two appendices, neither of which should be considered a position of the GISB XML Subcommittee, nor the position of the GISB organization itself. The GISB XML Subcommittee provides these appendices to the reader for additional information and observations on XML.

The first appendix, Appendix A: "Observations From Industry Segments," includes opinions of some of the industry segment participants regarding XML, its use, benefits and inhibitors. Each GISB gas industry segment was asked to provide input into the observations noted in Appendix A. The second appendix, Appendix B: "A Case Study in Ontario," provides information on an ongoing XML project in Ontario.

Appendix A: Observations From Some Industry Segment Members

A.1 XML – Observations from a Producer

Inhibitors:

- **Cost**

  Although GISB standards apply only to North America, governments outside of North America may choose to adopt GISB standards. When this occurs and XML standards are not incorporated into FERC regulations, international companies may face higher costs for international operations.

- **Validation**

  Validation is included in existing EDI standards. XML enables validation of the schema, structure, relationships and dependencies of the content but does not enable validation of the actual content. You could receive a valid XML data stream full of garbage numbers.

- **Readability**

  There is overhead in parsing and validating XML data streams, which could slow large data transfers. While the data is more readable, it can be misinterpreted by unsophisticated users.

- **Security**

  It is easy to tamper with the content of an XML data stream.

Benefits:

- **Application Development Cost**

  In certain situations, XML may enable reduced costs for development of interfaces between applications. However, many XML applications are dependent upon significant high cost development skills. If the XML standards are broadly adopted, there may be a saving in the cost of translations because they will be done in a standard way.

- **Validation**

  Validation is included in existing EDI standards. XML enables validation of the schema, structure, relationships and dependencies of the content but does not enable validation of the actual content.

- **Readability**

  XML is easily readable and parsable.

Other considerations:

- Members that adopt the XML standards may find it easier to establish B2B because as they may able to respond quicker to changes. Those that don't may lose market share.
-
- Since Enterprise Resource Planning (ERP) and supplier management applications are moving toward XML use, XML use in trading and transportation systems may enable easier interfacing with these other enterprise systems.
- Standardizing metering devices to send XML data streams instead of proprietary protocols may simplify the use of meter data.
- XML is being considered as a storage structure for other applications. This could enable sharing of additional types of data between applications. It is not clear if embedding XML storage will be based on standards or on proprietary structures.

A.2 XML – Observations From A Pipeline

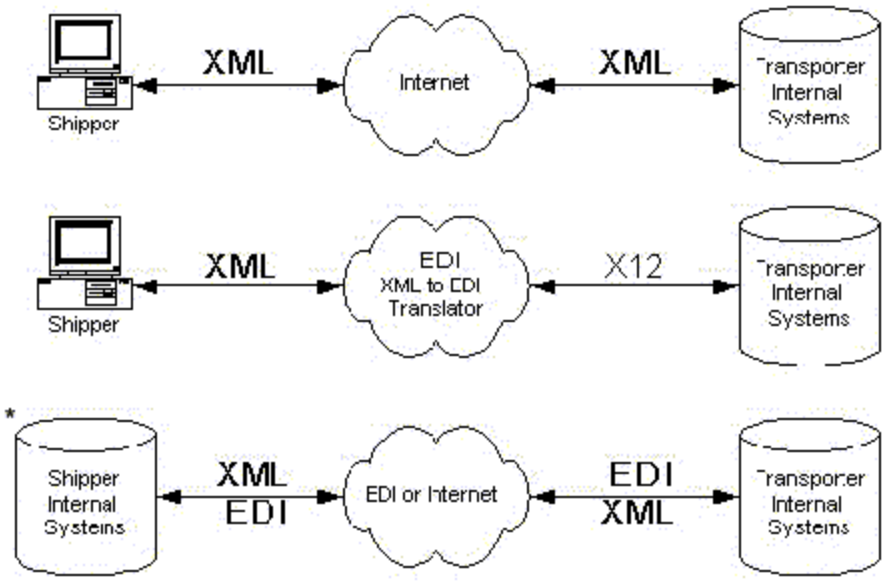
- **Usage:**

  The use of XML in the pipeline sector will allow customers a new method of sending to, and receiving data from their transportation service provider.

- **Implementation:**

  As discussed in other sections of this subcommittee document, XML is a method of "tagging" data to provide meaningful information *about* that data. From these tags, systems can be instructed to process this data on receipt provided that the receiving system is aware of the relevance of the tags.

- **Possible XML Physical Implementation Methods:**



** In this example, either party could initiate and receive in XML or EDI. If the partners are using different technologies, an EDI-XML translator would be required as in the second example*

- **Integration Flexibility:**

  XML is an extremely flexible language for the transmission of data. XML can be generated and sent directly from a variety of systems including databases, messaging systems, web servers, application servers and custom developed software. Any of these systems, as well as (in the near future) most standard web browsers can also interpret XML for the storage or presentation of data.

- **Internet as Communications Enabler:**

  Because XML was designed to be an Internet-ready communications language, XML is well suited to extend the capabilities of Web-implemented Customer Activities systems. XML can be used along with HTML to present data to customers in a web browser, format data for reporting and generate XML formatted data for internal systems from customer input through standard web forms.

- **Integration with Existing EDI or Flat File Systems:**

  XML is being adopted by several other industries, and as such the pipeline sector should be prepared that some of their customers may be in a position to implement XML <u>before</u> they would be in a position to implement an EDI infrastructure. The Pipeline industry, however, is more likely to have already implemented an EDI infrastructure, and may not want to spend the time or money developing an XML solution.

  To accommodate this possibility, XML can be integrated into existing EDI communications architectures by utilizing an EDI-XML translator. Shippers could send an agreed upon XML formatted document to the Transporter's EDI-XML translator which would then interpret and reformat the document to either the X12 or Flat File format the Transporter's system requires. Market-ready systems such as GISB Agent are already available with the ability to provide this

service. Other EDI products are bound to follow. Using this path would require the least changes needed by the transportation service provider who already has EDI in place.

For further information on EDI-XML co-existence, please see the white paper "XML and EDI Peaceful Co-Existence."[2]

- **System to System Communications:**

  Because most database and messaging systems are now being developed to be XML capable, it is possible for systems to be written that would allow direct communication from internal system to internal system. This could require a significant development effort and may be more appropriate for review in the future, however the opportunity is presented in an XML environment.

Inhibitors:

- **Redevelopment Effort**

  In any event, some amount of redevelopment or "retooling" of existing systems will likely be required to integrate XML into operations, however, because it is possible to implement XML into existing systems, the impact should be lower than if XML had to replace technologies such as EDI.

- **Need for Standards**

  XML (like EDI) is only effective when an agreed upon format is defined for the transmission of data. A well thought, clearly defined schema would need to be defined which could require considerable effort. Further, there is already movement by groups to begin the definition of such a schema for the Gas sector, which means that there is potential for conflicting schemas if not carefully managed.

- **The Growing Number of Interfaces**

  X12, Flat File, Customer Activity Screens, now XML -- the number of methods for interfacing has increased. Is it the industry's best interest to support this growing number of technologies? The answer may simply be that by preparing in advance for these things is simply a requirement of doing business in the day and age of rapid changes in technology. Customer systems for office supply ordering, travel management, and other business to business processes are already being built and adopted using XML based systems. This is bound to have a carry over effect to the core business of our customers.

A.3 XML – Observations From an LDC

On the issue of standardized electronic communication, there may be as many LDC positions as there are LDCs. Whether acting in its service requester role (e.g. placing nominations to a pipeline, executing capacity release transactions, etc...) or in its service provider role (e.g. processing customer choice enrollment and history requests), there is little debate that standardized electronic communications play a role in making business processes more efficient. XML shows significant potential towards achieving efficiencies in either LDC role.

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[2] The cited white paper "XML and EDI Peaceful Co-Existence" can be found at the following address: http://www.xmls.com/library/whitepapers/co-existence.pdf

As a service requester, LDCs may communicate their transactions to pipelines in at least two (X12-EDM and EBB-EDM) standard means and sometimes a third means (FF-EDM). LDCs have, with a few significant exceptions, avoided X12-EDM because they generally lacked the volume of transactions necessary to justify the investment in systems infrastructure to support X12. Many pipelines only had a few (if any) X12 Trading Partners because LDCs, who historically have held a large share of pipeline firm capacity, did not move to standardized electronic communication. One of the reasons LDCs, through the EIITF, advocated development of FF-EDM was that flat files, in a simplistic sense, emulated the batch nature of the X12 datasets. FF-EDM permits a service requestor to utilize standard electronic communications with tools simplistic as common spreadsheet software.

Pipelines are not required to provide FF-EDM and in many cases, have not yet indicated that they have plans to do so. While interactive standard electronic communication is handled via EBB-EDM, X12 remains the only batch option in some cases. XML could provide another batch alternative, for example, a flat-file created out of a spreadsheet could interface with X12 EDI via an XML translation. Because XML is similar to HTML, presentation to the user can be optimized for visual effectiveness. XML may develop into a technology that utilizes the best features of GISB three formats:

- The user interface of EBB-EDM
- The accessibility of FF-EDM
- The efficiency of X12-EDM

As a service provider, there are both differences and similarities to the electronic communications requirements faced by pipelines. The primary business process driving the need for standardized electronic communication is customer choice. While many states have gas unbundling initiatives in progress, most do not. There are perhaps 5-10 states where customer choice programs have evolved to the point where standardized electronic communications make practical sense today. Nevertheless, when one considers the number of burner tips and the types of transactions (enrollment, measurement, billing, etc.) that can happen each month on a per burner tip basis, the potential number of transactions is staggering. When some envision the end-state of customer choice through the eyes of today's technology, X12 EDI appears to be the only reasonable choice upon which to build standardized electronic communications.

While the end-state appears daunting, most customer choice programs are in their nascent stages. Many programs function well with manual or limited systems because the number of customers in the choice programs is very small. Web based enrollment combined with provision/acceptance of non-standard flat files drive larger programs successfully. Yet to reach to the next level, many believe standardized electronic transactions are necessary. Several states have initiated proceedings to develop such standardized transactions. Further, there are several industry groups who approach the same issues at a national level from different perspectives of the transactions.

In those cases where LDC customer choice programs have grown or project growth to the point where standardized electronic communications make sense, X12 EDI has most often been the choice upon which to standardize. A few years ago, many thought that large industry players would participate in most LDC customer choice programs and develop a communications infrastructure that supported a relatively small number of Trading Partners trading large quantities of data. While this prediction might some day come true, a more accurate description of the retail customer choice market shows

large industry players participating in only a few programs and smaller regional marketers and utility affiliates holding significant market shares, albeit in a few markets here and there.

Many see the lack of standardized electronic communications as one reason the market has not developed as predicted a few years ago. Yet many regional marketers and utility affiliates have been hesitant to adopt X12 EDI because they do not necessarily have national aspirations and are willing to customize the operations to work in a select few territories.

Utilities need to be responsive at a system level to their customers (the marketers) yet there is no clear consensus to move to X12 EDI for a variety of reasons elaborated above. Implementation of standardized electronic communications should not come at the expense of current market participants, rather it should be a natural evolution that makes sense for the market as a whole. Utilities can, in some cases, maintain dual systems to accommodate both sets of marketers. Where the dual system is somewhat sophisticated (e.g. internet based forms entry and flat file transfer) this may not prove too difficult but where the systems are manual, this can be very inefficient for the utility.

Technology is evolving rapidly to the extent that multiple options exist for standardized electronic community, it would appear solutions that satisfy a broader spectrum of market participants are on the horizon. The general expectation in the industry is that XML many prove to be a viable successor to, or a more efficient alternative, to the X12 format.[3] Because XML appears to incorporate browser like capabilities from the service requestor perspective and EDI like formatting from the service provider perspective, it may well be the optimal path for customer choice programs that are not yet at a stage where X12 implementation makes sense. Additionally, where X12 has been implemented or is about to be implemented, it appears likely that XML would complement X12.

A.4 XML – Observations From a Services Company

A.4.1 Overview

With the deregulation of the retail-energy industry in the 1990's, the need for a mechanism to exchange transactions amongst trading partners emerged as a critical enabling factor. At the time, pioneering states such as California, Pennsylvania and Massachusetts looked to EDI/Van technology as the most efficient and effective way to achieve such exchanges. At the time these states had to make their decisions, XML was in its infancy. There was no clear alternative to EDI.

For example, in 1997, a Massachusetts working group looking at the issue developed a report to the Massachusetts regulators. According to the Massachusetts DTE order which addressed deregulation:

> "The Report states that, after a review of the technologies and services available for packaging standardized transaction formats for transmission over public and private networks, the Working Group unanimously recommends the use of the electronic commerce industry's Electronic Data Exchange ("EDI")

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[3] STATE OF NEW YORK PUBLIC SERVICE COMMISSION, OPINION NO. 00-05, CASE 98-M-0667 – In The Matter of Electronic Data Interchange, OPINION AND ORDER ON IMPLEMENTATION OF ELECTRONIC DATA INTERCHANGE, Issued and Effective: April 2, 2000, Page 12.

implementation guidelines. The Report states that the EDI format to be implemented will use 'existing ANSI SC X.12 transactions which will be tailored for use in the exchange of information of distribution companies and suppliers'"
Source: D.P.U./D.T.E. 97-65, p.70, December 31, 1997
(http://www.magnet.state.ma.us/dpu/electric/97-65/97-65or2.pdf)

In the three years since that time, additional jurisdictions have adopted EDI as well. However, at the same time, development of XML has continued at a ferocious pace. Today, numerous industries are exploring XML as a standard for trading partner communications.

A.4.2 XML & Software Development

As jurisdictions around the United States, and for that matter around the world, deregulate their energy markets, they face a myriad of issues as they consider how best to deregulate energy markets. One of those issues is how best to enable the flow of transactions amongst trading partners. While on the surface this may seem like a technical infrastructure detail, the decisions made here can have a profound impact on the ability for new participants to gain access to the markets.

The adoption of XML as a standard has several benefits as relate to the basic "infrastructure" for trading partner relations.

Benefits include:

Lower Application Development cost
Reduction of translation cost
Lower testing/operating cost
Designed for the internet

- **Lower Application Development Cost:**

  As compared to traditional EDI-based application development, XML offers a lower cost alternative because applications can read it directly. Applications written for a business environment where XML is adopted as a standard can be designed and coded to take full advantage of direct integration of the XML-based transactions.

  XML as an Internet technology draws interest from a large and growing community of software vendors and engineers. XML software and development tools including utilities and parsers are inexpensive and rapidly flooding the development workforce domain.

  XML separates the data from display elements allowing more flexibility and easier manipulation of both data and presentation. This means that the data is standard and more accurately reflects actual database data making it easier to understand for database administrators.

  XML shortens the development lifecycle of user interface development using XSL style sheets. Quicker development equals lower cost. Style sheets allow the business User community to view (via browser technology) XML documents in a language they understand while simultaneously application server's process this file in a language they understand. Additionally, XML documents can be intelligently searched with standard browser tools

  XML with supporting industry wide common schema/dtd technology allow for advanced data typing including structure, data types, and enumeration's. This

means that the data component of a document can be processed through a stringent set of data validation rules prior to production application processing. This XML validation results in only acceptable data continuing into production systems reducing numerous operation costs of data cleansing downstream. XML aligns itself with object oriented technology providing a means for dynamic method calls to surrounding application objects independent of system platforms. An XML message with the appropriate developer toolset may be "piggybacked" on an existing Internet protocol (i.e. HTTP). The XML message structure can be designed to allow request and response method calls to application objects. This powerful combination of XML and object oriented design allow message calls to other platform independent applications as the transaction works its way through the business process workflow.

All of the above benefits would mean little if XML were difficult to implement. Thankfully, this is not the case. The resources required to develop XML-based applications require skills that are generally available in greater quantities in the marketplace, and at a lower cost than those with programming skills such as C++ and Java. Thus, not only does XML offer cost saving functionality, but the resources required to develop that functionality are less expensive than in other development environments.

In jurisdictions where the rules of trading partner relationships have not been established, the adoption of XML offers the greatest advantage. New applications can be written to take full advantage of XML. In addition, legacy system programmers can benefit from some of the inherent benefits of XML such as ease of readability as they modify their systems to accommodate the new trading partner transactions.

- **Reduction of translation cost:**

  Since XML can be read directly by applications, there is no need for translation from XML to other formats (such as flat files). Thus, for systems designed for markets where XML is adopted, trading partners can avoid the cost of translators and/or translation services.

  Even where the XML interface for a given system differs from the XML-standards, relatively simple translation can occur using eXtensible Stylesheet Language Translation (XSLT). XSLT allows for the transformation of XML documents. As with other XML-related development, it is relatively straightforward and can be learned quickly.

- **Lower operating cost:**

  Another benefit of XML is that it can be read by humans as well as applications. In the example below, there is little room to question the meaning of the data contained between the tags:

```
<CustomerInformation>
        <FullName>John William Smith</FullName>
        <LastName>Smith</LastName>
        <FirstName>John</FirstName>
        <MiddleName>William</MiddleName>
        <CompanyName>Smith Appliances</CompanyName>
</CustomerInformation>
```

  This ease of readability can be especially beneficial in the testing and operational considerations of trading partner relations. As analysts work to test new trading partner relationships, transactions can be readily debugged.

In addition, schema can be utilized by the trading partners to assure the quality of the transactions being sent. As the changes in the industry occur, XML's ease of parsing and validation help developers quickly adapt to such changes.

- **Designed for the Internet:**

  XML is well positioned to exploit the benefits of the Internet and existing investments in Internet infrastructure. As tools that support all aspects of the Internet continue to proliferate, applications, which rely upon XML, benefit.

  XML is viewable by users via desktop browsers. XML can leverage HyperText Transfer Protocol (HTTP) based communications and security infrastructure as well as other common protocols. XML facilitates deployment architectures that improve Internet delivery performance. XML as an Internet enabled technology facilitates EBT transaction creation, modification, and distribution with great ease.

  Many small to medium size companies have not adopted EDI due to the investments required. On the other hand, most companies have some Internet investment. XML is the vehicle by which those small/medium companies can leverage their Internet investments for the purpose of interacting in the deregulating energy markets.

  The adoption of XML as a standard may also have certain inhibitors. Inhibitors include:

  - XML as a relatively new language must prove itself.
  - XML as an alternative for communicating data exchange may require the conversion of current data formats and languages resulting in costs and technical resource commitments.
  - XML industry standards bodies must keep pace with this rapidly expanding technology. XML is about structured extensible business data. Standard business data structures across horizontal and along vertical business domains must be established for XML to truly reach its potential.
  - XML used in conjunction with object oriented designed systems will result in major benefits to an Organizations bottom line. However, in that many of today's production systems may not yet be object oriented, it will take time and technical resources to achieve many of the XML benefits.

  XML is a text format, which uses tags to delimit the data resulting in files larger than comparable binary formats. Not much of a disadvantage in that disk space is not as expensive as it once was and inexpensive zip programs can compress files very well and very fast. Also, most communication protocols can compress data on the fly, thus saving bandwidth as effectively as a binary format.

Appendix B: XML as an Electronic Business Transaction Strategy and Standard, "A Case Study: Ontario, Canada Energy Deregulation"

As part of the strategy to encourage participation in the open marketplace in Ontario, the Ontario Energy Board (OEB) has mandated in the Retail Settlement Code (RSC) dated February 28, 2000, the use of an Electronic Business Transaction (EBT) Clearinghouse. Transactions such as enrolments, requests for meter data, billing data, and payment history will be processed electronically via the Ontario EBT Clearinghouse (Hub). The implementation of a Hub will expedite transactions between the various market participants once the market opens in November 2000.

Ontario Electronic Business Transaction (EBT) Clearinghouse Sub Team Background

To assist in expediting the use of EBT in Ontario, Toronto Hydro and Ontario Hydro Networks Company (OHNC) formed a consortium that worked closely with the OEB for the purpose of developing detailed business processes and defining electronic transactions necessary to support retail choice. An Advisory Committee was formed, consisting of a consortium of market players – Brantford Hydro, Direct Energy, Enlogix, Hydro Mississauga, Milton Hydro, Ontario Hydro Networks Company (OHNC), Ottawa Hydro, Toronto Hydro, Union Gas, and Utilipro. The EBT Sub Team was then formed to establish the standards for the business rules, transaction sets, and protocol to be used in Ontario. The EBT Sub Team consisted of staff from some of the above companies, as well external expertise. The external team members consisted of ExtenSys, Excelergy, Systrends, and Ernst&Young. Their vast knowledge of deregulation and prior EBT experience was drawn upon. The EBT Advisory Committee reviewed the progress of the EBT Sub Team approximately every two weeks and provided feedback on progress to date. Both the Advisory Committee and the OEB received daily updates on project progress and assisted in clarifying the code and in closing issues.

One of the first recommendations of the EBT Sub Team that was reviewed and approved by the Advisory Committee was the choice of XML as a standard for the EBT format.

The EBT Sub Team formed five Working Groups. This allowed them to focus on each of the detailed transaction sets and to build the required process flows in order to adhere to what was mandated in the OEB RSC. These teams were: Infrastructure, Invoices, Meter Data, Payment Remittance Advice and Application Advice, and Service Transaction Requests (STRs). The focus of the Working Groups was to define the EBT standards, the business rules and to put in place the required transaction sets.

Phases of Work

Phases of work of the EBT Sub Team will incorporate:

- Complete detailed documentation of all EBT XML standards and formats
- The selection and recommendation of required computer equipment and software, assuring that any software selected supports the required EBT transactions.
- The completion of pre-production testing of the software, application interfaces and data exchange according to the EBT Implementation Guide. (Contained in Appendix C)

- The training of Trading Partners.

Guiding Principles

The EBT Sub Team worked with the following guiding principles. Transactions should be developed to:

- Facilitate Consumer choice and mobility in an open market.
- Lower the requirements for entry into the market for participants.
- Act as a single point of contact for all participants and Trading Partners.
- Controls cost and increase efficiency, speed, and accuracy.
- Minimize exception and manual processing.
- Focus on the use of electronic solutions rather than paper-based ones.
- Minimize the number of transactions.

Amendments

These EBT standards have been developed by consensus, maintaining the objective of practical and operational results. Recognizing that the processes outlined in these standards are new to many stakeholders, the EBT Sub Team will work with the OEB and all parties to resolve issues that are certain to arise during the implementation stage of these standards.

Choice of XML as the EBT Standard Technology

Several technology choices were evaluated by the membership of the Advisory Team:

A. XML (following currently available proposed utility industry standard transactions with Internet transport)

B. EDI (traditional VAN-centric with ANSI ASC X12 transactions)

C. Internet EDI (traditional ANSI ASC X12 transactions with an Internet transport)

A survey of participants aided in the technology choice of XML over the rest. The following criteria was used:

1. Ease of Implementation (best=1, worst=3)
2. Cost of Implementation (least costly=1, most costly=3)
3. Ongoing cost (least costly=1, most costly=3)
4. Adaptability to change (best=1, worst=3)
5. Technology risk (lowest risk=1, highest risk=3)
6. Strategic Positioning (best=1, worst=3)
7. Technology Maturity (most mature=1, least mature=3)

Transactions Standardised

Electronic Business Transactions standardised with XML formats included:

- Service Transaction Requests
    - Enrollment Request
    - Enrollment Response
    - Enrollment Response Reject
    - Enrollment Response Accept
    - Historical Usage Request
    - Historical Payment Request
    - Historical Usage
    - Historical Usage Reject
    - Historical Payment Accept
    - Historical Payment Reject
    - Drop Request
    - Drop Response Accept
    - Drop Response Reject
    - Change Request
    - Meter Changeout Request
    - Change Billing Option Request
    - Seamless move Request
    - Change Response Accept
    - Change Response reject
    - Meter Changeout Accept
    - Meter Changeout Reject
    - Change Billing Option Accept
    - Change Billing Option Reject
    - Seamless move Accept
    - Seamless move reject
- Metering Transactions
    - Monthly usage
    - First time usage
    - Cancel Monthly usage
    - Cancel First time usage
- Invoice Transactions
    - Invoice
    - Cancel
    - Settlement Total Invoice
    - Settlement Detail Invoice
    - Market Participant Invoice
    - Cancel Settlement Total
    - Cancel Settlement Detail
    - Cancel Market Participant
- Payment Remittance Advice Transactions
    - Payment Summary
    - Payment Details
- Application Advice Transactions

    - Application advice accept
    - Application advice reject
- Status Advice Transactions
- Functional Acknowledgement
    - Functional Acknowledgement (FA) accept
    - FA reject (bad doc level data)
    - FA reject (all bad transactions)
    - FA partial (some good transactions)