MANUAL

ieso
Connecting Today.
Powering Tomorrow.

Market Manual 6

Participant Technical Reference Manual

Issue 34.0

The "PTRM" provides the technical details for hardware and software that a participant in the electricity market may need to interface with the *IESO*

Disclaimer

The posting of documents on this Web site is done for the convenience of *participants* and other interested visitors to the *IESO* Web site. Please be advised that, while the *IESO* attempts to have all posted documents conform to the original, changes can result from the original, including changes resulting from the programs used to format the documents for posting on the Web site as well as from the programs used by the viewer to download and read the documents. The *IESO* makes no representation or warranty, express or implied that the documents on this Web site are exact reproductions of the original documents listed. In addition, the documents and information posted on this Web site are subject to change. The *IESO* may revise, withdraw or make final these materials at any time at its sole discretion without further notice. It is solely your responsibility to ensure that you are using up-to-date documents and information.

This document may contain a summary of a particular *market rule*. Where provided, the summary has been used because of the length of the *market rule* itself. The reader should be aware; however, that where a *market rule* is applicable, the obligation that needs to be met is as stated in the "*market rules*". To the extent of any discrepancy or inconsistency between the provisions of a particular *market rule* and the summary, the provision of the *market rule* shall govern.

Document ID	IMO_MAN_0024
Document Name	Participant Technical Reference Manual
Issue	Issue 34.0
Reason for Issue	Issued for Baseline 41.0 regarding the removal of the need for a Java Runtime Environment (JRE) and java policy file for multiple file upload capability for the Portal.
Effective Date	March 6, 2019

Document Change History

Issue	Reason for Issue	Date
For change history prior to Issue 10, see issue 17.0 of the PTRM. For change history prior to Issue 22.0, see issue 29.0 of the PTRM. For change history prior to Issue 30.0, see issue 33.0 of the PTRM.		
30.0	Issued for Baseline 35.0 in regard of need for Participants to include use of Windows 7 and IE 11.0, update java policy file and location, update hardware requirements and update of web based applications.	March 2, 2016
31.0	Issued for baseline 36.0 for revisions due to replacement of Reliability Compliance Tool with a functionally equivalent application in the Online IESO system.	September 14, 2016
32.0	Issued for baseline 37.0 for revisions due to refreshment of Market Information Management system.	December 16, 2016
33.0	Issued for baseline 38.1 for revision due to Market Information Management system IDK decommission. Revised Dispatch Information section to add information related to Dispatch Service system.	December 6, 2017
34.0	Issued for Baseline 41.0 regarding the removal of the need for a Java Runtime Environment (JRE) and java policy file for multiple file upload capability for the Portal.	March 6, 2019

Related Documents

Document ID	Document Title
MDP_RUL_0002	Market Rules

Table of Contents

List of Figures

Table of Changes

Reference (Section and Paragraph)	Description of Change
Section 2.1.1 Para.20	Updated section in include phase "where applicable" in regard to use of java runtime environment.
Section 2.1.2 Para.32	Updated section in include phase "where applicable" in regard to use of java runtime environment with browser.
Section 2.1.2 Para.47	Removed reference to IESO Energy Market Application in regard to hosting of market applications in IESO portal.
Section 2.1.2 Para.48	Updated references to applications hosted in Online IESO to remove the new designation or reference to older systems.
Figure 2-11	Removed reference to IESO Energy Market in figure label.
Section 2.1.2 Para.62	Updated content regarding need for Java Runtime environment.
Section 2.1.2 Para.63 - 72	Updated section to remove paragraphs and figures on Java Runtime Environment and java policy file as the JRE and policy file are no longer needed for the IESO Portal.
References	Removed Java Runtime Reference URL

1.   Overview

1.1   About this Manual

1   The "Participant Technical Reference Manual" is comprised of the following sections:

Section	Name of Section
1.0	Overview
2.0	Participant Workstation, Network and Security
3.0	Dispatch Information
4.0	Operational Metering Equipment and AGC
5.0	Market Applications

The content of each is described more fully later in this section.

1.2   Purpose

2   This "Participant Technical Reference Manual" ("PTRM") provides the potential and active *market participants,* program participants and/or service providers (collectively referred to in this document as participants) with the necessary general technical standards to participate in the *IESO-administered markets*. It also provides references to other documents and information sources for detailed technical specifications required for participating in the *IESO-administered markets*. This document is not intended to be used as a stand-alone technical reference manual for all issues within the realm of electricity production, distribution, or consumption.

3   Written for *participants*, it provides only information relevant to the participant for communicating with the *IESO* and participating in the electricity market. It provides more detailed information on the requirements stated in the "Market Rules".

4   It is intended as a generic guide and the relevance of information in certain sections will depend on the market requirements of the participant. *Participants* are expected to understand what information they will require for their particular role in the market and apply the required sections accordingly.

1.3   Scope

5   This document is intended to provide *participants* with a description of the various *facilities* and interfaces they require to participate in the *IESO-administered markets*.

6   This document supplements the *market rules*. It also points to other documents and information sources that provide installation, set-up, and configuration information for the various tools and *facilities* required for participation in the electricity market as a supplier, transmitters, *distributor*, *generator*, or *consumer*.

7   The material contained in various sections of the PTRM is limited to information that is relatively stable and not subject to frequent change. Technical details that are subject to change, on a more frequent basis, are posted on the Technical Interfaces page of *IESO*'s Web site at *www.ieso.ca*. It is therefore important for *participants* to refer to the specific technical documents on the Technical Interfaces page when reviewing the requirements outlined in the "PTRM". Specific document references are included in each of the relevant sections of the "PTRM" as well as in the References table at the rear of the document.

1.3.1   Out of Scope

8   Technical requirements for *revenue metering* are not contained within the "PTRM". Details for *revenue metering* requirements are contained in "Market Manual 3: Metering" which is available on *IESO*'s Web site.

1.4   Limitations

9   The information in this document is limited to the information available at the time of publication. It is subject to change as the various technical interfaces and/or market requirements evolve.

10   The information in this document is based on the *market rules* provided to the *IESO* by the Minister of Energy, Science and Technology dated April 15, 1999 and subsequent updates thereof. Future changes in the "Market Rules" may result in changes in this document. No warranty is provided that any participant's requirements have been completely or correctly interpreted or that all issues have been identified.

11   The "Participant Technical Reference Manual" is only a technical specification manual and does not provide any procedural information. For procedural details please refer to the relevant user manual and/or guide.

1.5   Who Should Use This Manual

12   The "PTRM" is meant for all those who wish to participate in the *IESO-administered market*. These include, but are not limited to, the *generators, distributors, wholesale sellers, wholesale consumers, retailers, transmitters* and the "*financial market" participants*.

13   The "PTRM" provides the participants with the technical details and specifications of the hardware and software as well as other security-related information required by participants for interfacing and information exchange with the *IESO*.

1.6   Conventions

14   The standard conventions followed for *market manuals* are as follows:

- o   The word 'shall' denotes a mandatory requirement;

- o   Terms and acronyms used in this *market manual* including all Parts thereto that are italicized have the meanings ascribed thereto in Chapter 11 of the "Market Rules";

- o   Double quotation marks are used to indicate titles of legislation, publications, forms and other documents.

- o   Any procedure-specific convention(s) shall be identified within the procedure document itself.

1.7   How This Manual is Organized

15   This document is organized by specific areas of interest and not by *market participant* roles. It is the responsibility of *participants* to know what components are relevant.

16   The "Participant Technical Reference Manual" is divided into several parts based on specific areas of interest. A brief description and summary of each part is provided below:

- o   Section 1.0 - Overview: Contains information about the purpose, scope, limitations and structure of the manual.

- o   Section 2.0 - Participant Workstation, Network and Security: This section contains the minimum technical specifications for the *participant workstation* required by *participants* making *bids/offer* or obtaining information about market activity. The minimum hardware and software specifications for the participant network used for interacting with the *IESO* are also described. This part also provides *participants* with information and technical specifications for the digital certificates. The participants require the digital certificates or User ID account, identity credentials for purposes of data confidentiality and security.

- o   Section 3.0 - Dispatch Information: This part contains information about the technical requirement of the *dispatch workstation* and general information about dispatch message exchange. The primary audiences for this part are those participants who will be providing electrical power into or withdrawing electric *energy* from the *IESO-controlled grid* and will receive *dispatch instructions* from the *IESO*. It includes as well information on the functional aspects of the Dispatch Message Exchange as well as the message structures & actions. Minimum hardware and software specifications for the real time network required for acquiring real time data, *dispatch* of *automatic generation control* (*AGC*) and dispatch messaging are also provided besides general information on voice communication specifications and types.

- o   Section 4.0 - Operational Metering Equipment & *AGC*: This part details information and technical specifications for the operational metering requirements. It does not contain information on *revenue metering* which is provided in the "Market Manual 3: Metering" on the *IESO*'s Web site.

It also provides technical specifications for the *AGC* Operational Remote Terminal Units (RTUs).

- o Section 5.0 -Market Applications: Provides technical specifications & requirements for the bidding application, *settlement* application, invoicing and application interfaces (MIM API). For viewing templates, validation tables and sample data files please refer to the Technical Interfaces page of *IESO*'s Web site.

17   The technical specification and requirements contained in the Sections of this Manual are authorized under "Appendix 2.2 of the *market rules*". Specific references, where applicable, will be included at the beginning of each section.

– End of Section –

2. Participant Workstation, Network & Security

18   (For supporting rule references, please refer to "Appendix 2.2, Section 1.4 of the *market rules*")

2.1 Participant Workstation

19   A participant workstation is any *participant* client computer or server that communicates with or conducts transactions with the *IESO* systems. Any data or information exchanged with *IESO* systems is considered a communication. Any communication that is used to submit or retrieve data or information in regards to the wholesale electricity markets for the purpose of conducting business shall be considered a transaction.

2.1.1 Hardware Requirements

Platform

20   The client software provided by the *IESO* is designed to be platform independent. The *IESO* has performed extensive testing of this software on the Windows 7 operating systems. Displays may be rendered incorrectly if a Windows Operating System is not used. Other operating systems and hardware may be used as long as the operating system supports the Oracle Java Runtime Environment 7.0 where applicable. At this time there are no known issues with the *IESO* Portal and the supported browsers.

21   For Windows 7.0-SP1 and above it is recommended that the client workstation hardware conform to Microsoft's specifications found at: http://windows.microsoft.com/en-us/windows/windows-help?os=winxp#windows=windows-7.

Going forward the *IESO* recommends at least the following:

Processor

22   The minimum recommended processor is an Intel I5.

Memory

23   The minimum recommended system requirements are 4 GB of internal RAM.

Disk

24   The recommended available disk space is a minimum of 15 gigabytes on a typical 128 GB hard drive.

Interface Cards

25   A minimum of a DSL or Cable connection for high speed internet access is strongly recommended if the *participant* is interfacing with the *IESO* over the public Internet.

26   If connecting to the *IESO* through an internal network over the web, then the appropriate participant network equipment will be required.

Monitor

27   The minimum supported monitor must be XVGA with a resolution capability of 1024 x 768 pixels but using an FHD level monitor of 1920 x 1080 pixels would better serve the needs of the workstation for wholesale market use.

Printer

28   It is recommended that a printer where required for printing market application output should have resolution of at least 600 dpi and supports multiple fonts.

2.1.2   Software Requirements

Operating System

29   The recommended operating system is Windows 7-SP1 as shown on the *IESO* Supported Client Platform web page at :

http://www.ieso.ca/Pages/Participate/Supported-Client-Platforms.aspx

30   Previous versions of Windows are no longer supported by the *IESO*. The operating system must have support for the TCP/IP protocol.

31   It should be note that Windows XP is no longer supported by Microsoft and the *IESO* encourages that the participants use Windows 7 as a minimum.

Note: When Windows is used as the operating system, the preferred Short Date format is yyyy/mm/dd. Other Short Date formats may be used provided the year placement is set to yyyy.   Go to the Control Panel Regional Settings to make this adjustment. The delivery dates used by the Internet Explorer browser in the submission of *bids* are generated from this date setting and value.

Browser

32   All *IESO* applications within the MPI are fully tested with the *IESO* supported OS /Browser and JRE combinations where applicable. However it is recommended that participants use IE 11.0 due to end of Microsoft support for earlier browser versions.

33   128-bit encryption is required with the Internet Explorer browser. To make sure that Internet Explorer uses 128-bit or more of cipher strength, Please use following steps:

a. Click Tools while Internet Explorer is open.

b. Click Internet Options and then click advanced.

c. Under Security section, check mark Enable TLS 1.0, TLS 1.1 and TLS 1.2, Enable SSL 3.0 and Disable Enhance Protected Mode.

d. Save the changes by clicking Apply and OK.

34   The *IESO* secure websites have been configured to work with SSL 3.0 or higher which requires this level of encryption.

35   The viewing resolution must be 1024 x 788 pixels or higher in view maximized mode.

36   Internet Explorer has been tested with the Online IESO System. It will function as expected with the supported Microsoft OS, Internet Explorer combinations

37   The *IESO* Portal is accessible with Internet Explorer 8.0, 9.0, 11.0 as well as Mozilla Firefox 2.x, 3.x or Safari 2.x & 3.x (on Windows 7-SP1). These specifications are provided by the *IESO*'s Portal vendor Oracle. The vendor has also stated that browser support is no longer based on OS but strictly tied to the browser themselves, no matter which OS they are installed on except where noted. However going forward the IESO no longer supports Internet Explorer versions prior to 11.0.

Prudential Manager Browser configuration

38   The Prudential Manager applications have the following requirements:

39   Screen resolution of 1024 X 768 or higher

40   Internet Explorer version 11.0 with Compatibility View setting updated to include ieso.ca to the website list. IE 8.0 and 9.0 will work but are not supported.

41   Internet Explorer native XMLHTTP enabled

42   Internet Explorer pop-up blocker configured to allow pop-ups from *IESO* secure sites

Firewall

43   It is recommended that the each *participant* ensure that each participant workstation is protected by an appropriate firewall for the network and workstations being used. The choice of the technology to be employed is up to the *participant*.

IESO Confidential Report Site

44   The *IESO* has implemented a new confidential report site... The production URL for the confidential report repository HTTPS site is: https://reports.ieso.ca/private/. The sandbox URL for the confidential report repository HTTPS site is: http://reports-sandbox.ieso.ca/.

45   The new reports site offers the following access methods:

- New web user interface for browser-based access

- Secure File Transfer Protocol (SFTP) for machine access

- RESTful API for machine access

   o Query available reports using a URL request

   o API returns output as XML or JSON

   o No dependency on UI – reliable and direct access to reports.

46   An explanation and of the access interfaces for the new confidential report site can be found at: http://www.ieso.ca/Documents/ti/API_Guide/IESO_Reports_API_Guide.pdf

Microsoft Internet Explorer Configuration for Portal and Online IESO

47   The *IESO* Portal is the secure web based system used for hosting market applications accessible to *participants*. This includes:

- Transmission Rights Auction

- On-line Settlement Forms

- Prudential Manager

- Various Collaboration initiatives - MACD-TFE Technical Exceptions, Emergency Preparedness, SOE LDC Extranet, Market Surveillance Panel, RT-GCG Cost Recovery Framework, etc., for secure document submission and retrieval etc.

- Access to the new Online IESO system for Registration, Meter Trouble Reporting, Notice of Disagreement, Meter Installation registration, Facility and Equipment registration Prudential and Demand Response Auction applications

48   The Online IESO system securely hosts a number of market applications. This includes

- Registration - for market participants, contacts and user accounts

- Metering Installation Registration

- Facility/Equipment Registration

- Meter Trouble Reporting application

- Notice of Disagreement application

- Demand Response Auction application

49   For the supported versions of Microsoft Internet Explorer to work properly with the Portal and Online IESO there are a number of configuration settings that need to be made. This includes configuration items in both the Advanced and Security tabs under

Internet Options menu selection in Internet Explorer. It is important to note that the settings are unique to each user profile for IE on a workstation. Therefore, if multiple users with separate logins share a workstation, settings will need to be checked and altered as required for each user. It is also important to recognize that Internet Explorer has differences in configuration settings between Internet Explorer 8.0, Internet Explorer 9.0 and Internet Explorer 11.0 under Windows 7.

50   Under Windows 7, Internet Explorer 8.0, 9.0 and 11.0 use the Protected Mode capability for the various security zones as described at: http://msdn2.microsoft.com/en-us/library/bb250462.aspx. The recommendation is to put the Portal and *IESO* corporate web site URL's into the 'Trusted sites' zone when using Windows 7 and turn off Protected Mode for this zone only., Windows 7 and above enforces the opening of a new browser window every time the security zone changes

Internet Options - Advanced

51   A number of parameters may need to be set for Advanced Internet Options. To do this:

1. Under the IE **Tools** menu select **Internet Options**

2. Select the **Advanced** tab. See Figure 2-1. (**IE** / Wi**ndows** 7.0 shown)
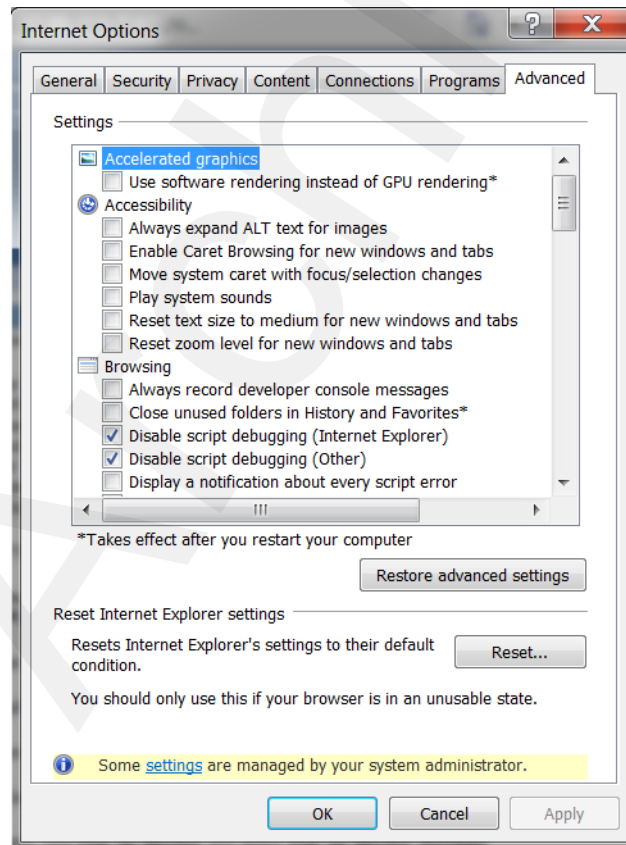
Figure 2-1: Internet Explorer, Internet Options - Advanced

3. Choose the following settings as shown in Table 2-1 for the appropriate Windows / IE combination and then click on the 'Apply' button. Depending on the user's workstation software environment, specific options may need to be altered from the settings

recommended here for proper function of Internet Explorer under all circumstances with other non-*IESO* applications.

Table 2-1 : Internet Explorer *Adv*anced Internet Options with Windows 7 SP1

Ad*vanc*ed Internet Option Parameter		IE 8.0 – Windows 7 and above	IE 9.0 – Windows 7 and above	IE 11.0 – Windows 7 and above
Accelerated graphics				
User software rendering instead of GPU rendering	N/A	N/A	N/A	No stipulation
Accessibility Parameters – all				
Always expand ALT text for images		No stipulation	No stipulation	No stipulation
Move system caret with focus/selection changes		No stipulation	No stipulation	No stipulation
Play system sounds		N/A	N/A	No stipulation
Reset text size to medium for new windows and tabs		No stipulation	No stipulation	No stipulation
Reset text size to medium while zooming		No stipulation	No stipulation	No stipulation
Reset Zoom level for new windows and tabs		No stipulation	No stipulation	No stipulation
Browsing Parameters				
Always record developer console messages		No stipulation	No stipulation	No stipulation
Close unused folders in History and Favorites		No stipulation	No stipulation	No stipulation
Disable script debugging (Internet Explorer)		No stipulation	No stipulation	No stipulation
Disable script debugging (Other)		No stipulation	No stipulation	No stipulation
Display a notification about every script error		No stipulation	No stipulation	No stipulation
Enable automatic crash recovery (* requires restart)		✓	✓	✓
Enable FTP folder view (outside of Internet Explorer)		✓	✓	✓
Enable Suggested Sites		No stipulation	No stipulation	No stipulation
Enable page transitions		No stipulation	No stipulation	N/A
Enable Personalized		No	No stipulation	N/A

Ad*vanc*ed Internet Option Parameter		IE 8.0 – Windows 7 and above	IE 9.0 – Windows 7 and above	IE 11.0 – Windows 7 and above
Favorites menu		stipulation		
Enable third-party browser extensions *(requires restart)		✓	✓	✓
Enable visual styles on buttons and controls in web pages		✓	✓	✓
Go to an intranet site for a single word entry in the address bar		N/A	N/A	No stipulation
Load sites and content in the background to optimize performance		N/A	N/A	✓
Notify when downloads complete		No stipulation	No stipulation	✓
Reuse windows when launching shortcuts		No stipulation	No stipulation	N/A
Show friendly HTTP error messages		✓	✓	✓
Underline links		Always	Always	Always
Use inline AutoComplete in File Explorer and Run Dialog		N/A	N/A	No stipulation
Use inline AutoComplete in the Internet Explorer Address bar and Open Dialog		No stipulation	No stipulation	No stipulation
Use most recent order when switching tabs with Ctrl+Tab		No stipulation	No stipulation	No stipulation
Use Passive FTP (for firewall and DSL modem compatibility)		No stipulation	No stipulation	No stipulation
Use smooth scrolling		✓	✓	✓
HTTP 1.1 Settings				
Use HTTP 1.1		✓	✓	✓
Use HTTP 1.1 through proxy connections		No stipulation	No stipulation	✓
International				

Ad*vanc*ed Internet Option Parameter		IE 8.0 – Windows 7 and above	IE 9.0 – Windows 7 and above	IE 11.0 – Windows 7 and above
Always show encoded addresses		No stipulation	No stipulation	No stipulation
Send IDN Server Names for Intranet addresses		No stipulation	No stipulation	No stipulation
Send IDN server names for non-Intranet addresses		No stipulation	No stipulation	✓
Send URL path as UTF-8		No stipulation	No stipulation	No stipulation
Send UTF-8 query strings for Intranet URLs		N/A	N/A	No stipulation
Send UTF-8 query strings for non-Intranet URLs		N/A	N/A	No stipulation
Show Information Bar for encoded addresses		No stipulation	No stipulation	No stipulation
Use UTF-8 for mailto links		No stipulation	No stipulation	N/A
Microsoft VM				
Java Console enabled		N/A	N/A	N/A
Java logging enabled		N/A	N/A	N/A
JIT compiler for virtual machine enabled		N/A	N/A	N/A
Multimedia				
Enable alternative codecs in HTML5 media elements * (requires restart)		N/A	N/A	✓
Enable automatic image resizing		✓	✓	✓
Play animations in web pages * (requires restart)		No stipulation	No stipulation	✓
Play sounds in web pages		No stipulation	No stipulation	✓
Play videos in web pages		N/A	N/A	✓
Show image download placeholders		No stipulation	No stipulation	✓
Show pictures		No stipulation	No stipulation	✓
Show image dithering		No stipulation	No stipulation	N/A

Ad*vanc*ed Internet Option Parameter		IE 8.0 – Windows 7 and above	IE 9.0 – Windows 7 and above	IE 11.0 – Windows 7 and above
Printing				
Print backgrounds colors and images		No stipulation	No stipulation	N/A
Search from the Address bar		No stipulation	No stipulation	N/A
Security				
Allow active content from CD to run on My Computer * (requires restart)		No stipulation	No stipulation	No stipulation
Allow active content to run in files on My Computer		No stipulation	No stipulation	No stipulation
Allow software to run or install even if the signature is invalid		No stipulation	No stipulation	No stipulation
Block unsecured images with other mixed content		N/A	N/A	No stipulation
Check for Publishers certificate revocation		✓	✓	✓
Check for server certificate revocation * (requires restart)		✓	✓	✓
Check for signatures on downloaded programs		✓	✓	✓
Do not save encrypted pages to disk		No stipulation	No stipulation	No stipulation
Empty Temporary Internet Files folder when browser is closed		No stipulation	No stipulation	No stipulation
Enable DOM storage		N/A	N/A	No stipulation
Enable Enhanced Protected Mode * (requires restart)		N/A	N/A	No stipulation
Enable Integrated Windows Authentication * (requires restart)		No stipulation	No stipulation	No stipulation
Enable memory protection to help mitigate online attacks		No stipulation	No stipulation	N/A
Enable native XMLHTTP support		✓	✓	✓

Ad*van*ced Internet Option Parameter		IE 8.0 – Windows 7 and above	IE 9.0 – Windows 7 and above	IE 11.0 – Windows 7 and above
Phishing Filter		Turn on automatic website checking	Turn on automatic website checking	N/A
Enable SmartScreen filter		N/A	N/A	✓
Enable Strict P3P Validation * (requires restart		N/A	N/A	No stipulation
Send do not track requests to sites you visit in Internet Explorer * (requires restart)		N/A	N/A	No stipulation
Use SSL 2.0				
Use SSL 3.0				
Use TLS 1.0		✓	✓	No stipulation
Use TLS 1.1		✓	✓	✓
Use TLS 1.2		✓	✓	✓
Warn about invalid site certificates		✓	✓	N/A
Warn about certificate address match * (requires restart)		N/A	N/A	✓
Warn if changing between secure and not secure mode		✓	✓	✓
Warn if Post submittal is redirected to a zone that does not permit posts		✓	✓	✓

Note: Even though IE8.0 and 9.0 will work, the IESO is no longer supporting those versions. The settings above are for reference only.

Internet Explorer - Internet Options - Security

52   A number of security configuration settings need to be made in order for proper functioning of the browser with various *IESO* web sites. The *participant* can choose to define and place the Portal and Online IESO URLs for the Production and Sandbox environments into the Trusted Sites zone under IE Security If the URLs are left in the Internet zone by default then it is recommended that the Security settings for that zone be configured as defaulted (medium security level) except where noted. However for Windows 7 is important that the URLs be placed in the 'Trusted sites' zone as well as the *IESO* corporate site as discussed previously.

53   When the URL's are included in the 'Trusted Sites' zone it is recommended that the Security settings default of medium be left as is.

54   However the *participant's* IT security people should be involved in deciding the appropriate settings and implement based on their own rules and policies, which may take precedence over the settings recommended here. The choice is in the end, up to each *participant.*

Internet Zone Security Settings

55   When leaving the *IESO* Portal URLs by default in the IE 'Internet' zone for Windows *7* it is recommended the following settings be made:

1.   Under the **Tools** menu select **Internet Options**

Select the **Security** tab. See Figure 2-2 (IE 11 / Windows 7 shown). For Windows *7* some additional security has been added in the form of Protected Mode as mentioned above. This can be turned on or off for each security zone. It is required under Windows 7 for the Portal Energy Market GUI web site that Protected Mode is turned off. This can be done in the Security tab via the check box at the bottom of the Internet Options window as shown in Figure 2-2.

Figure 2-2: Internet Explorer 11.0, Internet Options - Security - Windows 7

2.   Click on the Internet zone icon to specify its security settings. The default level for the Internet zone in IE is 'Medium'. Most of the settings should be left as is unless security policies for the *participant* require something else.

3.   Click on the 'Custom Level' button to activate the Security Settings configuration window. See Figure 2-3. (IE 11 / Windows 7 shown)

4. Verify default settings are as per Table 2-2 and Table 2-3 when *IESO* Portal URLs are by default in the Internet zone. If conflicts occur for other IE operations with other web sites modify as required for optimal and secure operation of Internet Explorer.

5. Click on the "OK" button to accept all changes.
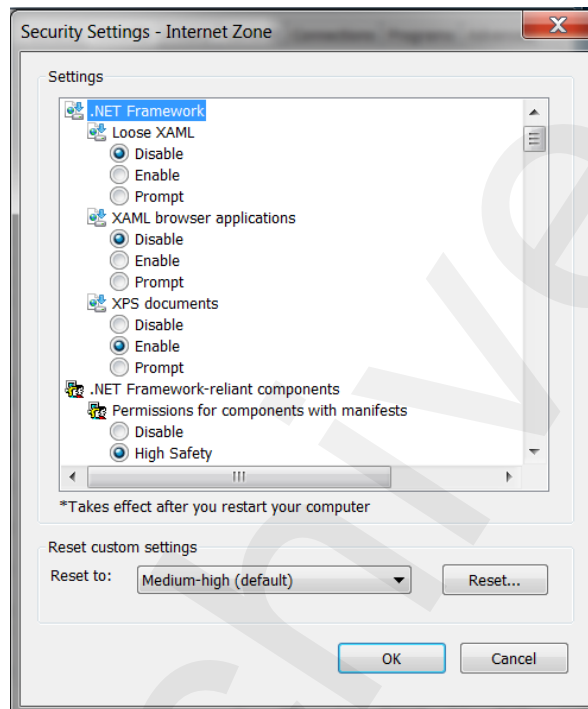
Figure 2-3: Internet Explorer 11.0, Internet Options - Custom Security Settings Window

Trusted Sites Security Settings

56 When including the *IESO* Portal Online IESO URLs in the IE 'Trusted Sites' zone it is recommended the following configuration settings be made

1. Under the **Tools** menu select **Internet Options**

2. Select the **Security'** tab. See Figures 2-2 to 2.3 above.

3. Click on the Trusted Sites zone icon to specify its security settings. The default level for the Trusted Sites zone in IE is Medium for Windows 7. It is recommended to leave as default for Windows 7. Notice that the **'Sites'** button is now active.

4. Click on the **'Sites'** button to activate the 'Trusted Sites' entry window. See Figure 2-5

5. Type in the address (es) of the trusted sites for the *IESO*'s Production and Sandbox Portal environments and use the 'add' button to add them. See Figure 2-5 and 2-6. Note that the production Online IESO system has already been added.
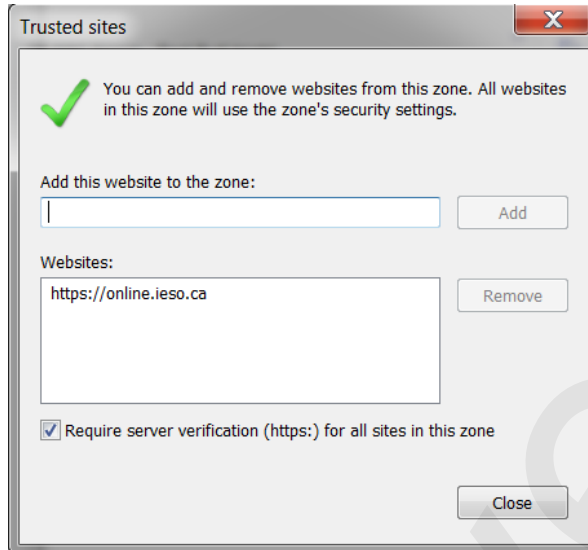
Figure 2-4: Internet Explorer 11.0, Internet Options - Trusted Sites Security –Windows 7
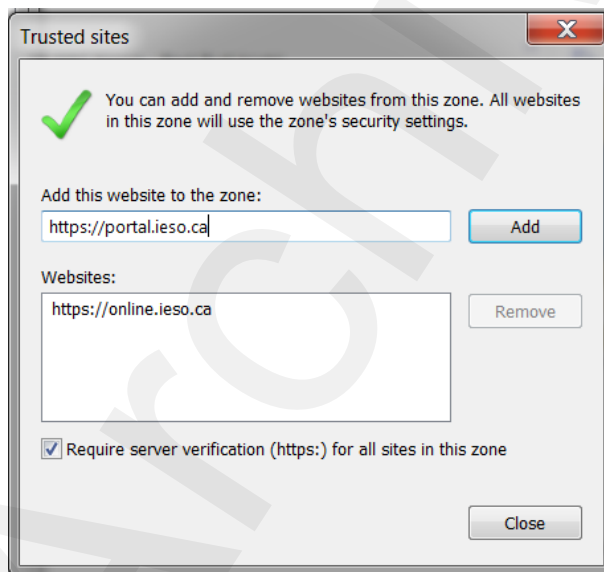
Figure 2-5: Internet Explorer 11.0, Trusted Sites Security - Web Sites Addition -Windows 7
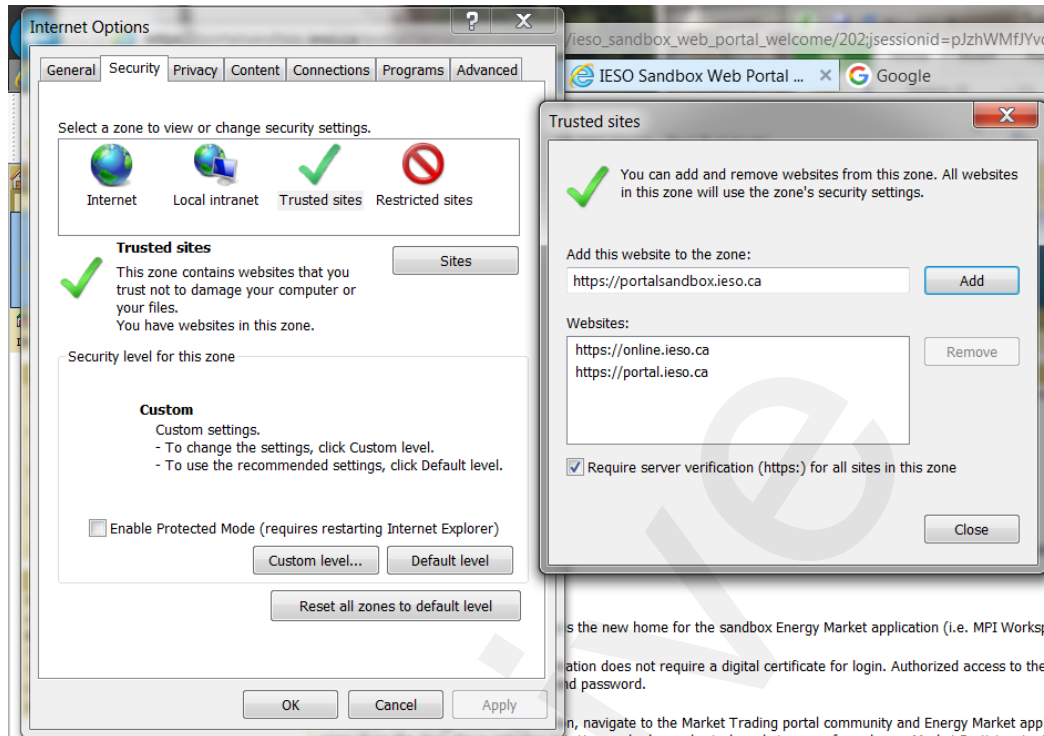
Figure 2-6: Internet Explorer 11.0, Trusted Sites Security - Web Sites Addition –Windows 7

6. Click on the "Require Server Verification (https) for all sites in this zone" option check flag if all sites entered here are https sites like the *IESO*'s Portal.

7. Click on the 'OK' button.

8. Click on the 'Custom Level' button to activate the Security Settings configuration window.

9. Verify settings as per Table 2-2 when *IESO* Portal URLs are in the Trusted Sites zone for and the appropriate Windows and Internet Explorer combination. If conflicts occur for other IE operations with other web sites modify as required for optimal and secure operation of Internet Explorer. Note that choosing the 'Prompt' parameter value will require more user overhead than 'Enable'.

Note: *The user can use the right mouse click and then on 'What's This' on each item in IE 'Security Settings' for an explanation of each item.*

Compatibility View Settings

57   When including any of the *IESO* Portal, portalapps (i.e. Prudential Manager), or Online IESO URLs in the Compatibility View Settings the following must be done

1. Under the **Tools** menu select **Compatibility View settings.** A popup window will display. See Figure 2.7 below.
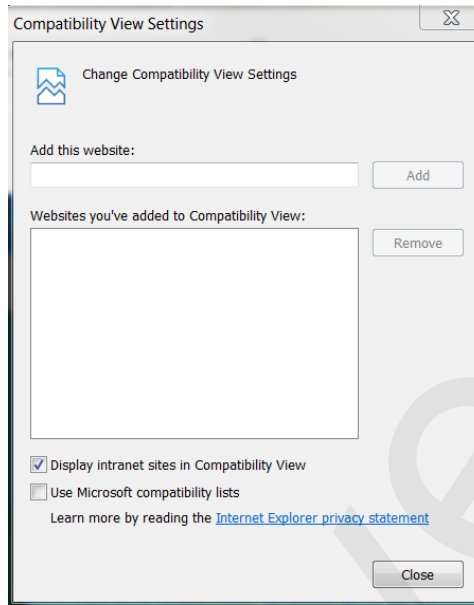
Figure 2-7: Internet Explorer Compatibility View Settings

2. Type in the URL of the website to add and click the add button. The domain of the website will be added to the list. For example if https://portal.ieso.ca is typed in 'ieso.ca' will be added. It is similar for any other *IESO* secure website.

3. When the Portal, portalapps.ieso.ca, and Online IESO sites are added, the Compatibility View settings list will show as shown in Figure 2.8. Any other required websites can be added as needed by the *participant*.
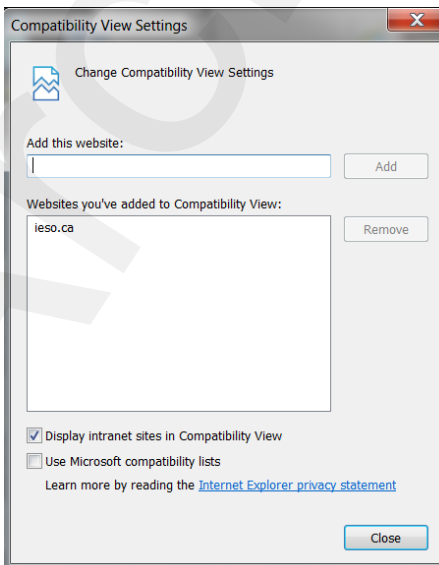
Figure 2-8: Compatibility View Settings with ieso.ca added

Table 2-2: IE Internet Options, Security Settings –Windows 7-SP1

Parameter		When Portal and other *IESO* URLs added to 'Trusted Sites' zone in Windows 7-SP1 and IE 11.0
General Security Level for zone		Medium
.NET Framework		
Loose XAML		No stipulation
XAML browser application		No stipulation
XPS documents		No stipulation
.NET Framework-reliant components		
Permissions for components with manifests		High safety
Run components not signed with Authenticode		prompt
Run components signed with Authenticode		Enable
Active X Controls and Plug-ins		
Allow ActiveX Filtering		Enable
Allow Previously unused ActiveX controls to run without prompting		Enable
Allow Scriptlets		Enable
Automatic prompting for ActiveX controls		Enable
Binary and script behaviors		Enable
Display video and animation on a webpage that does not use external media player		No stipulation
Download Signed ActiveX Controls		Enable
Download Unsigned ActiveX Controls		Prompt
Initialize and script ActiveX controls not marked as safe		Prompt
Run ActiveX controls and plug-ins		Enable

Run antimalware software on ActiveX controls		Disable
Script ActiveX controls marked as safe for scripting		Enable
Downloads		
Automatic prompting for file downloads		Enable
File Download		Enable
Font Download		Enable
Enable .NET Framework setup		Enable
Miscellaneous		
Access data sources across domains		Enable
Allow dragging of content between domains into separate windows		Enable
Allow dragging of content between domains into the same window		Enable
Allow META REFRESH		Enable
Allow scripting of Microsoft Web browser control		Enable
Allow script initiated windows without size or position constraints		Disable
Allow web pages to use restricted protocols for active content		Prompt
Allow websites to open windows without addresses or status bars		Enable
Display mixed content		Enable
Don't prompt for client certificate selection when no certificates or only one certificate exists - (i.e. automatic certificate presentation)		Disable
Drag and drop or copy and paste files		Enable
Enable MIME sniffing		Enable

Include local directory path when uploading files to a server.		Enable
Launching applications and unsafe files		Prompt
Launching programs and files in an IFRAME		Enable
Navigate sub-frames across different domains		Enable
Render Legacy Filters		Enable
Submit non-encrypted form data		Enable
Use Pop-up blocker		No Stipulation
User data persistence		Enable
Web sites in less privileged web content zone can navigate into this zone		Enable
Scripting		
Active scripting		Enable
Allow programmatic clipboard access		Enable
Allow status bar updates via script		Enable
Enable XSS filter		Disable
Allow websites to prompt for information using scripted windows		Enable
Scripting of Java applets		Enable
User Authentication		
Logon		Automatic logon only in Intranet zone

Internet Explorer Pop-up Blocker with Windows 7-SP1 and the Portal

58   Internet Explorer, pop-up blocker functionality can have some beneficial and some detrimental effects depending on the needs of the browser user. When enabled with just default settings, the IE pop-up blocker affects the functionality of the Portal. The Energy Market Application System Messages and Market Status windows for example do not activate and properly display when pop-up blocking is active and not disabled for the Energy Market Application hosted in the Portal web site. It is recommended that IE configuration settings for pop-up blocking be set so that Energy Market Application functionality is not affected.

59   This functionality continues as is with Internet Explorer 11.0 under Windows 7. The directions included here apply to all the combinations of Windows 7 and IE 11.0.

Internet Explorer Turn Pop-up Blocker On or Off

60   In order to turn off (or on) the IE pop-up blocker function:

1.   Under the **Tools** menu select the **Pop-Up Blocker menu** option

2.   A submenu list will display. If the pop-up blocker is enabled the first submenu option will indicate **Turn Off Pop-up Blocker**. If it is disabled the first submenu option will indicate **Turn On Pop-up Blocker.** This option works as a toggle to enable or disable the pop-up blocker. See Figure 2-9.
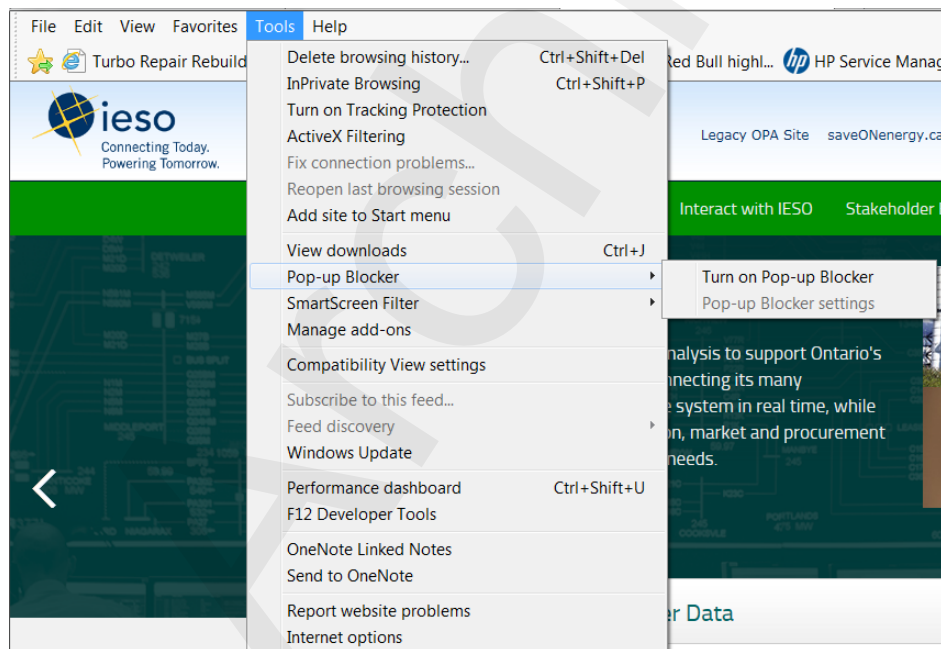
Figure 2-9: Internet Explorer, Enabling or Disabling Pop-up Blocker

Internet Explorer Configure Pop-up Blocker Settings

61   In order to access pop-up blocker settings and set up the pop-up blocker filter parameters to allow the proper functioning of Energy Market Application within the Portal:

1.   Under the **Tools** menu select the **Pop-Up Blocker menu** option

2. A submenu list will display. Select the Pop-up Blocker settings submenu option when the pop-up blocker has been toggled on. See Figure 2-10.

3. The Pop-up Blocker Settings windows will activate See Figure 2-12

4. Select the desired blocking level setting (e.g. '*Low: Allow pop-ups from secure sites*' as an option if pop-ups are required to be blocked from all sites except those sites protected by SSL). It is up to the discretion of the *participant* to choose the required blocking level setting for their needs. The low setting will allow all Energy Market Application windows as the Portal URL is a secure site.

5. Enter in the URL addresses of the Sandbox and Production Portal sites in the address of Web site to allow and use the Add button (see Figure 2-13). This will allow the proper functioning of Energy Market Application and Portal, no matter what the blocking level setting.
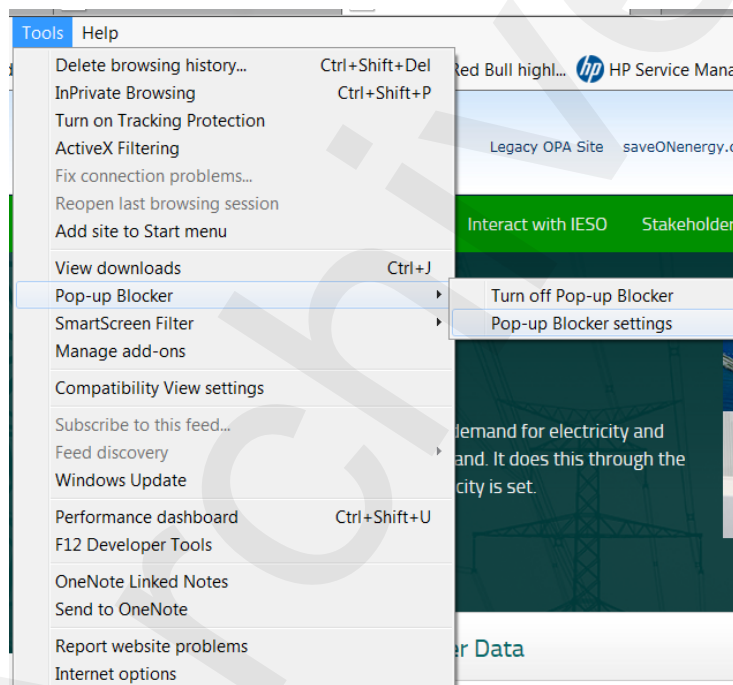
Figure 2-10: Internet Explorer, Activating Pop-up Blocker Settings
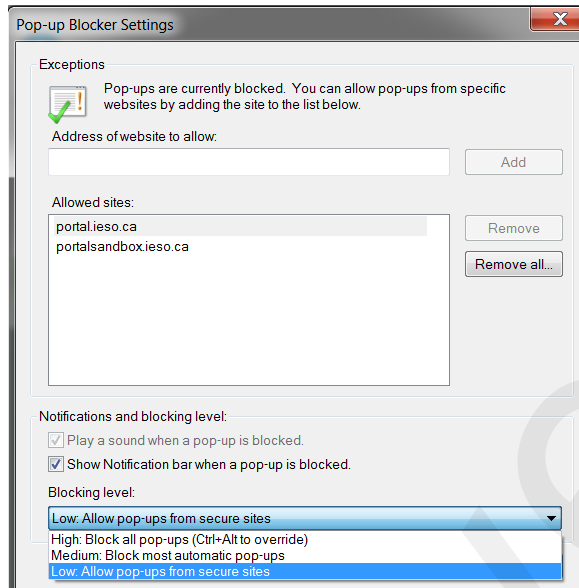
Figure 2-11: Pop-up Blocker Settings Window Filter Setting for Portal Use
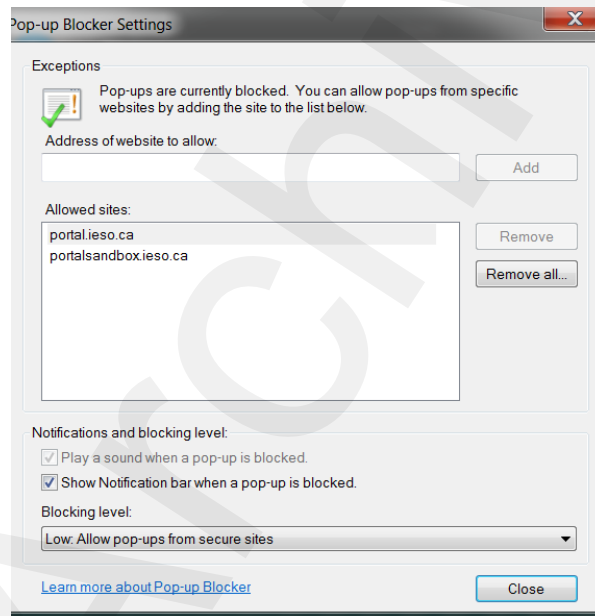
Figure 2-12: Addition of Portal URL to Allow Web Site List for Pop-ups

Java Runtime Environment

62   A Java runtime environment installed on a client workstation is no longer required for use with the IESO Portal for use with a java applet for multiple file upload. This functionality has been replaced with server side JavaScript. Please refer to the *IESO* Supported Client Platform web page for any required Java runtime environment where applicable.

Internet Connection

63   For *participants* planning to connect to the *IESO* through the public Internet, the *participant* must have an established Internet connection. This may be in the form of either a high speed link to an ISP (Internet Service Provider) or through an internal Web-gate or proxy server. The speed of this Internet connection will directly affect application performance.

2.2   Participant Network

64   *Participants* will submit *bids/offers*, access market, *settlements*, and metering information through the use of the *IESO* participant network.

65   There are three methods for a *participant* to connect to the *IESO*. These are defined as PUBLIC over the Internet or as PRIVATE through a facility contracted by the *participant* with a telecommunications service provider or SHARED over the *IESO* provided Multiprotocol Label Switching (MPLS). *Participants* who require high performance or reliability may wish to consider the PRIVATE or SHARED network alternatives.

66   Regardless of the method chosen, failure of the telecommunications network can occur. *Participants* should take this into consideration and establish alternate paths or contingency plans, as required.

2.2.1   Internet

67   The connectivity bandwidth should be at least 1024Kbps but higher speeds are recommended to maintain optimal performance.

68   *Participants* will access the *IESO* using *IESO* supplied authentication credentials which are subject to the limitations and conditions defined in the Market Rules. To authenticate to any of the secure *IESO* Web sites the *participant* will present an *IESO* authentication credential (e.g. to the *IESO* Portal or Online IESO or other secure *IESO* website). If the presented *IESO* authentication credential is valid, the user will be granted access to the site and authorized applications. *Participants* must register for *IESO* authentication credentials. . Registration will be performed as specified in the *Identity Management Operations Guide* via the Online IESO system (see Technical Interfaces page of *IESO*'s Web site).

69   Secure Sockets Layer (SSL) is used to encrypt the messages between the client system at the *participant* and a secure Web Server at the *IESO*. SSL uses a combination of asymmetric (public and private keys) and symmetric keys (shared secret) to negotiate the secure session between the *participant* system and the *IESO* Web Servers. This is a standard technology developed originally by Netscape and used extensively by Internet web servers to establish secure connections between two systems.

2.2.2   Private Network

70   The Private Network option is recommended to *participants* concerned about having direct control over the performance of telecommunications with the *IESO* for commercial purposes. As the name implies, the *participant* privately arranges this service with a commercial telecommunications service provider. The quality of service

is subject to the contract between the *participant* and the service provider. All associated costs will be borne by the *participant*.

71   The *IESO* enables this option, by permitting the telecommunications service provider to establish a point of presence at the *IESO*'s main and backup operating centers. The *IESO* also will provide space and a physically and electrically secure environment for the premises equipment.

72   *Participant* is expected to terminate its point-of-presence at the *IESO*'s premises with routers, supplied by the *participant*, located at the *IESO*'s main and backup operating centers. The actual demarcation point is the Ethernet connection to the router. The *participant* is solely responsible for the management of its telecommunications facilities.

73   In the interest of manageability, a list of preferred telecommunications service providers has been established. These are listed below. As the list may be revised periodically, it is recommended that the *participant* check the latest version of this document. Also, the *IESO* is prepared to review on a case-by-case basis if the *participant* prefers a telecommunications service provider not in the list.

74   The current list of preferred telecommunications carriers consists of the following: Allstream, Bell Canada, Hydro One Telecommunications, and Rogers Communications.

2.2.3   Shared Network

75   The Multiprotocol Label Switching (MPLS) network will be maintained through the service provider with *IESO* having responsibility for connectivity up to the router/security device located on the *participant* site. Static routing will be used across the interfaces between *IESO* and the *participant's* network.

76   The *participant* will work the *IESO* to define a satisfactory internal IP or registered external public IP Ethernet address for the Ethernet port that connects to the *participant's* internal network.

77   To arrange for a shared network connection, contact the *IESO* (see www.*IESO*.ca).

Connecting to the Supplied Ethernet Port

78   A network connection will need to be established between an Ethernet Port on the router/security device and the *participant's* Internal Network.

79   If distance between the Ethernet Port on the router/security device and the *participant's* Internal Network is an issue, then a recommended solution will be to deploy an Ethernet Repeater or "Ethernet Extender."

Traffic Aggregation

80   The *IESO* will preserve the predictable response time of the Real Time network for *participants* that chose to use the MPLS Network to submit *bids*, *offers*, and access market *settlements* and metering information over the MPLS Backbone.

81   A single virtual circuit will be established between the *IESO* and the *participant* with appropriate Quality of Service and queuing controls enabled.

Participant Firewall Configuration

82   Web based network communications will be secured using SSL. Depending on the *participant's* internal network configuration, changes may have to be made to allow a SSL connection if firewalls are used.

83   Changes to the *participant's* firewall configuration will be dependent upon the type of firewall in use. For standard and encrypted web traffic, TCP Ports 80 and, 443 will need to be open.

2.3   Accounts / Identity Credentials

84   The *market rule* amendment (MR-00376) binds all *participants* in regard to authenticated communication or transactions when using *IESO* accounts and identity credentials.

85   The *market rules* requires that the *IESO* implement access control protocols to protect the unauthorized disclosure of *confidential information* transmitted by electronic communications. The use of UserID account and strong password identity credentials in combination with SSL encryption allows the *IESO* to fulfill the appropriate *market rules* governing confidentiality. Additionally, User ID account identity credentials in conjunction with SSL protocols and adaptive authentication software mechanisms can be used to establish authentication, authorization and integrity.

86   User ID account identity credentials used with the *IESO* Portal, Reports site and Online IESO system are authenticated and managed for identity management and Single Sign on by a combination of commercial products from Oracle and Microsoft.

Account Suspension and Auditing

87   Portal/Online IESO accounts used for accessing the *IESO* Portal, Online IESO and secure Confidential Reports site will be subject to a number of security provisions. These include:

- Portal/Online IESO Passwords must conform to the construction rules as described in the *Identity Management Operations Guide*.

- If a user enters an incorrect password four times in a row on the Portal the account will be locked out for a fixed period of time after which the user may attempt login again.

- If a user enters an incorrect password five times in a row on the *IESO* Report site the account will be locked out for a fixed period of time after which the user may attempt login again.

- If the user is attempting login to the Portal from an unrecognized prior location or computer or is attempting login during a time of day that does not match a pattern of recognized use, additional authentication questions will be asked. The question choices and their corresponding answers shall have been provided by each user at time of account registration and initial Portal login.

- In accordant with Market rule amendment (MR-00376), if the user fails to answer any additional authentication questions correctly the account will be immediately locked out for a fixed period of time after which the user may attempt login again.

- All login attempts successful or not will be logged for analysis by the *IESO*.

- All Portal/Online IESO activity, login, logout and pages visited etc. will be logged for analysis by the *IESO*.

2.3.2   Identity Management

88   *IESO* ITOPS Customer Support , with the implementation of the Registration System handle all internal *IESO* management aspects of the Identity Management processes and coordinate their efforts with both *participants* and internal staff. Access to the *IESO* secure web servers requires the use of User ID account identity credentials for authentication and authorization.

89   *Participant Rights Administrators* look after all *participant* internal management aspects of the Identity Management processes using the Online IESO Registration application to communicate with the *IESO,*

90   Administration activities for User ID account identity credentials include:

- o   Registration
- o   Participant Approval
- o   User Account Creation and system access privileges assignment
- o   User Account Revocation and removal of system access privileges
- o   Change of system access privileges
- o   User ID password reset
- o

91   Individual Subscriber refers to a person at the *participant* or agent of such. Application Subscriber refers to an application at the *participant* or agent of such. Either can be referred to as Credential Subscribers. Participant Rights Administrators who request User ID account identity credentials for themselves shall be considered Individual Subscribers when dealing with their own User ID account identity credentials. Under the *IESO* Trust Model each Individual Subscriber, Application Subscriber should be identified using the *participant's* internal policies and procedures(see "*Identity Management Operations Guide*" which is available on the Technical Interfaces page of *IESO*'s Web site):

User ID account password reset is handled by direct communication with *IESO* Customer Relations.

IESO ITOPS Customer Support is responsible for issuing and maintaining User ID account identity credentials.

2.3.3   Energy Market Application

Energy Market Interface (EMI)

92   All *participants* must use the EMI via the IESO supported browser. The supported browser is listed on the "IESO Supported Client Platform" web page.

93   All *participants* must register their EMI User account with the IESO, and assign applicable MIM contact roles and permissions using the online IESO tool.

94   Participants can download the "Identity Management Operations Guide" and the "Submitting, Revising and Cancelling Bids/Offer/Schedules and Forecasts" (See the Technical Interface Page http://www.ieso.ca/Pages/Participate/Technical-Interfaces.aspx and the Training Page http://www.ieso.ca/Pages/Participate/Training.aspx on the IESO's web site) for instructions on EMI interface use.

MIM Programmatic API Application (Application Based Solution)

95   *Participants* can choose to use the MIM programmatic API solution with a *participant* custom application.

96   All *participants* must register their API accounts with the IESO, and assign the applicable MIM system access role and permissions using the online IESO tool.

97   In addition to the API account, the *participant* must register the IP addresses of the systems used to access the IESO MOSMIM Web Server with the *IESO* in order for the appropriate firewall rules to be implemented at the IESO to permit *participant* access with the MIM programmatic API.

98   The API account and IP address registration are required for both MIM production and sandbox environments to enable access to the bid site through the *IESO* firewall. *Participants* must manage their API accounts and IP addresses using the production and sandbox online IESO tool respectively.

99   When a *participant* uses the MIM programmatic API Application to access the *IESO* Web Server MOSMIM, a SSL (Secure Socket Layer) is session is started. *Participants* with firewalls must have the SSL port 443 open *f*or communication with the IESO Web Server.

100   The MIM API is XML based Web Services. Its Web Services Client Tool (MWT), WSDL and XSD file can be downloaded from the IESO Web site (see the Technical Interfaces Page of IESO's Web site).

101   The USERID used for authentication with the MIM Web Services is the REGISTRATION User Login Name only. The REGISTRATION participant Constant Shortname is not required.

2.3.4   Portal/Online IESO/Confidential Reports and Identity Management System

102   All Portal/Online IESO/Confidential Reports users login with a UserID account credential for all Portal, Online IESO hosted applications and the Confidential Reports site.

103   The Portal is protected by Oracle and Microsoft identity management technologies. These components provide for single-sign-on, authentication, authorization, auditing and in conjunction with SSL protocols, confidentiality and integrity of communications. Online IESO is protected by Microsoft identity management technologies. The Confidential Reports site is protected by the vendor supplied technologies.

104   All Portal, Online IESO and Confidential Reports identity management components for User ID account credentials are server based and only a web browser is required by the *participant,* as specified in this document, to access each system with this type of identity credential.

105   The *IESO Portal User Interface User's Guide* should be referenced for Portal login procedures. The *IESO Reports API Guide* (should be referenced for secure access to the Confidential Reports site. This can be found at: http://www.ieso.ca/Documents/ti/API_Guide/IESO_Reports_API_Guide.pdf

2.3.5   Requirements for Browser Software Compatibility

Workstation Platform for Portal and Online IESO Browser Client

106   The browser client recommended by the *IESO* portal vendor (Oracle), Online IESO system vendor (Appian) supported by the *IESO* is as shown on the "IESO Supported Client Platform" web page.

107   Recommended by the Portal vendor but not supported by the *IESO* is: :

   o   Mozilla Firefox 1.0, 1.5 or 2.0.1

   o   Safari 2.0 and 3.0

Any of these will work.

Ports

108   Port 443 must be open to allow access over SSL (Secure Socket Layer). *Participants* with firewalls must have this port open for communication with the *IESO* systems.

Other Documentation

109   The *relevant* IESO Portal and MIM programmatic API manuals should be referred to when appropriate.

<p align="center">**– End** *of Section* **–**</p>

3.   Dispatch Information

110   (For supporting rule references, please refer to "Appendix 2.*2, Sections 1.1 & 1.3 of* the *market rules"*)

3.1   Message Exchange and Dispatch Service

111   Dispatch Message Exchange system is currently being used by IESO to send dispatch instructions to and receive responses from Participants.

112   A new Dispatch Service system is implemented by IESO and will be replacing the Dispatch Message Exchange system.

113   All Participants using existing Dispatch Message Exchange system must migrate to the new Dispatch Service system within a 12-month period following production rollout of the new system.

3.2   Dispatch Message Exchange

3.2.1   Overview

114   *Participants* using a *dispatch workstation* will be integrating directly with the EMS systems at the *IESO* and will require interaction with the Message Exchange system. *Participants* that require this module will be receiving the client software from the *IESO* via the network and will be instructed on its installation and application.

115   Message Exchange information will be stored in the *IESO* Operations Database (ODB), for use by the Compliance Monitor. This verifies that the requested *dispatch* actually takes place based on the measurement availability.

116   The *participant* will:

- •   acknowledge receipt of the message;
- •   accept or refuse the *dispatch* request; and
- •   perform the requested control action.

117   The Message Exchange function is used by the *IESO* to send *dispatch instructions* to the *participants*. This function is triggered by the *dispatch* request of an application (such as *energy dispatch*) to issue a message either automatically by Inter-Control Center Communications Protocol (ICCP) or by WEB-based Message Exchange or manually (off-line by telephone or fax) by the Exchange Coordinator to a *participant*.

118   The Message Exchange function sends *dispatch instruction* to the *IESO participants* using ABB's ICCP Block 4 capabilities or the WEB-based Message Exchange *facilities*.

119   In order to interface with the Message Exchange using ICCP the *participants* must also have ICCP Block 4 configured on their *dispatch workstations* and have specialized software to interpret and manage the ICCP block 4 messages.

120   WEB-based Message Exchange is an alternative *facility* made available to the *IESO participants* that can be used to support the Message Exchange requirements. The WEB-based Message Exchange adds additional capability to the existing Message Exchange functionality. WEB-Based Message Exchange permits *dispatch instructions* to be sent to the *participants* using browser compatible user interface and application programming interface. These interfaces will be included with the delivery of this product. WEB-Based Message Exchange will be simpler to deploy than the ICCP-based Message Exchange and more cost effective for the *participants*, however this may be a less reliable approach.

121   Interfaces (see figure below) shows the relationship that Message Exchange (ME) has with other parts of the system. Most of the functions are internal to *IESO* however on the right of the diagram is the interface with the *participants*.
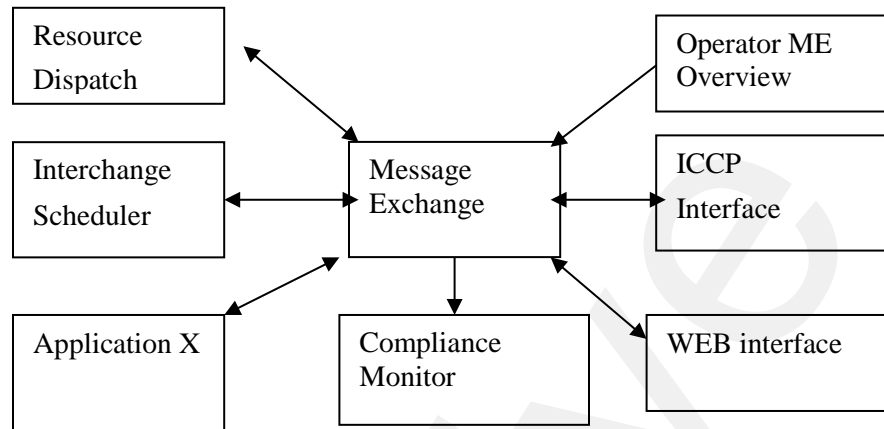
Figure 3-1: Message Exchange Interfaces

122   Specifics of ICCP Block 4 are discussed in the ICCP guidelines, which can be ordered from EPRI – Report TR-107176 over the Internet.

123   A WEB-Based Message Exchange user guide has been posted on the *IESO* Web site. The user guide provides information on message displays, user actions and contract management message displays, etc. *Participants* are encouraged to consult the Web site for further details and latest updates to the user guide.

3.2.2   Hardware Requirements

124   *This sect*ion provides descri*ption of* the *dispatch workstations* required by *participants* injecting into or withdrawing electrical power from the *IESO-controlled grid* or will receive and transmit information to the *IESO*.

Platform

125   The client software provided by the *IESO* is designed to be platform independent. The *IESO* has performed extensive testing of this software on the Windows 7 operating systems. Displays may be rendered incorrectly if a Windows Operating System is not used.

126   For Windows 7 and above, it is recommended that the client workstation hardware conform to Microsoft's specifications found at: http://windows.microsoft.com/en-us/windows/windows-help?os=winxp#windows=windows-7

The following provides the minimum hardware requirements:

Processor

127   The minimum required processor speed is an Intel I5.

Memory

128   The PC must have a minimum of 4 GB megabytes of internal RAM.

Hard Disk

129   The PC must have at least four gigabytes of available disk space on a typical 128 GB hard drive.

Interface Cards

130   The network card must support a high-speed (10 Mbps or greater) network, as it will be required to communicate over Ethernet to an *IESO* supplied router at the *participant* site. The wiring between the *dispatch workstation* and the router is the responsibility of the *participant*. The *IESO* supplied router will communicate over private network (MPLS) to the *IESO*.

Monitor and Graphic Card

131   The supported monitor must be XVGA with a graphic card that is configurable to 1024 x 768 pixels with 'small font' and 65536 colors at a minimum. A higher resolution of 1920 x 1080 pixels is however, recommended.

Sound Card

132   The PC must include an appropriate sound card and speakers for receiving audible alarms.

Printer

133   The recommended printer is high resolution with at least 600 dpi and supports multiple fonts.

3.2.3   Software Requirements

Operating System

134   The PC should be operating with Windows 7 with support for TCP/IP protocol. It is recommended that the latest operating system patches be maintained.

Internet Browser

135   For WEB based message exchange the PC should include the IE 8.0 or IE 9.0 browser.

Connectivity

136   All *dispatch workstations* must maintain a live connection that will allow workstations to receive, send, and acknowledge the messages with the minimum throughput established by the *IESO*.

Power Supply

137 Given its importance, it is strongly recommended that the participant(s) provide an Uninterruptible Power Supply (UPS) to power the dispatch workstation

3.2.4 Functional Parts

138 Message Exchange (ME) consists of several independent functional parts:

a. An ICCP Server responsible for establishing and maintaining the communication between utilities using the ICCP protocol and maintains the communication parameters and status for each link.

b. A Web Server (Servlet or Application Server) responsible for establishing and maintaining communication between *participants* using the https protocol and managing user logins, client requests, publishing client response to SCADA (Supervisory Control and Data Acquisition), subscribing to & performing action requests from SCADA and publishing results of action requests to SCADA.

c. A Web Client providing user interface for the WEB-Based Message Exchange java applet. The software as shown on the "IESO Supported Client Platform" web page is required in order to execute the Message Exchange Applet.

d. The ME Database Server is responsible for storing and retrieving the messages and their status. This database will support both WEB & ICCP.

e. The ME Application Server will co-ordinate the message exchange between different functions. It is responsible for message scheduling and tracking (both WEB and ICCP).

3.2.5 Dispatch Messaging

139 The *dispatch* messages are generated automatically by the *dispatch algorithm* every five minutes. The Exchange Coordinator (EC) monitors the *dispatches* and the EC can prevent the messages from being sent out in the event of a system disturbance while activating *operating reserve*.

140 The availability and reliability of the supporting facilities must be such that the following criteria is met:

a. The Exchange Coordinator (*IESO* BES Control Room Operator), in not more than sixty seconds after issuance of the *dispatch* message, must receive the acknowledgement and compliance indication after issuance of the *dispatch instruction*.

b. The acknowledgement of receipt of a *dispatch* message is automatically performed by the Client application (either *IESO* provided or *participant*). The compliance is a manual action by the *participant* to accept or reject the instruction.

c. The *IESO* shall manage and/or control the ICCP and Web-Based communications *facilities* that support the transmission of *dispatch instructions* to the *participants' dispatch* agent at the point of system injection.

d. Failure of any of the facilities such that the *dispatch* message and/or the reply are not sent/received is alarmed through monitoring software to the Exchange Coordinator upon detection. The alarm is displayed within the message *dispatch* tool and it will be logged in the systems control log. The alarm indicates the actual, or most likely, reason for the failure.

e. An *outage* to any of the supporting message *dispatch* facilities must be addressed with the highest priority.

Dispatches Processed Through Message Exchange

Energy Dispatch

141 The *IESO* issues *dispatch instructions* for each *registered facility*, other than a *boundary entity* and an *hour-ahead dispatchable load facility*, prior to each *dispatch interval*, indicating for that *dispatch interval*:

▪ The target *energy* level to be achieved (in MW) by the *facility* at the end of the *dispatch interval* at a rate, in the case of a *dispatchable load*, equal to the rate provided by the *participant* as *dispatch data*, and in the case of a *generation facility* equal to the most limiting of:

▪ The last *dispatch instruction* and offered ramp rate: or

▪ Actual MW output and the *generations facility's* effective ramp rate

Reserve Dispatch

142   The *IESO* will process reserve *dispatches* through the Message Exchange. Reserve *dispatches* are targets for capacity, in the reserve class specified that are available from a participant's resource after acceptance of the *dispatch instruction*.

Reserve Activation

143   The *IESO* will process reserve activation *dispatches* through the Message Exchange. *Energy dispatches* are target *energy* output or *load reduction* from a *participant's* resource. The *participant*'s resource is expected to follow the *emergency* ramp rate specified during registration of the resource and be at the target within the timeframe specified by the *operating reserve market* for which the *dispatchable generation/load facility* was scheduled.

Automatic Generation Regulation Activation

144   The *IESO* will specify *AGC* obligations of a resource through the Message Exchange. The *AGC* obligations include the *Regulation* Range and may include a specified Base Point that the participant's resource is required to support for a specified period of time.

Voltage Regulation Dispatch

145   *IESO* will be installing the capability to specify voltage *regulation dispatches* for Load and *Generator participants* through the Message Exchange. Currently the *IESO* continues to manage the voltage *regulation dispatches* manually. Voltage *regulation dispatches* can be specified in terms of terminal voltage set point or MVAR output. Voltage *regulation dispatches* are targets for terminal voltage and MVAR output for a *participant*'s resource that should be reached within 5 minutes of acceptance of the *dispatch instruction*.

Invoking the Call Option

146   *IESO* will be installing the capability to inform *participants* that they are required for Must Run or Voltage Support through the Message Exchange. Currently the *IESO* continues to inform *participants,* manually, that they are required for Must Run or Voltage Support.   The Call *dispatch* will identify the *dispatch period* that the *participant's* resource is required for. The *participant* is expected to *bid/offer* into the market as define in the "Market Rules", for the specified *dispatch period*.

3.2.6   Dispatch Message Structure

General Structure of All Dispatch Messages

147   *Dispatch* messages are composed of a message header and a message b3.2ody. The content of messages is not 'case sensitive'.

148   The message header identifies the message and is a common format for all messages.

149   The HEARTOUT, HEARTIN, ACCEPT, REJECT, RECEIPT, CONFIRMATIONOK, AND CONFIRMATIONNOTOK only include the header information.

150   *AGC* dispatch messages may be sent in one of two forms:

(1) Dispatch Message Body – Regulation with Range Dispatch Only: will include the following fields:

- Persistent Resource
- DISPATCH_TYPE = 'RGR'
- Startstop = 'Start'
- RESOURCE_ID
- REGULATION_RANGE = The *regulation* range in MW expected from the resource.
- DELIVERY_START_TIME
- DELIVERY_STOP_TIME

(2) Dispatch Message Body – Regulation with Range and Fixed Base-Point Dispatch: will include the following fields:

- Persistent Resource
- DISPATCH_TYPE = 'RGS'
- Startstop = 'Start'
- RESOURCE_ID
- AMOUNT = The fixed base point in MW that the unit will operate at while on AGC.
- REGULATION_RANGE = The *regulation* range in MW expected from the resource.
- DELIVERY_START_TIME
- DELIVERY_STOP_TIME

151 For details of the Dispatch Message Structures and sample examples of all the message types, please refer to the "Web Based Message Exchange – Market Participant's Guide" document, which is available on *IESO*'s web site (see the Technical Interfaces page of *IESO*'s web site).

3.2.7   Dispatch Message Scenarios

152 Heart beat messages are sent by the *IESO* to determine whether the *participant* is able to receive *dispatch instructions* from the *IESO*.

IESO – Action	MP –Response	Comment
HEARTOUT	HEARTIN	The *IESO* will send a HEARTOUT message every 60s to check for an active MP message exchange client. If the *IESO* does not receive the HEARTIN response from the client with a specified period of time (currently configured to 10s) the MP client is considered out of service and the Exchange Coordinator be informed of the problem.

153 The following scenario demonstrates the Based on the *bids* and *dispatch* scheduling optimizer (DSO) *dispatches* GENERIC-LT.G2 to 268MW at 2000/08/30 9:05 with the

expectation that that the instruction will be met at 2000/08/30 9:10. The *dispatch* MP accepts the *dispatch* and complies with the instruction.

IESO – Action	MP – Response	Comment
ENERGY DISPATCH: RESOURCE_ID=GENERIC-LT.G2 DISPATCH_TYPE=ENG AMOUNT=268 DELIVERY_DATE=2000/08/30 DELIVERY_HOUR=10 DELIVERY_INTERVAL=2	RECEIPT	The MP client should immediately send a RECEIPT message back to the *IESO* acknowledging that the message has been received.
	ACCEPT	The MP client should send an ACCEPT message to inform the *IESO* that they intend to comply with the *dispatch*.
		The *IESO* receives the ACCEPT message and initiates compliance monitoring of the requested *dispatch*.
CONFIRMATIONOK		The COMFIRMATIONOK message is sent to confirm that the ACCEPT message was received and acknowledged by the *IESO*.

154 The following scenario demonstrates what will happen when the *participant* rejects a *dispatch* message.

IESO – Action	MP – Response	Comment
ENERGY DISPATCH: RESOURCE_ID=GENERIC-LT.G2 DISPATCH_TYPE=ENG AMOUNT=268 DELIVERY_DATE=2000/08/30 DELIVERY_HOUR=10 DELIVERY_INTERVAL=2	RECEIPT	The MP client should immediately send a RECEIPT message back to the *IESO* acknowledging that the message has been received.
	REJECT	The MP should send a REJECT message to inform that they do not intend to comply with the *dispatch*.
		The Exchange Coordinator is informed that the *dispatch* was rejected.
CONFIRMATIONOK		The COMFIRMATIONOK message is sent to confirm that the REJECT message was received and acknowledged by the *IESO*.
		The Exchange Coordinator will assess the impact of the REJECT and choose alternate resources as required.
		The Exchange Coordinator will request additional information from the *participant* to explain the reasoning behind the REJECT of the *dispatch* instruction.

155 The following scenario demonstrates what will happen if the *participant* does not respond to a *dispatch instruction.*

IESO – Action	MP – Response	Comment
ENERGY DISPATCH: RESOURCE_ID=GENERIC-LT.G2 DISPATCH_TYPE=ENG AMOUNT=268 DELIVERY_DATE=2000/08/30 DELIVERY_HOUR=10 DELIVERY_INTERVAL=2		The MP client should immediately send a RECEIPT message back to the *IESO* acknowledging that the message has been received. If the RECEIPT message is not received within 20s the Exchange Coordinator will be made aware of the problem.
		If a response to the *dispatch instruction* is not received within 60 seconds, the *dispatch instruction* is considered to be in a timeout state, which locks out the MP client from further accepting or rejecting *the dispatch instruction*. If, within 30 seconds after a *dispatch instruction* has timed out, *participants* call and request the *IESO* to manually accept or reject *the dispatch instruction*, the *IESO* will attempt to do so on their behalf. If, within those 30 seconds, the *participants* do not request the *IESO* to manually accept or reject *the dispatch instruction*, the *IESO* will consider that the *participants* have rejected *the dispatch instruction*.

3.2.8   Real Time Network

156   The Real Time Network will be used for:

  a.   Real time data acquisition of power system data required by the *IESO* to operate the power system;

  b.   *Dispatch* of *automatic generation control* (*AGC*) control commands; and

  c.   *Dispatch* messaging.

157   Function (a) and (b) above are typically executed by an RTU, and function (c) by a *dispatch workstation*.

158   Real-time network communication with the *IESO* Control Center is typically via a MPLS communications network, but could also be via a site-to-site VPN connection over the Internet for medium performance sites. The MPLS network will be made available by the *IESO* to the *participant*, or, in the case of a medium performance site where the VPN option is preferred, the *participant* will provide access to the public internet. In some cases, where the size and the location of the *participant's* electrical plant warrants, a secondary communications system for increased *reliability* will also be made available.

159   The connection to the Real Time Network for an RTU or a functionally equivalent device e.g. PML *meter*, requires the *participant* to provide the following:

  a.   i)   Where MPLS access is the preferred method, physical access for the communications carrier and *IESO* to the *participant* site to install a local loop and other required premises equipment such as the MPLS router and a DNP3 communications device must be provided.

       OR

       ii) Where site-to-site VPN is the preferred method for a medium performance site, logical access via Internet Service Provider (ISP) to the public internet from the *IESO* network security device as well as physical access for *IESO* to install premises equipment such as a network security device and DNP3 communications device must be provided.

  b.   Space to house the customer premises equipment in a suitable environment (e.g. dry, clean, 0 – 40°C, free of Electro-Magnetic interference, etc.)

  c.   A suitable power source for the customer premises equipment (typically a reliable source of 120V ac, 60 Hz – usually from a UPS with a total load capacity of 500 Watts) with at least 8 hours of survivability after loss of commercial power.

  d.   Access for maintenance personnel as needed.

  e.   Connectivity from the *participant* equipment to the customer premises equipment as stated for the particular device.

  f.   A point of contact (a person and telephone number) to enable the *IESO* to request repairs by the *participant* for telemetry failures.

MPLS connection diagram:
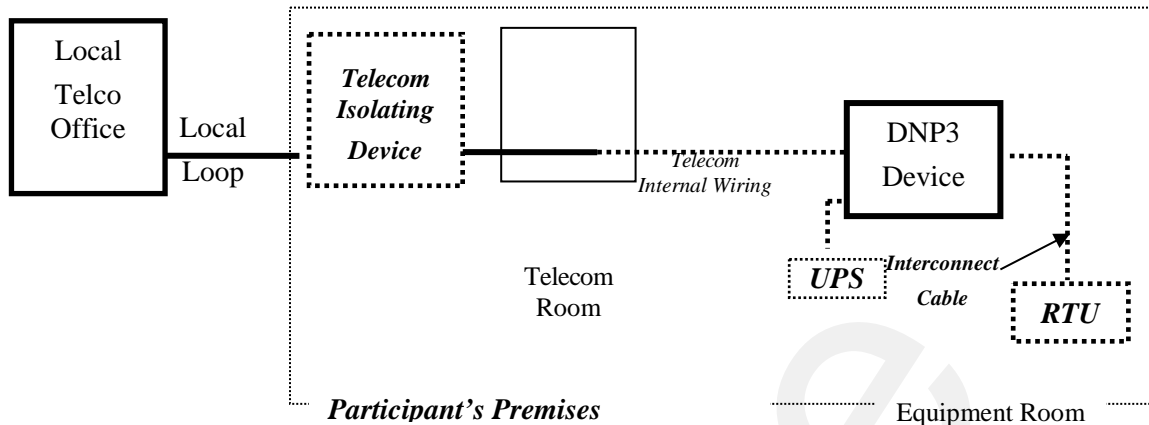
(Legend: *IESO* responsibility _____   *Participant* responsibility   ) ········

Site-to-Site VPN connection diagram:
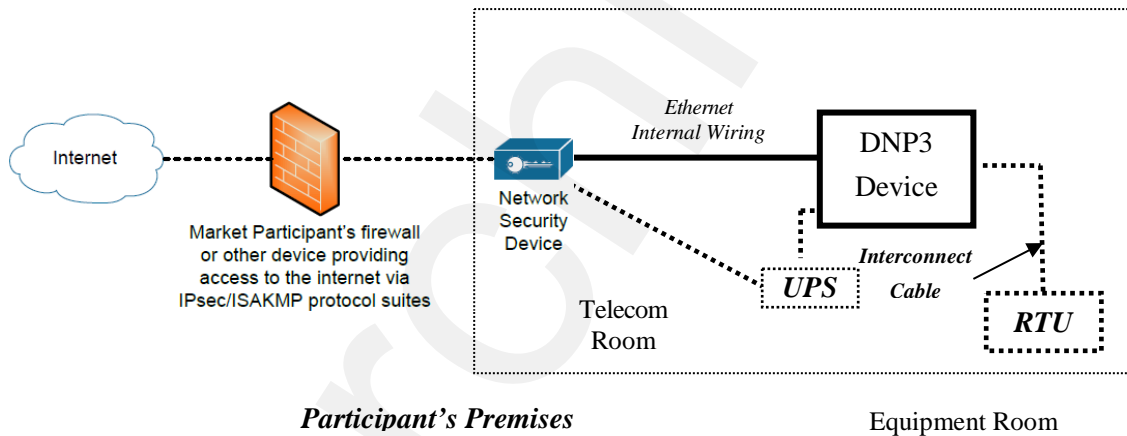
(Legend: *IESO* responsibility _____   *Participant* responsibility   ) ········

Figure 3-2: Responsibilities for Telecommunications and Site Readiness for RTUs

160   The connection to the Real Time Network for a *dispatch workstation* requires the *participant* to provide the following:

a.   Access for the communications carrier to the *participant* site to install a local loop and other customer premises equipment.

b. Space to house the customer premises equipment (Router) in a suitable environment (e.g. dry, clean, 0 – 40°C, free of Electro-Magnetic interference, etc.)

c. A suitable power source for the customer premises equipment, typically a reliable source of 120V ac, 60 Hz.

d. Access for maintenance personnel as needed.
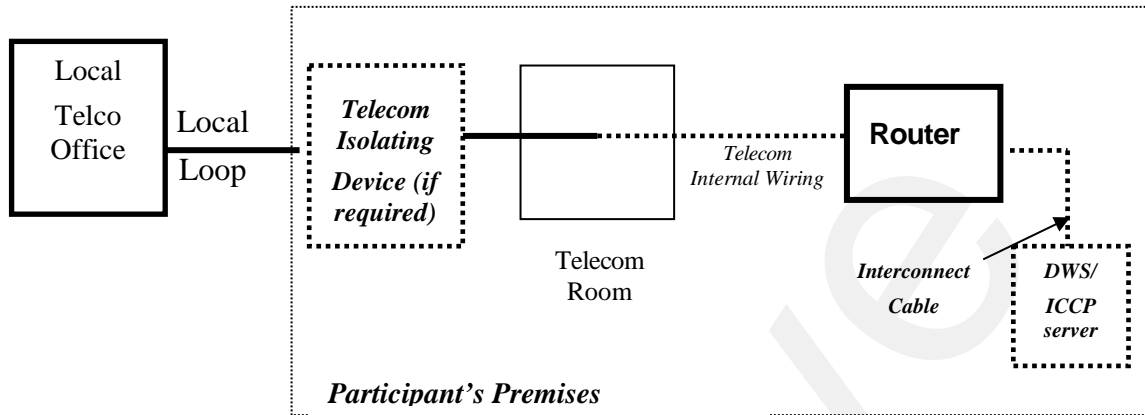
(Legend: *IESO* responsibility_____   *Participant* responsibility   )........

Figure 3-3: Responsibilities for Telecommunications and Site Readiness for DWS/ICCP Server

3.3   Dispatch Service

3.3.1   Overview

161 Dispatch Service system allows Participants to retrieve and accept/reject dispatch instructions as well as easily search current and historical dispatch instructions, up to 60 days in the past, with the ability to sort and filter the data based on multiple criteria.

162 Dispatch Service system uses web/internet based communication (HTTPS protocol).

163 During transitional period (Dispatch Message Exchange and Dispatch Service operate in parallel), IESO will be able to send dispatches for each Participant to either Dispatch Message Exchange system or Dispatch Service system.

164 Dispatch Service system will eventually replace Dispatch Message Exchange system.
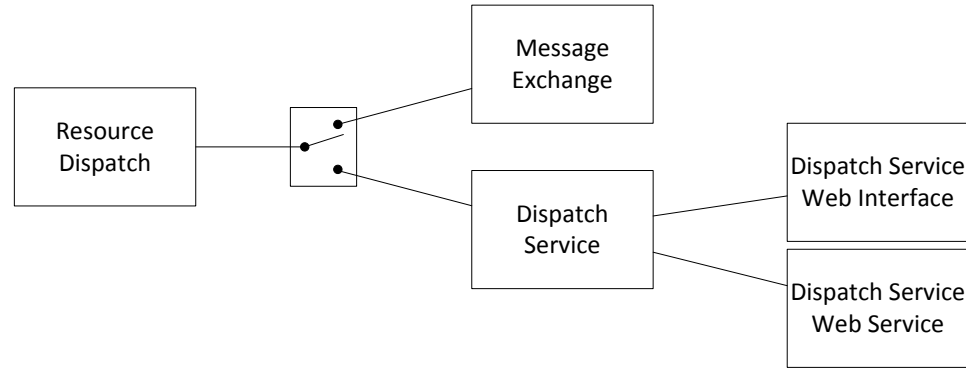
165

3.3.2   Dispatch Service Web User Interface

166   Dispatch Service system has a web user interface which allows Participants to view and accept/reject dispatch instructions as well as easily search current and historical dispatch instructions, up to 60 days in the past, with the ability to sort and filter the data based on multiple criteria. "Dispatch Service Client User Guide" (http://www.ieso.ca/-/media/files/ieso/document-library/training/dispatch-service-web-client-user-guide.pdf) describes the web user interface in details.

3.3.3   Hardware & Software Requirement – Web User Interface

167   Refer to section 2.1 Participant Workstation for Hardware and software requirements.

3.3.4   Dispatch Service Web Service

168   Dispatch Service web service consists of a set of operations through which users retrieve and respond to dispatch instructions. Participants need to integrate the web service into their own systems. The "Dispatch Service Web Service Design Specification" (http://www.ieso.ca/sector-participants/technical-interfaces) contains detailed description of Web Service request, response, and error messages.

3.3.5   Hardware & Software Requirement – Web Service

169   Refer to section 2.1 Participant Workstation for Hardware and software requirements.

3.3.6   Dispatch Notification Service

170   In addition to the Dispatch Service web service through which dispatch workstations retrieve dispatch instructions, dispatch messages can be pushed to Participants' server if MPs host a Dispatch Notification Service. Dispatch notification service is described in "Dispatch Notification Web Service Design Specification" document (http://www.ieso.ca/sector-participants/technical-interfaces).

3.3.7 Hardware & Software requirement – Dispatch Notification Service

171 Refer to section 2.1 Participant Workstation for Hardware and software requirements.

3.4 Voice Communication Specifications

172 Voice communications are broken into two categories:

- Normal-priority path *participants*; and
- High-priority path *participants*.

173 The determination for whether a *participant* requires a High Priority path is defined in the "Market Rules" Appendix 2.2. Regardless of the status of the *participant*, all calls will be 'caller identified' and handled through confidential links between sites. All calls involving *IESO* operations will be recorded by the *IESO* and must be responded to as set out in the *market rules*.

174 In either category, voice communications between the *IESO* and *participants* is critical for reliable and secure operations of the high-voltage electrical grid and is required by the "Market Rules" (Chapter 5, Section 12.2).

The *IESO* uses MSAT telephone services. MSAT satellite telephone service is considered to be a High Priority path in that it does not use the Public Switched Telephone Network to complete calls between MSAT callers. It is therefore capable of providing an independent communication function between the *IESO* and new *participants*. Other satellite telephone services are not considered because they require Public Switched Telephone Network links to either complete a call or to interconnect with *IESO* MSAT communications

3.4.1 Normal-Priority PATH

175 A normal priority path will be of a type and capacity that allows unblocked communication with the *IESO*. This will be the primary path used during the normal conduct of business between a *participant* and the *IESO*. It may consist of a dedicated telephone number on the Public Switched Telephone Network (PSTN) to be used by the *IESO* only or an extension of a private network or Virtual Private Network (VPN) from either party. This path may involve connection to an *IESO* approved or administered network. Whatever mode is used this circuit will:

a. provide inherent privacy for the users with the ability to add other parties by invitation only;

b. interface with the *IESO* through the normally available PSTN facilities. Where available, caller identification will be available on this line. Such a *facility* shall be exempt from restriction by Line Load Control and/or have Priority Access for Dialing status; and

c. not be routed by the *participant* into an answering machine or Voice Mail that impedes or delays an immediate interactive conversation with a live person in attendance at the facility.

3.4.2   High-Priority PATH

176   A High Priority circuit will be of a type that provides backup communication between *facilities*. It must be 'hardened' against failure due to loss of commercial power at any point (MSAT Synchronous satellite communication facilities may be considered as 'hardened' *facilities* but are not desired as primary operating *facilities* due to the delay time involved in conversing over the link). In addition to the normal priority path requirements these *facilities* will:

a.   continue to operate for a minimum of eight hours after the loss of commercial power at any point;

b.   be protected against loss of service that may result from overload of the common carrier's public facilities; and

c.   be a circuit with physically diverse path from the Normal Priority path to eliminate any common point of failure.

177   An 'autoringdown' circuit and other similar dedicated facilities may be considered as High Priority and 'hardened' depending on location.

178   Connection to an *IESO* approved, administered, or operated network may also be considered acceptable as a High Priority path. The MSAT network is a presently approved network. Other satellite networks are not approved due to reliance on PSTN connectivity being required to either complete a call or to interconnect with MSAT telephones.

179   All conversations between a *participant* and the *IESO* are confidential and will ordinarily connect only the two concerned parties. Other parties may join the conversation by invitation only.

180   The *IESO* will record all calls involving *IESO* operations. For all other cases, if a *participant* desires call recording, it is the responsibility of that *participant* to record the call.

3.4.3   Security

181   All communications between the *IESO* and the *participant* are considered confidential and therefore it is recommended that unencrypted radio frequency transmitters, such as cellular phones and other wireless technologies, not be used for communications

3.4.4   Diverse Path

182   A diverse path will not use either the same physical path or equipment between sites. This does not include the end user devices.

– **End of Section –**

4. Operational Metering Equipment & AGC

183   (For supporting rule references, please refer to "Appendix 2.2, Section 1.2 of the *market rules"*)

4.1   Operational Metering Equipment

4.1.1   Introduction

184   This section covers operational metering requirements. It does not cover specific *revenue metering* requirements.

185   Real-time operational information from *participants* is required by the *IESO* for the operation of the high voltage *electricity system*. *Participants* provide this information by using appropriate monitoring equipment that they supply. The information is sent to the *IESO* over *IESO* provided Real Time Network.

186   Specifics for the types of monitoring equipment required by the *IESO* are detailed in the "Market Rules", Chapter 4. The requirements in terms of quantities measured and performance for operational metering are mainly based on the *facility* ratings.

187   Remote real-time data can be provided to the *IESO* by the *participants* using two standard data transfer protocols:

   a.   Distributed Network Protocol (DNP), and/or

   b.   Inter Control Center Protocol (ICCP).

4.1.2   Qualified Devices

188   The standard device for collecting real-time information is the Remote Terminal Unit (RTU). Real-time information about the disposition of the *participants' facility* is collected from the *participant* supplied RTU's and forwarded on a regular basis to the *IESO* Control Center. The Energy Management System (EMS) at the *IESO* Control Center polls the RTUs for information every two to four seconds. Total data latency must not exceed four seconds.

189   The EMS communicates with the RTUs using the DNP 3.0 protocol. The Binary Input Data are Object 1, Qualifier 01, Variation 1 (normal) and Variation 2 (not normal). The Analog Input Data are Object 30, Qualifier 01, Variation 4 (normal) and Variation 2 (not normal) with Application Confirm Request. All data must show Data Quality Flags when not normal, such as Off Line, Restart, Communication Lost, Local/Remote Forced, Over-range. If data are derived from some intermediate devices, these flags must indicate any manual manipulation or failure of these data in these devices. Pseudo data do not require any Data Quality Flags.

190   DNP (Distributed Network Protocol) is an open, standards-based protocol used in the electric utility industry to address interoperability between substation computers, RTUs, IEDs (Intelligent Electronic Devices) and master stations. This protocol is based

on the standards of the International Electrotechnical Commission (IEC). DNP 3.0 is the recommended practice by the IEEE C.2 Task Force for RTU to IED communications.

191   The document "DNP 3.0 Subset Definitions" is available to DNP User Group members at the DNP User Group Web site (http:/www.dnp.org). This document will help DNP implementers to identify protocol elements that should be implemented.

192   If the *participant* wishes to use more than one *meter* at a location for the transmission of real-time data to the *IESO*, the *IESO* requires that the data be combined to one data concentrator such as an RTU so that only one telecommunications connection is required. The data from a failed meter or device must show the Offline and Communication Lost Flags.

193   If ICCP (Inter Control Center Protocol) is used for real-time data transfer to the *IESO*, the *participants* will provide their own ICCP server and software or optionally use a third party's ICCP server and software. Co-ordination with the *IESO* is necessary to establish the communication link between the *participant* and the *IESO* Control Centers.

194   The overall requirements for *reliability* and performance of the monitoring and control equipment are specified in Chapter 4 of the "Market Rules".

4.1.3   Field Instrumentation Standards

195   The field instrumentation standard focuses on overall accuracy of the measurements being reported to the *IESO*. The accuracy requirement is for an overall end-to-end measurement error no greater than two percent of full scale.

196   This measurement error is the sum of all the errors in the measurement chain. Typically the measurement chain is comprised of:

  a.   primary conversion by potential and/or current transformers;

  b.   secondary conversion by transducers; and

  c.   report by the RTU.

197   Any load *meter* reading must accurately reflect the quantity being measured regardless of load balance across the phases. For generation, a minimum of 2 metering elements is required.

198 As a guideline to the *participants*, the anticipated errors in the measurement chain described above are:

 a. Primary conversion 0.5% of full scale

 b. Secondary conversion (transducers) 0.5% of full scale

 c. Report by the RTU, comprising analogue to digital conversion by the RTU and quantification errors 1.0% of full scale

199 The above accuracy standards are expected to be met by all new installations. However, for existing installations, the existing instrumentation transformers and burdens will be accepted by the *IESO*, for the life of the instrumentation transformers, except where their accuracy is insufficient for monitoring quantities that affect the system limits of the *IESO* controlled electricity network. It is up to the *participant* to ascertain with the *IESO*, during *facility* registration, whether the accuracy of their instrumentation transformers would have such impact.

4.1.4 Data Specifications

200 The specific data that needs to be made available to the *IESO* depends not only on the electrical capacity of the *participant facility* and its participation in the market, but also on other factors that influence the safe operation of the *IESO-controlled grid*. The detailed requirements are available in Chapter 4 and associated Appendices of the "Market Rules" and through consultation with the *IESO*.

201 In a generic sense, the data monitored falls into two classes – analogue and status.

Analogue Points

202 These are continuously varying measurements such as watts, volts and amps. Typically the measurements are derived from a primary conversion device such as potential or current transformer and a transducer. This measurement chain scales down the actual electrical value that the RTU can report, for example, 0 – 100 MW to an analogue representation of 4-20 mA or 0-1 mA. *Participants* may contact the *IESO* for more detailed information.

Status Points

203 Status points are typically discreet, binary values such as the open or closed status of a switch. This information is presented to the RTU by a contact whose state is representative of the state of the device being monitored. *Participants* should check the RTU vendors' literature for available options in status monitoring.

4.1.5 Power Supply Specification

204 As the data received from the RTU is an integral piece to the operation of the electricity grid, the RTU and associated communications equipment requires connection to a secure source of power. Therefore the RTUs must be powered from an industrial grade uninterruptible Power Supply (UPS) or from continuously charged batteries. In case of a power failure, sufficient battery capacity must be provided to permit ongoing operation of the RTU for a minimum of eight hours.

205 The RTUs must be operated in an environment of –40°C to +80°C and 95% non-condensing relative humidity.

4.1.6   Communications Specification

206   The RTUs can communicate with the *IESO* using either a serial port (operating in the range of 4.8 - 19.2 kbps) or an Ethernet port (10 Mbps) using IP - please check with the *IESO* at the time of your installation. Ethernet (IP) connections must comply with the specifications outlined by the DNP Users Group in the document entitled, "Transporting DNP3 over Local and Wide Area Networks." The communications port will be connected to the Real Time Network supplied by the *IESO* located at the *participant's facilities*.

207   The Real Time Network's customer premises equipment (FRAD and DSU) require a secure source of power supplying 115 Vac. The use of an inverter, backed with at least 8 hours of battery power, will normally provide this *reliability*. The inverter may also supply power to the RTU. If required, the *IESO* can recommend a dedicated inverter and a bypass-switch for powering the telecommunications equipment. In this case, the primary source of power will be a *participant* provided dc supply to the inverter in the range of 100-280 Vdc capable of supplying the load for at least 8 hours and a secondary 115V ac source connected to the bypass switch.

208   For the *IESO* supplied telecommunications equipment, the acceptable environment is 0°C to +40°C and 5% - 90% non-condensing relative humidity.

4.1.7   RTU Site Certification

209   The certification of an RTU site is composed of the following activities:

a.   Field Instrumentation Accuracy Audit;

b.   Environment Audit;

c.   Telecommunications connection; and

d.   RTU Check-In Service.

210   Upon the successful completion of the site certification process by the *IESO*, the RTU Site is certified as acceptable for market use. Each of the above certification activities is described in more detail below.

211   Field Instrumentation Accuracy Audit, which is the verification of all the errors in the measurement chain, may be required by the *IESO*. The *participant* should be able to demonstrate that the overall measurement error is no greater than two percent of full scale. An acceptable method would involve a combination of manufacturers' specifications and calibration records.

212   Environment Audit may be required to verify the physical and electrical environment for the RTU and *IESO* installed telecommunications equipment. The *participant* may be required to demonstrate that the electrical power supplies meet the requirements. Also, the *participant* may be required to demonstrate that the environment in which the RTU and telecommunications equipment is installed meets the manufacturer's environmental requirements.

213   A telecommunication connection must be established between the *participant* and *IESO*. *Participants* will grant access to their premises to *IESO* staff or *IESO* designated staff to establish the required telecommunication connection.

214   The work involved in establishing this connection typically includes:

a. installation of a local loop between the RTU location and a telecommunications service provider;

b. installation of telecommunication equipment at the *participant's* premises. Typically this equipment is comprised of two small modules, router/security device and DNP3 communication device; and

c. verifying that the telecommunication connection is working properly.

215 RTU Check-In Service is the final step in RTU Site Certification. This involves the verification of the accuracy of the RTUs database to ensure a proper correspondence between the actual field device such as a breaker or measurement and the representation in the RTU. The proper operation of the RTU with *IESO*'s Energy Management System (EMS) and the verification of the RTU database being transmitted to the *IESO* will also be verified. Details of the check-in-service process are available from the *IESO*.

4.2   AGC Operational RTU Specifications

216 *Automatic generation control* (*AGC*) is a contracted *ancillary service* used by the *IESO* to fine-tune the match between generation and load. Specific details of implementation will be determined during the contracting process.

217 The actual control of *generators* under *AGC* is accomplished by control signals sent directly by the *IESO* to the plant controller or RTU installed for data gathering and control. **The *IESO* can send either pulse commands to raise or lower generation or it can send MW setpoint commands to change the current generation. The type of signal the sent to a specific unit that is providing *AGC* is determined by the *IESO* and is also dependent on the design of the unit's governor system which controls the power input to the generator.** A number of associated data inputs, such as *generator* status, *generator* output, etc. must also be telemetered by the RTU to the *IESO* Control Center.

218 The control signals from the plant controller or RTU will issue raise/lower pulses using an output relay. These can be dry or wet contacts depending on the configuration. The pulses typically are one second in length. On receipt of a raise/lower pulse, the generating units under *AGC* control are expected to change their output MW by a pre-determined amount.

219 Units which do not have remote MW setpoint capability in their governors will execute a power change based on the pulse width (time that the pulse is active) of the raise or lower pulse provided by the *IESO's AGC* controller. The pulse width is used to change the position of the unit's power control device – usually a hydraulic gate or a steam turbine governor valve. The resulting power change may not be exactly what was intended by the *AGC* controller. During the next pass of the *AGC* controller (typically every 2 seconds) the error will be detected and a further adjustment made by the *AGC* controller to all the units participating in *AGC*.

220 Units which have MW controllers with remote MW setpoint capability can choose to use either a pulse width to raise or lower the MW setpoint value or they can chose to use a direct MW setpoint value provided by the *IESO's AGC* controller. A direct MW setpoint value is preferred because it eliminates any error in converting the pulse width into a MW value. This specification applies to those units that have a MW controller

with remote MW setpoint capability. A typical block diagram of the entire *AGC* control loop is shown in Figure 4-1 below.
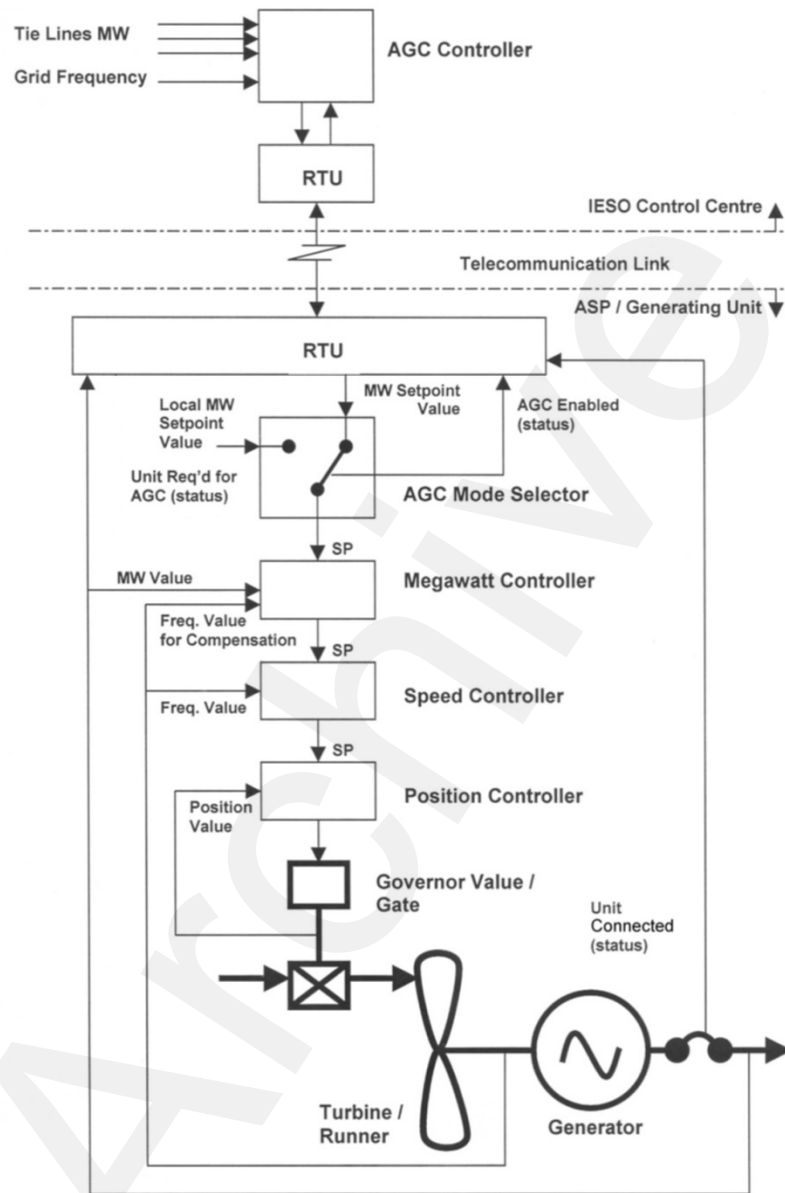
Figure 4- 1 Block Diagram of Typical AGC Control Arrangement for Generation units With Remote MW Setpoint Control Capability

221   The information necessary to control the *generation facility* under the terms and conditions of the *AGC* contract will reside and operate in the EMS according to the existing control schemes.

222   It is the *participant's* responsibility to protect their equipment from damage due to erroneous pulses or spurious signals that may cause the equipment to operate beyond its designed parameters, regardless of how these signals were generated or transmitted.

5.   Market Applications

5.1   Market Application Systems Information

5.1.1   Overview of Dataflow Systems

223   The figure below provides an overview of the dataflow from the *participants* to the *IESO* systems. The following paragraphs also provide technical details of various market applications and application interfaces. It is not intended to provide procedural information, being outside the purview of this document. Procedural information is available in the relevant *market manuals*.

Energy Bids & Offers (Gen, Ld, Imp, Exp)
Energy Schedules (Int, Slf, NonD)
Bilaterals
Operating Reserve Offers (Gen, Imp, Load)
Standing Bids for Energy, OR & Sched
SUBMIT, REVISE, DELETE, REVIEW

Market Participants

Acceptance of Submission
Transaction Code
Errors if any

Invoices
CR- Reports

Market Results:
Accepted Amounts
Clearing Prices

Financial Bids & Offers
Standing Bids
SUBMIT, REVISE, DELETE, REVIEW

Interface System (MIM*)
GUI hosted in IESO Portal

Revenue Metering System

HandOff for MV-Star
Data Requests

Energy Bids & Offers
OR Offers
Schedules

Contracts

MIS System

Accepted Amounts
Clearing Prices & Volumes
Constraints
Shadow Prices?

Accepted Amounts
Schedules?

EMS System

FEM Schd & Prc
RTEM Schd & Prc
OR Schd & Prc
CR Schd & Prc
BIlaterals
RTEM Prc Crvs
OR Prc Crvs
RTEM Zonal Prc
OR Zonal Prc

Public Information
System Forecasts
System Status
Market Prices & Volumes
MIS Constraints

Invoices
CR Reports

Commercial Reconciliation

Market Participants
&
Public Info

Figure 5-1: Overview of Dataflow from the MP to IESO systems

5.1.2   Energy Market Application

224   The Market Information Management (MIM) system at the *IESO* is responsible for receiving *participant bids* and schedules, and then publishing market results. Commercial *settlement* reports and *invoices* may be downloaded via the *IESO* Reports Web Server. The *participant* may communicate with the system using three mechanisms:

a.   Through a *IESO* provided browser-based GUI;

b.   Through a programmatic interface via an *IESO* provided API (Web Services).

Bid Data Validation

225   Submissions are checked for date and all other validations. Submissions for *bids* in the mandatory window must be made not later than 10 minutes before the mandatory hour closing.

226   Data coming in to the Market Operating System (MOS) is subject to validation. Three types of validation rules are recognized: syntax validation, technical feasibility checks, and commercial acceptability checks. Invalid data will be rejected with the appropriate error messages being posted to the sender.

227   *Bids/offers* submitted during the mandatory or restricted window will require *IESO* operator approval/rejection. In case of acceptance of a *bid/offer* that is submitted during the mandatory/restricted window and which exceeds the change tolerances, the *IESO* operator will communicate the decision to the *participant* as a system log message. This *bid/offer* will then also be included in the valid *bid* report. If the *bid* is rejected by the Exchange Coordinator, the decision is communicated to the *participant* via a system log message.

228

MIM Web Services

229   The MIM Web Services Definition Language (WSDL), the XM Schema Definition (XSD) and the Web Services Client Tool (MWT) are provided at the *IESO* Web site under Technical Interfaces (*Market Participant Submissions*) for viewing or downloading.

230   The MIM Web Services is a SOAP based web services and *participants* can use the operations to submit and download dispatch data using XML formatted files.

231   *Participants* can download their applicable Bids/Offers data using the following query operations:

Type of Bids/Offers	Web Services Function
Real Time Energy Market (RTEM)	RTEMBidQueryOperation
Operating Reserve	OperatingReserveBidQueryOperation
Schedule	ScheduleQueryOperation

| Bilateral Contract | BilateralBidQueryOperation |
| Daily Generation Data (DGD) | DGDBidQueryOperation |

232 *Participants* can create a new Bid/Offer or update their existing Bids/Offers data using the following upload operations:

Type of Bids/Offers	Web Services Function
Real Time Energy Market (RTEM)	RTEMBidUploadOperation
Operating Reserve	OperatingReserveBidUploadOperation
Schedule	ScheduleUploadOperation
Bilateral Contract	BilateralBidUploadOperation
Daily Generation Data (DGD)	DGDBidUploadOperation

233 *Participants* can cancel their existing Bids/Offers data using the following cancel operations:

Type of Bids/Offers	Web Services Function
Real Time Energy Market (RTEM)	RTEMBidCancelOperation
Operating Reserve	OperatingReserveBidCancelOperation
Schedule	ScheduleCancelOperation
Bilateral Contract	BilateralBidCancelOperation

234 *Participants* can query market statuses by calling the "MarketStatusOperation" function.

235 *Participants* can query market messages by calling the 'MarketMessageOperation' function.

236 *Participants* can retrieve a list of resources for which the account has permission to submit/download Bids/Offers data by calling the 'ResourceOperation' function.

237 *Participants* can retrieve a list of participants for which the account has permission to submit/download Bids/Offers data by calling the 'ActAsMarketParticipantOperation' function.

5.1.3   Settlements Application

238 The current Commercial Reconciliation system produces *settlement statements*. The *IESO* Funds Administration (FA) applications group produces *invoices*. *Participants* have the ability to review and/or download the invoices through the *IESO* Reports web server. *Settlement statements* are similarly available through the secure *IESO* Reports web server (https://reports.ieso.ca/private/)

239 Detailed information regarding the precise format of *settlement statement* files and supporting data files is detailed on the Technical Interfaces page of *IESO*'s Web site.

240 Further information regarding *charge type* calculations may be found on the Technical Interfaces page of the *IESO*'s Web site.

Settlement Statement Files

241 The *settlement statement* files and supporting data files contain *settlement amounts* and the underlying data used in those calculations for a *participant*. The data included

mostly pertains to a particular trading date (the primary trade date), but it may also contain missing charges from prior trading dates. Content, field usage, and format are detailed, in "Format Specification for Settlement Statement Files and Data Files", and may be found on the Technical Interfaces page of the *IESO*'s Web site.

242   Some general notes about the statement files are listed below:

Participants will download the files via secure access from the IESO Reports web server.

The timeline for generating the preliminary and final statements for the financial and *physical markets* is detailed in the "Settlement Manual". In general terms however, their issuance is based on a *business day* timeline rather than on a calendar day timeline and is specifically governed by:

- The *IESO Settlement Schedule & Payment Calendar* ("Market Rules" Ch. 9 Section 6.2, "Market Manual 5: Settlements Part 5.1: Settlement Schedule and Payment Calendars (SSPCs)"); and

- Any emergency procedures that may have to be invoked by the *IESO* under the *IESO* "Market Rules".

The companion data files are issued following the same timeline as the Statement Files.
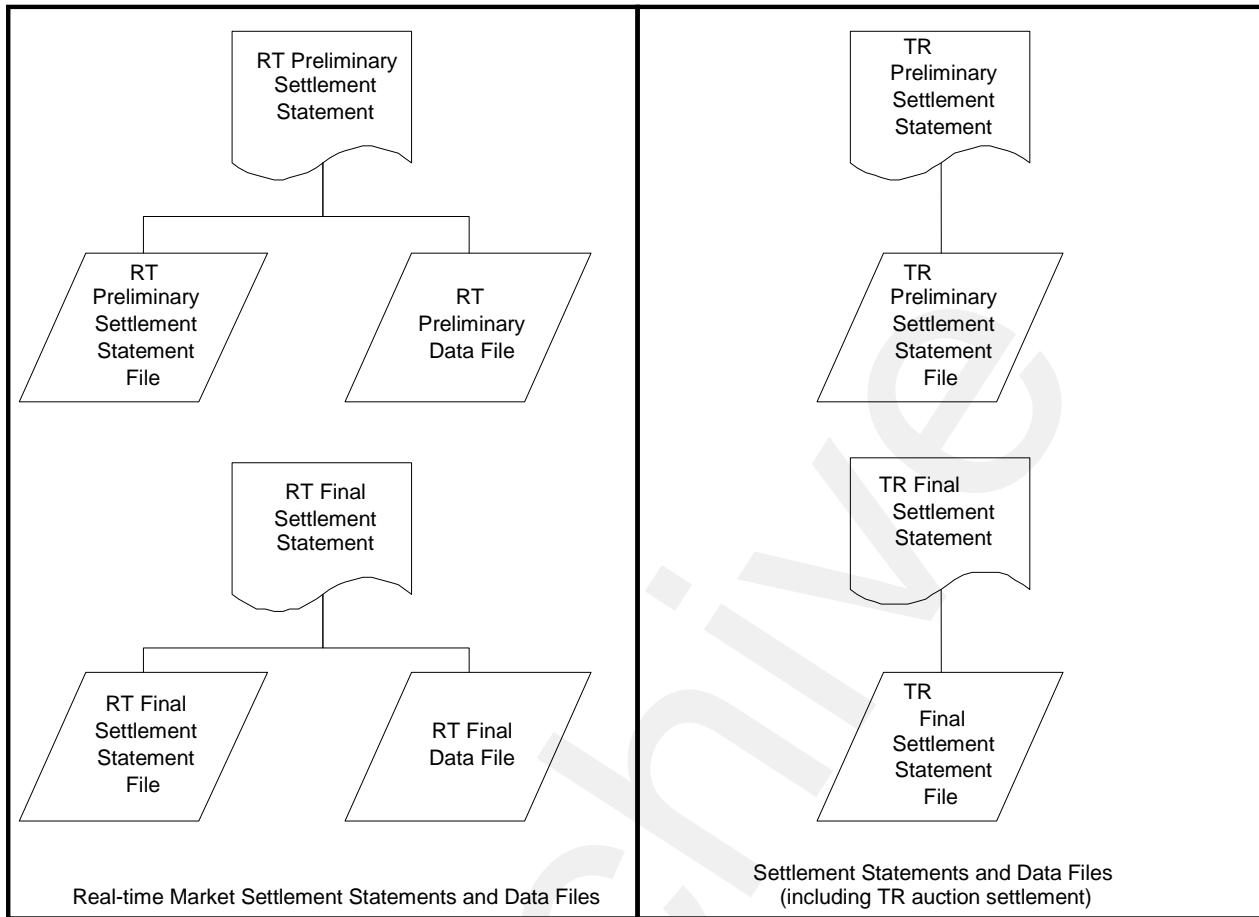
Figure 5-2: Schematic Overview for Settlement Statements and Data Files

243 The *preliminary settlement statement* provides each *participant* with an opportunity to review all *settlement amounts* that have been calculated for a particular *trading day* and raise a *notice of disagreement* if necessary. After a predetermined *notice of disagreement* period, a final statement is generated.

244 Information regarding the format of the *settlement statement* files and supporting data files is provided in, "Format Specification for Settlement Statement Files and Data Files".

Settlement Statement Supporting Data Files

245 The timeline for issuing the preliminary and final data files for a given trading date are detailed in the "Settlement Manual". In general terms however, their issuance is based on a *business day* timeline rather than on a calendar day timeline and is specifically governed by:

- The *IESO Settlement Schedule & Payment Calendar* ("Market Rules" Ch. 9 Section 6.2, "Market Manual 5: Settlements Part 5.1: Settlement Schedule and Payment Calendars (SSPCs)"); and

- Any emergency procedures that may have to be invoked by the *IESO* under the *IESO* "Market Rules".

- With each set of *settlement statement* files, each *participant* will receive a data file. Each data file will correspond to a statement, and will have the same *settlement statement* ID.

- The data contained in the supporting data file provides each *participant* supporting data that is used in calculating the preliminary *settlement* for a particular trading date in the *physical market*. The final *settlement* data file contains the supporting data that is used in calculating the final *settlement*.

5.1.4 Portal On-line Settlement Forms Application

246 Within the *IESO* Portal the On-line Settlement Forms application provides functionality to permit secure submission and historical search for a number of settlement data on-line forms. This includes but is not limited to:

- Ontario Power Generation Rebate Returned to the *IESO*

- Submission of Transmission Service Charges for Embedded Generation

- Embedded Generation and Class A Load Information

Over time on-line settlement data submission forms and functionality will be updated to meet current requirements.

5.1.5 Portal Prudential Manager Application

247 Hosted within the *IESO* Portal the Prudential Manager Forms application provides functionality to permit participants to understand and manage their prudential requirements. This includes information on estimated net exposure, margin call warnings, margin calls, prudential support obligations, prudential support posted, prudential support reassessments, notification of prepayments and default notices.

5.1.6 Portal Transmission Rights Auction Application

248 The *IESO* Web based TRA application securely available via the Portal allows participating *participants* to access Transmissions Rights Auctions data by navigating to the TRA application pages:

- The Future Rounds page provides authorized access to upcoming TRA auction information when available.

- The Active Rounds page provides authorized access to TRA Auctions in progress.

- Transmission Rights Auction Settlement information can be found in the Financial Market Settlement Schedule and Payment Calendar.

- TRA users must update their Portal account password every 90 Days

5.1.7 Online IESO System

249 The web based Online IESO system allows *participants* to access it using a Portal account even though it is not directly hosted by the Portal. A user logged into the Portal

can click on the Online IESO System link and access it although the will have to login as SSO is not set up with it.

250   The Online IESO System – Manage Participation, Manage Resources, Manage Enrolment Requests, Manage My Information, Manage System Access, Submit Capacity Qualification, Submit Prudential Support Information and Update Organization applications enable the *participant* to register who they are, and in addition register for enrolment in markets or programs and request system access for *IESO* systems etc..

251   The Online IESO System - Manage Meter Installation application has been added to permit management of metering installations.

252   The Online IESO System - Manage Meter Data Report Profile, Request Meter Data Report applications have been added to permit management of meter data reports as a replacement for MVWEB

253   The Online IESO System – Manage Facilities and Equipment application has been added to permit management and registration of equipment and facilities installations.

254   The Online IESO System – Create a Meter Trouble Report and Schedule a Metering Outage application replaces the old workflow MTR system with equivalent and improved functionality.

255   The Online IESO System – Create a Notice of Disagreement, View Notice of Disagreement system Variables applications replace the old workflow NOD system with equivalent and improved functionality.

256   The Online IESO -   Submit DR Auction Offer, Manage Demand Response Commitments, Demand Response MPPS Action applications have been added to permit submissions and reporting for the new Demand Response Auction.

257   The Online IESO System - Reliability Compliance Tool application enables the IESO to perform comprehensive and thorough reporting procedures and audit controls for ensuring the *IESO* and *participants'* compliance to all reliability standards and criteria for *IESO* Reliability Compliance Program.

5.1.8   IESO Confidential Report Site

258   The web based Confidential Report Site allows *participants* to access it using a Portal account even though it is not directly hosted by the Portal. *Participants* register their users for access via the normal Online IESO Registration processes. The report site supports XML, HTML, text, zip and EDI report files and now provides additionally for SFTP download.

5.2   Funds Administration

5.2.1   HTML and Text File Invoices

259   *Invoices* will be distributed to the *participants* via XML, HTML or text files hosted on the *IESO* Confidential Reports web server The *participant* using any standard web browser over the web can view these XML, HTML or text files. The *participant* can also download and save the XML, HTML or text file and print the *invoice*.

260   Descriptions of the XML and text file *invoice* may be found in the technical interface document entitled, "Text File Invoice Format Specification".

5.2.2   E-mail

261   Emailing of *invoices* and statements is not available as an option.

5.2.3   Fund Transfers

262   Banks used by the *participants* must have *electronic funds transfer* capability. *Electronic funds transfer* is a computerized mode for payment and withdrawal used in transferring funds from the *participant's* bank account to the *IESO* and vice versa.

263   There are 3 types of *electronic funds transfer* used by banks including EDI, Wire Transfers, and pay-only *electronic funds transfer* (Direct Deposit). The amount of information passed to the *IESO* with each of these types of payment is different. The short time frame within which the *IESO* is required to remit payment to the credit side of the market makes it important to identify the source and relevant *invoices* associated with payments made to the *IESO* as quickly as possible. The EDI and Wire transfer approaches to *electronic funds transfer* provide the *IESO* with sufficient detail to make identification possible. Pay-only *electronic funds transfer* (Direct Deposit), however, cannot provide the *IESO* with the needed information. The *IESO* is therefore requesting participants using pay-only *electronic funds transfer* to send a fax to the *IESO* Finance Department with the details of the payment provided (*participant* name, *invoice* number(s), amount of payment).

– End of Section –

Appendix A: List of Commonly Used Acronyms

ANSI	American National Standards Institute
AGC	*Automatic generation control*
API	Application Program Interface
BES	Bulk Electricity System
BOC	Backup Operating Center
Bps	Bits per second
DMI	Desktop Management Interface
DSU	Digital Service Unit
EDI	Electronic Data Interchange
EMS	Energy Management System
FIS	Financial Information Systems
GUI	Graphical User Interface
ICCP	Inter Control Center Protocol
ICG	*IESO-Controlled Grid*
IEEE	Institute of Electrical and Electronics Engineers
IESO	Independent Electricity System Operator
IP	Internet Protocol
ISO	International Standards Organization
IT	Information Technology
KB	Kilobytes
Kbps	Kilobits per second
LAN	Local Area Network
MB	Megabytes
Mbps	Megabits per second
MIM	Market Information Management
MMP	*Metered Market Participant*
MSP	*Meter* Service Provider
MW	megawatts
NERC	*North American Electric Reliability Council*
OS	Operating Systems
PC	Personal Computer (IBM compatible)
PSTN	Public Switched Telephone Network
PKI	Public Key Infrastructure
PLC	Participant Life Cycle or Registration System
RCT	Reliability Compliance Tool
RTU	Remote Terminal Unit
RTEM	Real-Time *Energy Market*
SCADA	Supervisor Control and Data Acquisition

TCP   Transmission Control Protocol
UPS   Uninterruptible Power Supply
URL   Uniform Resource Locator
VAr   Volt-Ampere-Reactive

– End of Section –

References

Document Name	Document ID
DNP 3.0 Subset Definitions	Non-*IESO* (www.dnp.org)
Market Rules	MDP_RUL_0002
Market Manual 3: Metering; Part 3.0: Metering Overview	MDP_MAN_0003
Market Manual 1: Market Entry, Maintenance & Exit; Part 1.3: Identity Management Operations Guide	IMP_GDE_0088
Format Specifications for Settlement Statement Files and Data Files	IMP_SPEC_0005
Market Manual 5: Settlements Part 5.0: Settlements Overview	MDP_MAN_0005
Market Manual 5: Settlements Part 5.1: Settlement Schedule and Payment Calendars (SSPCs)	MDP_PRO_0031
Web Based Message Exchange – Market Participant's Guide	IMP_MAN_0031
IESO Reports API Guide	N/A

– **End of Document –**