



NX Application One-Line Diagram User Guide

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1. NX application overview

Data which defines and represents the physical characteristics, ratings, and operational data of transmission and generation equipment, is required to develop accurate system models and maintain the day-to-day reliable operation of New England's bulk power generation and transmission system. It is the responsibility of transmission owners (TO) and market participants (MP) (owner or lead) to determine and submit the data required by Operating Procedure No. 16 (OP 16) and Operating Procedure No. 14 (OP 14), Appendix B using the NX application.

In 2016, ISO added the ability to store and view one-line diagrams previously provided to ISO in hard copy to its web-based NX application. The NX application is certificate based and provides authorized users an entry system with real-time access to one-line diagrams, NX data, and tools for reviewing and analyzing that data. The application uses roles to provide access, which limits each user to only those functions and data deemed appropriate by the security administrator.

2. What are NX application one-lines?

One-line equipment is designed to hold all one-line diagrams associated with a single station, generator or overview area. The one-line equipment is linked to a station record through the *ISO Station ID* field on the one-line form. Each station record can be associated with only one set of active one-line forms.

The station record, which is created by ISO administrators, has a transmission owner and local control center (LCC) associated with it. Only an ISO administrator or an administrator from the associated transmission owner or LCC will be able to create or modify one-line equipment for that station.

The one-line diagrams are files (PDF, JPG, etc.) loaded as attachments to the one-line equipment. Each attachment has effective and termination dates to allow users to identify which diagram(s) are current and which are historical or terminated. More detailed information about one-line attachments can be found in section 5.3, File Attachment status.

More detailed information about one-line forms can be found in section 8, One-line form.

3. Operating and Planning Procedures

The requirements for providing one-line diagrams are defined in Operating Procedure No. 16 (OP 16), *Transmission System Data*: https://www.iso-ne.com/static-assets/documents/rules_proceeds/operating/isone/op16/op16_rto_final.pdf.

This document and others can be accessed directly from the application via the *Help* menu. From the *Help* menu, select *NX-9/NX-12D Operating Procedures*. The dialog box illustrated below provides links to all the related Operating and Planning Procedures and appendices.

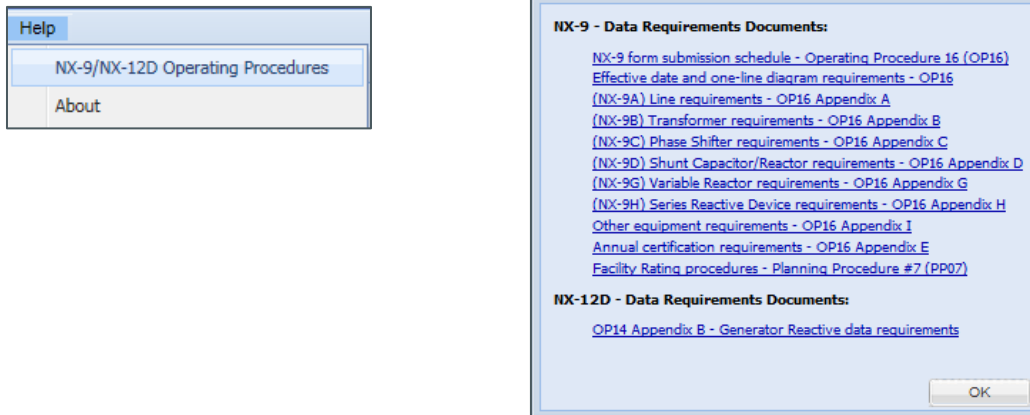


Figure 1: NX-9/NX-12D Help menu and Operating Procedures dialog box

4. Access and technical requirements

The NX application is a certificate-based application. A current certificate is required to gain access via the links in section 4.4-Logging into the NX application. Some users have a certificate under more than one participant. ISO grants access to the appropriate companies through the ISO Customer Asset Management System (CAMS) while participant security administrators grant individual user access, also through CAMS.

4.1. Application access for companies

Companies which are required to submit station one-line diagrams have already been granted access to the application. If you have questions about your company's access, please contact your security administrator or the ISO NX-9 administrator (nx9admin@iso-ne.com).

A sandbox environment is also available which allows users the opportunity to become familiar with the application without affecting production data. All companies with access to the production environment will also be granted access to the sandbox environment.

- Application assignment for major transmission owners and local control centers:
 - *NX912D Major TO – the production environment*
 - *NX912D Major TO Sandbox – the sandbox environment*
- Application assignment for all other companies:
 - *NX912D Other Cust – the production environment*
 - *NX912D Other Cust Sandbox – the sandbox environment*

4.2. Application access for individuals

Access for individuals is provided by your security administrator. Security administrators are responsible for ensuring confidentiality rules are adhered to when considering whether to grant access to any individual. ***Companies providing data for multiple generators or facilities must consider if a user is able to view data for all of the company's equipment. If not, then that user should not have direct access to the application.***

New roles have been added to the application for users tasked with maintaining one-line diagrams. The pre-existing read-only roles also provide read-only access to the one-line diagrams. The roles which provide access to one-line diagrams, either an administrator or read-only, are described below.

Some roles have overlapping access. Granting roles with duplicate access can reduce performance in the application since it adds complexity to the logic when accessing data. Please see the notes included with each role description to identify these overlaps and avoid granting unnecessary roles.

- Administrator roles

TO_OneLineAdmin – This is the primary role for market participant users responsible for supplying one-line diagrams to ISO. This role allows the user to create and modify one-line forms and upload new or modified diagrams.

LCC_OneLineAdmin – This is the primary role for LCC users responsible for supplying one-line diagrams to ISO. This role allows the user to create and modify one-line forms and upload new or modified diagrams.

- Read-only roles for support personnel and end-users

NX ExtAppvReadOnly – This role provides the user with read-only access to one-line forms in the submitted or approved states. Users also have read-only access to NX-9 and NX-12D forms in the approved state. Users can only see data for their company's equipment. This role is appropriate for the end-user who uses approved data in other applications or processes.

- *Users with the NX ExtNX9Admin, NX ExtNX9Compliance, NX Ext12DAdmin or NX ExtReadOnly roles should not be granted the NX ExtAppvReadOnly role as it duplicates permissions without providing additional access.*

NX ExtReadOnly – This role provides the user with read-only access to one-line, NX-9 and NX-12D forms in all states. This allows support staff to view forms as they are created and moved through the various states.

- *Users with this role should not be granted the NX ExtAppvReadOnly role, as it duplicates permissions without providing additional access.*

NX AppvReadOnly – This role is only available to companies assigned the NX912D_MAJOR_TO group and provides the user with read-only access to submitted and approved one-line forms as well as approved NX-9 and NX-12D forms for all New England equipment. Users cannot view NX forms that are in states other than Approved or one-line forms in the Preliminary state. This role is most appropriate for the end-user who uses approved data in other applications or processes.

- *Users with this role should not be granted the NX ExtAppvReadOnly role, as it duplicates permissions without providing additional access.*

4.2.1. Certificates

The NX application is a certificate-based application and uses the same certificate as other ISO single sign-on (SSO) applications. Users who provide data on behalf of multiple companies will have a separate certificate for each company they operate for.

The ISO CAMS application will automatically identify whether a company/user combination already has a certificate when the first role to the NX application is assigned. If no certificate is identified, the process to issue one will be started automatically. The user will receive an email with instructions for obtaining and loading their certificate within 24 hours. A separate email from the ISO will provide necessary PIN information.

Certificates must be renewed annually. The renewal process is automatic and users will receive an automated email notification.

Questions regarding certificates should be directed to ISO Customer Support (<http://www.iso-ne.com/about/contact/customer-support>).

4.2.2. Participant Agents

Some users (agents) have a representative relationship with more than one participant. A user can act for multiple participants by using a different certificate and set of roles for each participant. Both the NX application and CAMS allow a user to act for multiple participants as long as the user/participant pair is unique and has its own certificate.

Security administrators are responsible for ensuring confidentiality rules are adhered to when considering whether to grant access to any individual. **Companies providing data for multiple generators or facilities must consider if a user is able to view data for all of the company's equipment. If not, then that user should not have direct access to the NX application.**

4.3. Technical requirements – browsers, screen size, and resolution

While any size monitor can be used, the application was designed for use on a 21-inch monitor with a resolution of at least 1260 x 960. Using a monitor of at least 21 inches will limit the need to scroll horizontally or vertically to see the full display.

Performance can vary depending upon the internet browser being used. This is a by-product of the technology used in the development of the new application. We recommend the following browser types/versions based on testing performed at ISO (better-performing browsers listed first):

- *Firefox v. 44.0.2 or above*
- *Internet Explorer v.11 (compatibility view is not set)*

New versions of browsers provide better security and standardization. To promote support for the newer versions of browsers for our SMD applications, the ISO is committed to third party releases of patches and updates.

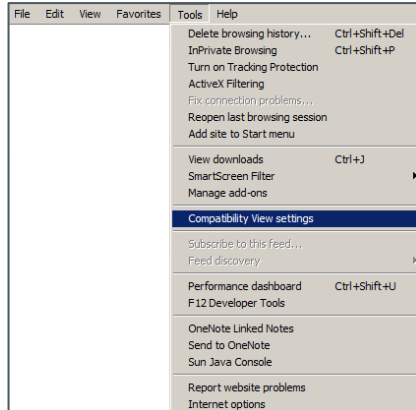
Effective January 2016, for Windows 7, Internet Explorer 11 is supported for all applications; patches and updates for IE 11 will be supported going forward. Earlier versions of Internet Explorer are no longer supported. When using Internet Explorer, you must ensure that compatibility view is not set. Please see the instructions for modifying your *Compatibility View Setting* below.

Older browser versions (such as IE8) and other browsers (such as Firefox and Chrome) may work with the application. ISO users have had no issues and report slightly better application performance using Firefox (44.0.2). However, ISO does not support older browser versions or other browsers.

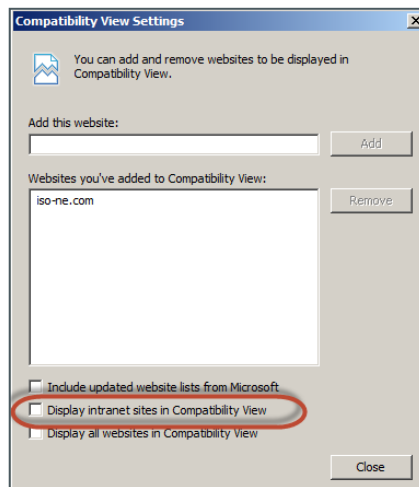
ISO's official current statement regarding web browser support can be found on our website:
<http://www.iso-ne.com/participate/support/web-browser-support>

Internet Explorer (IE) users must turn off compatibility view. When using IE, you must ensure that compatibility view is not set. If your display appears to be missing data or your forms or displays do not have the same appearance as the examples in this document, please check your compatibility view setting as follows:

- From the *Tools* menu of your IE browser, select *Compatibility View Settings*:



- Uncheck the *Display intranet sites in Compatibility View* setting and click the *Close* button:



- The NX application session will restart and the display issue will be corrected.

4.4. Logging into the NX application

The application is accessible from the *SMD Applications Home Page*.

To access the production system, select the *NX application* (NX-9, NX-12D and One-Line Diagrams) from the *SMD Applications Home Page* at: <https://smd.iso-ne.com/>

To access the sandbox system, select the *NX application* (NX-9, NX-12D and One-Line Diagrams) from the *Sandbox SMD Applications Home Page* at: <https://sandboxsmd.iso-ne.com/>

4.5. Access provided by each user role

The tables in this section provide detailed information regarding the specific data, displays, notifications, and reports that are available to each role. When multiple roles are assigned, the least restrictive role is applied. For example, a user with the *NX ExtReadOnly* and *NX ExtAppvReadOnly* roles will be able to view all their company's NX-9, NX-12D, and one-line equipment in *all* states, not just the approved equipment.

Table 1
Data access by role

Role	View Data for:		Form Permissions:			
	All NE Equipment	Single Participant Equipment	Terminals and Stations	NX9	NX12D	One-Line
Participant One-Line Administrator <i>TO OneLineAdmin</i> ³		X ²	Refresh terminal list only			Read (all States), Write ² (Preliminary)
LCC One-Line Administrator <i>LCC OneLineAdmin</i> ³	X		Refresh terminal list only			Read (all States), Write ¹ (Preliminary)
Participant Read-Only <i>NX ExtReadOnly</i> ⁴		X	Read	Read (all States)	Read (all States)	Read (all States)
Participant Read-Only–Approved Only <i>NX ExtAppvReadOnly</i> ⁴		X	Read	Read (Approved)	Read (Approved)	Read (Submitted and Approved)
Participant NX9 Compliance Officer <i>NX Ext NX9Compliance</i> ⁴		X	Read	Read (Approved)	Read (Approved)	
All Approved Equipment (for TOs, LCCs only) <i>NX AppvReadOnly</i>	X		Read	Read (Approved)	Read (Approved)	Read (Submitted and Approved)
ISO Terminal Administrator <i>NX ISOTerminalAdmin</i>	X		Read/Write			
ISO EMS Modeler <i>NX EMSModeler</i>	X		Read (terminals) Write (stations)	Read (all States)	Read (all States)	Read (all States), Write (all States)
<p>¹ LCC_OneLineAdmins have read access to all New England one-lines but write access only to those one-line forms they own.</p> <p>² TO_OneLineAdmins have read access to one-line forms they own as well as those they are associated with as the TO on the station record but write access to only those one-line forms they own.</p> <p>³ User has write access to Participant Private Equipment notes on forms owned by their company.</p> <p>⁴ User has read access to Participant Private Equipment notes on forms owned by their company.</p>						

Table 2
Administrator write access by one-line data type and one-line form state

The following table shows the **write access** for participant and ISO one-line administrators depending on the state of the one-line form.

One-Line State	TO or LCC Administrator (dependent on form owner)			ISO Administrator		
	Admin Comments	Effective Date ¹	Other Attributes including attachment uploads	Admin Comments	Effective Date ²	All Attributes ³
Preliminary	X		X	X	X	X
Submitted	X			X	X	X
Approved	X			X	X	X
Deleted ⁴						
¹ <i>Effective Date</i> is set by the application and is always equal to the current date at the time of form submission. ² The ISO administrator may adjust the <i>Effective Date</i> after form submission to allow selection of a new station added after form submission. ³ <i>All attributes</i> can be modified except participant private attributes. Participant private attributes are the <i>Private Participant Equipment Notes</i> and <i>Private Administrator Comments</i> . ⁴ Both participants and ISO are restricted from modifying deleted one-line forms.						

Table 3
Participant display access by role

Display	Roles					
	TO OneLine Admin ⁴	LCC OneLine Admin ²	NX Ext ReadOnly ¹	NX ExtAppv ReadOnly ¹	NX ExtNX9 Compliance ¹	NX AppvReadOnly (LCC, TO Only) ²
Application Log	Read	Read				
NX9 Certification					Read/Write	
Equipment Search – NX9			Read (all states)	Read (Approved)	Read (Approved)	Read (Approved)
Equipment Search – NX12D			Read (all states)	Read (Approved)	Read (Approved)	Read (Approved)
One-Line Search	Read (all states)	Read (all states)	Read (all states)	Read (Submitted, Approved)		Read (Submitted, Approved)
Line Totals			Read (all states)	Read (Approved)	Read (Approved)	Read (Approved)
NX9 Forms			Read (all states)	Read (Approved)	Read (Approved)	Read (Approved)
NX12D Forms			Read (all states)	Read (Approved)	Read (Approved)	Read (Approved)
One-Line Forms	Read (all states) Write ⁴ (preliminary)	Read (all states) Write ³ (preliminary)	Read (all states)	Read (Submitted, Approved)		Read (Submitted, Approved)
NX Comparison – NX9			Read (all states)	Read (Approved)	Read (Approved)	Read (Approved)
NX Comparison – NX12D			Read (all states)	Read (Approved)	Read (Approved)	Read (Approved)
Outstanding Requests						
Terminals & Stations	Refresh terminal list only	Refresh terminal list only	Read	Read	Read	Read

¹ Role provides access to single participant data only.
² Role provides access to all New England data.
³ LCC_OneLineAdmins have read access to all New England one-lines but write access only to those one-line forms they own.
⁴ TO_OneLineAdmins have read access to one-line forms they own as well as those they are associated with as the TO on the station record but write access to only those one-line forms they own.

**Table 4
ISO display access by role**

Display	Roles		
	NX AppvReadOnly	NX EMSModeler	NX ISO TerminalAdmin
Application Log		Read	
Equipment Search – NX9	Read (Approved)	Read (all states)	
Equipment Search – NX12D	Read (Approved)	Read (all states)	
One-Line Search	Read (Submitted, Approved)	Read (all states)	
Line Totals	Read (Approved)	Read (all states)	
NX9 Forms	Read (Approved)	Read (all states)	
NX12D Forms	Read (Approved)	Read (all states)	
One-Line Forms	Read (Submitted, Approved)	Read/Write (all states)	
NX Comparison – NX9	Read (Approved)	Read (all states)	
NX Comparison – NX12D	Read (Approved)	Read (all states)	
EMS Full Comparison		Read	
EMS Transfer Comparison		Read/Write	
EMS Transfer		Read/Write	
Outstanding Requests		Read/Write	
Terminals & Stations	Read	Read (terminals) Write (stations)	Read/Write (all)

5. Understanding equipment, attachments, effective dates and one-line form status

5.1. Equipment and application tracking of one-line forms

To the NX application, equipment is simply a way to group a set of form revisions. The NX application defines equipment as a set of NX or one-line forms. The first form defines the equipment and each subsequent revision builds on the set of forms. When a new revision becomes effective, the previous revision expires.

The bullet list below contains some helpful information about how the NX application assigns effective dates and tracks the forms associated with each piece of defined equipment.

- One-line equipment can represent a set of one-line diagrams for a transmission station, generation station or area overview. NX equipment represents a set of NX forms for a line segment, a transformer, a generator, or other transmission equipment.
- All forms for one-line or NX equipment will have the same file attachments. The NX software automatically allows every form to access all file attachments for that equipment.

- The application tracks revisions and orders them by effective dates.
- All forms which are associated with a defined piece of equipment are listed on the *Revisions* tab and can be viewed on any one of the forms associated with the equipment.
- When a new one-line form revision is approved, the application finds the currently effective form and sets its expiration date.
- The field *Equipment In Service Start* is set to the *Effective Date* of the first approved one-line form for a defined piece of equipment or One-Line Set.
- The field *Equipment In Service End* is set to the *Effective Date* of the last approved one-line form for a defined piece of equipment or One-Line Set.
- The last revision for a defined piece of equipment is one with the *Remove Equipment From Service* flag set and when approved and effective, it retires the entire set of forms.
- All forms that are part of the equipment's set of forms will have the same date in the *Equipment In Service Start* and *Equipment In Service End* fields.

5.2. One-line form effective dates

The set of effective dates on a one-line form determines the status of the form's data. In order to determine which forms are effective now and which forms are no longer effective, the user must interpret the set of effective dates on the equipment's forms.

A clear view of all the forms which are associated with a defined piece of equipment can be found on the *Revisions* tab and can be viewed on any one of the forms associated with the equipment. The revisions will be sorted to show the newest revision at the top of the list.

Reference #	State	Effective Date	Expiration Date	Revision Comments
1606220008	Submitted	06/24/2016		add construction print for future project
1606210002	Approved	06/22/2016		replaced station print due to addition of new switch at station
1606200001	Approved	06/21/2016	06/22/2016	Initial Upload on 21-JUN-2016

Open

Figure 2: One-line form *Revisions* tab example

The table below lists all of the effective dates which are stored for a one-line form. All dates for one-line forms are software derived.

OP 16 defines the schedule for submitting one-line forms. Links to the relevant procedures are included in section 3, Operating and Planning Procedures and can also be accessed directly from the NX application via the *Help* menu.

Table 5
One-line form effective dates

NX Form State	Description
Equipment In Service Start Date (EISSD)	<i>Software derived</i> – set equal to the effective date of the first form for the equipment’s set of forms. This field is null until the <i>Effective Date</i> is set on the first approved form for new equipment. The EISSD is the same on all forms for a defined piece of equipment.
Effective Date	<i>Software derived</i> – set equal to the current date when the form state is changed to submitted.
Expiration Date (ED)	<i>Software derived</i> – set equal to the effective date of the next effective revision for the equipment.
Equipment In Service End Date (EISED)	<i>Software derived</i> – set equal to the expiration date of the last form for a defined piece of equipment’s set of forms. This field is null until the <i>Effective Date</i> is set on the last approved form for the equipment (the form with “remove equipment from service” flag set). The EISED is the same on all forms for a defined piece of equipment.

5.3. File Attachment status

The *File Attachments* tab of any one-line form will display all attachments for the associated equipment regardless of which form revision added or terminated the attachment. The effective date or termination date of an attachment is equal to the effective date of the form revision that added or terminated it. To determine what changed on an attachment, the user should review the revision comments of the specific form that added the attachment.

To determine the effective status of a one-line diagram (an attachment to a one-line form); the effective dates of the attachment must be used. The figure below is an example of the *File Attachments* tab on a one-line form.

- The *Effective Date* equals the effective date of the form revision which added the attachment.
- Attachments which are no longer effective have a termination date. The *Termination Date* indicates the effective date of the termination and equals the effective date of the form revision which terminated the attachment.
- The *Expected Effective Date* is only used for one-line preliminary attachments, is entered by the participant when the diagram is added and reflects the date the diagram was expected to be effective at the time the attachment was added. When evaluating preliminary diagrams, the user should consider that this date is not maintained and reflects the best available date at the time the attachment was added to the form.

The File Attachments tab displays all attachments regardless of which form revision added the attachment.

File Attachments						
File Name	Attachment Type	Description	Expected Effective Date	Effective Date	Termination Date	
testdoc1.bmp	Final	Updated print includes new switch.		06/22/2016		
DEFG.jpg	Preliminary	project DEFG construction print	12/01/2016	06/23/2016		
MS1168 South switching diagram BMP	Final	Schematic effective at initial upload on 21-JUN-2016		06/21/2016	06/22/2016	

Figure 3: One-Line diagram File Attachment status

5.4. One-line form states

The NX application uses form states to identify a form’s status in the approval process. One-line form states are described in the table below:

**Table 6
One-line form states**

NX Form State	Description
Preliminary	The initial starting state of a new one-line form created by either the ISO administrator or the participant/LCC administrator. Participant and LCC administrators can edit data and upload diagrams on one-line forms they own in this state.
Submitted	One-line forms in the submitted state are considered effective but have not been reviewed by the ISO administrator. Users can view and utilize one-line diagrams on submitted forms. Participant and LCC administrators can make corrections to forms in the submitted state by changing the state to <i>Preliminary</i> , making their corrections and then re-submitting the form.
Approved	Approved one-line forms indicate the ISO administrator has reviewed the form for changes to the ISO energy management system (EMS) model. Approved forms are not always currently effective. Users must evaluate the effective dates of approved forms to determine the form status (historical or current). See section 5.5-One-line form status, for more information about effective dates and form status.
Deleted	A deleted form is not part of the history of effective forms. Forms created in error are deleted prior to being approved or effective.

5.4.1. One-line form life cycle

- The cycle starts when the participant creates a preliminary form as either a new version of an existing form, or a new form for new equipment.
- When the participant has entered all data and the form is valid, the participant changes the state to *Submitted* and this moves the form to the attention of the ISO administrator.
- If the participant needs to change something on the form and it’s still in the *Submitted* state, it can be changed back to *Preliminary*, modified and re-submitted.
- If the user determines the form is not needed, the user sets the state to *Deleted*.

- Once submitted, the ISO administrator will review the form and the attachments to determine if a change is necessary to the ISO network model. After this review is complete, the ISO administrator sets the form state to *Approved*.
- See section 8.5, Create and submit one-line forms and diagram attachments for more information.

The figure below illustrates the life cycle of a one-line form from creation through approval. Instructions for creating and submitting one-line forms are in section 8.5.

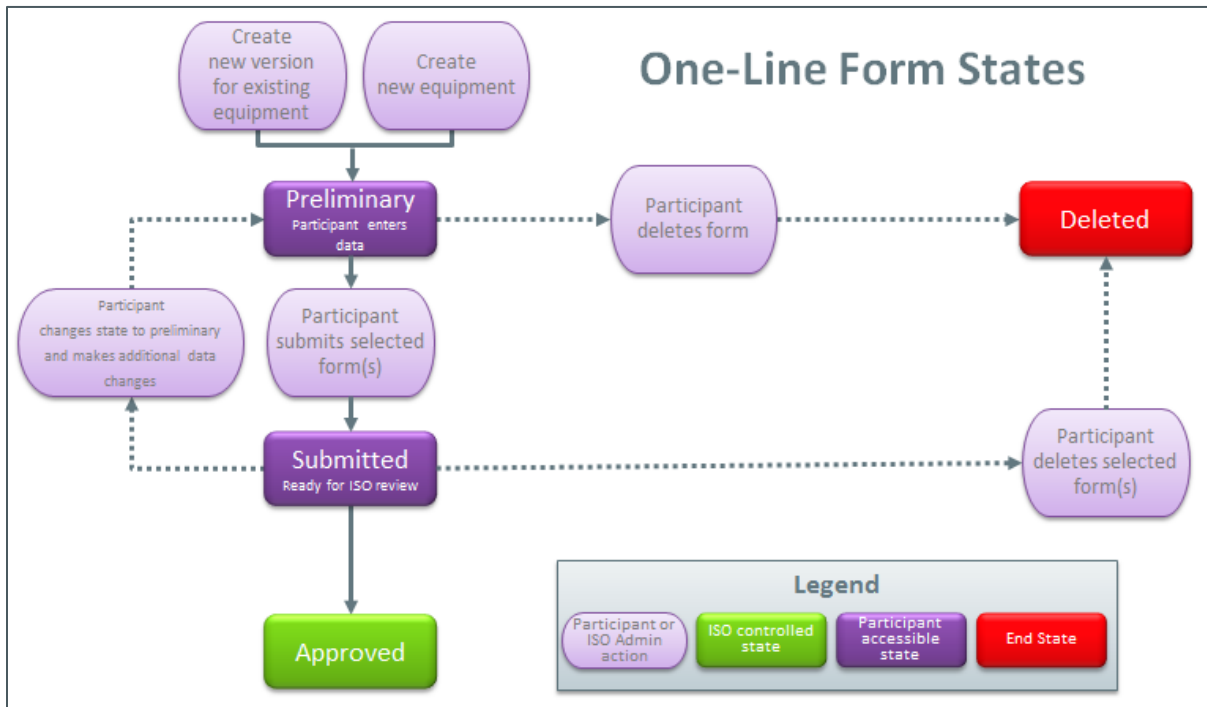


Figure 4: One-Line form states and life cycle

5.5. One-line form status

To determine the effective status of a one-line form, the effective dates listed in Table 5 One-line form effective dates, must be used. The figure below illustrates the effective dates which must be considered when determining the status of any one-line form. Only one-line forms in a *Submitted* or *Approved* state should be evaluated for current effectiveness. One-line forms in *Preliminary* state are not effective. As a reminder, any one-line form of the one-line equipment will allow access to all one-line file attachments.

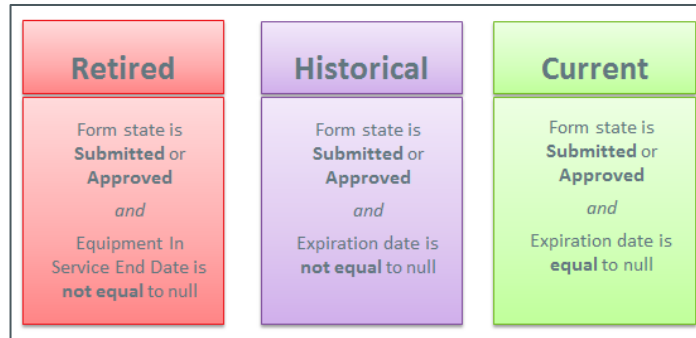


Figure 5: One-line form effective status

6. Menus and navigation

The application utilizes a menu bar just under the application title bar to provide access to all displays and reports within the application. There are nine main menus in total, but which menus and options within a menu are presented to a user is dependent on the roles assigned to the user in CAMS. This section addresses only those menus that are available to one-line administrators and users who can view one-line forms.

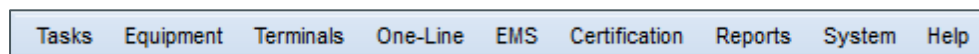


Figure 6: Menu bar

6.1. Menu options

6.1.1. Tasks

The *Tasks* menu is not available to one-line administrators or users with read-only privileges.

6.1.2. Equipment

The *Equipment* menu is available to all users with the ability to view NX forms which includes users with read-only access to one-line forms. It provides access to the *Equipment Search* display as well as all NX form displays. Selecting a form type from this menu will open a blank NX form from which the user can open a specific NX form of the same type through use of the *Open* button and entry of a valid reference number.

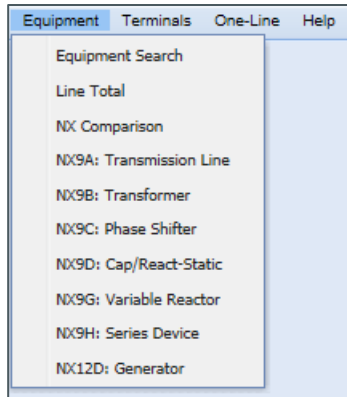


Figure 7: Equipment menu

6.1.3. Terminals

The *Terminals* menu is available to all users. It provides links to the *Terminals* and *Stations* displays and the *Refresh Terminals List* function. Section 9.1, *Terminals and Stations* provides more information on the *Refresh* function.

Users with access to strictly one-line forms will see only the *Refresh Terminals List* option.

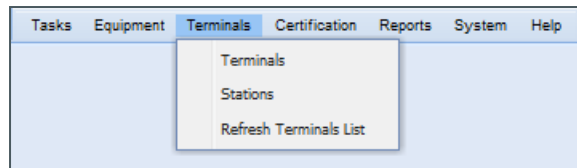


Figure 8: Terminals menu

6.1.4. One-Line

The *One-Line* menu is presented to one-line administrators and users with read-only access to one-line, NX-9 and NX-12D forms. Section 7, *One-Line Search* display provides further detail on this display while one-lines are explained in more detail in section 8, *One-line form*.

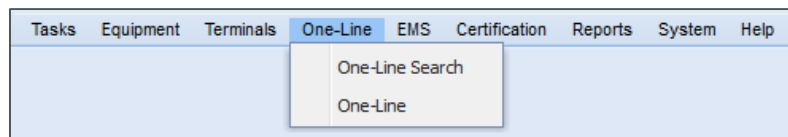


Figure 9: One-Line menu

6.1.5. System

The *System* menu is available only to administrators and provides access to the *Application Log* (section 9.2) which lists specific events. Availability of data is dependent on the roles defined in CAMS for the user.

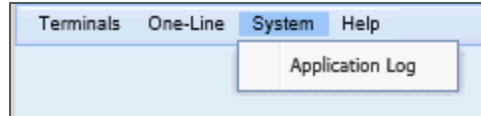


Figure 10: System menu

6.1.6. Help

The *Help* menu is available to all users. Selection of the *NX-9/NX-12D Operating Procedures* option will provide a pop-up dialog box with hot links to the Operating and Planning procedure pertinent to the data within the NX application.

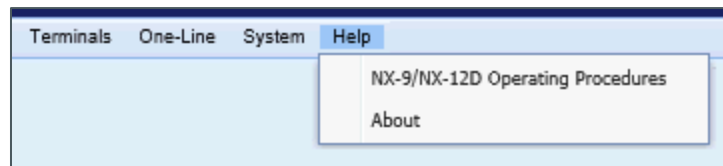


Figure 11: Help menu

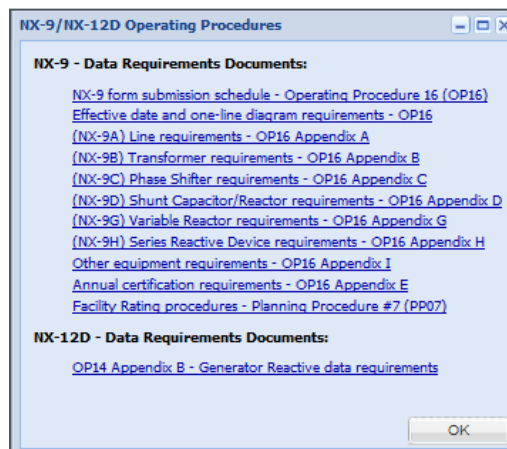


Figure 12: NX-9/NX-12D Operating Procedures dialog box

6.2. Navigation

6.2.1. Open a one-line form

There are multiple ways to open a one-line form. The following methods are available:

- Open the *One-Line Search* and use the column view settings to locate the desired record. Double click the row or select the row and then select the *Open* button.
- If you know the reference number of the form, you can open an empty one-line form from the one-line menu, select the *Open* button at the bottom right of the display, enter the *reference number* of the desired form in the resulting pop-up and select *OK*.
- One-line forms listed on the *Revisions* tab of another form can be opened simply by double clicking the entry on the *Revisions* tab.

6.2.2. In Progress indication

The application utilizes an indicator to show a request in progress. When opening forms or displays, a progress bar will appear in the application title bar.

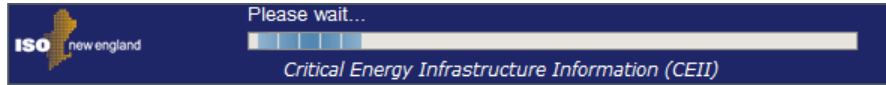


Figure 13: Display progress bar

7. One-Line Search display

The *One-Line Search* display provides a list of all one-line forms available to the user. The search is the primary mechanism for locating and opening a form for a chosen station or overview. The form provides access to the one-line diagrams associated with the station or overview.

The *One-Line Search* display is a list display that looks much like a spreadsheet and has many of the same features. List displays provide display control buttons (export, print, refresh), column view setting options (sort, filter, hide, unhide, reset) and the open button (open the selected form). Sections 7.2 and 7.3 describe the general functionality available on list displays.

7.1. One-Line Search display data

The *One-Line Search* display provides access to existing one-line forms and their one-line diagrams, or file attachments. When opened, the one-line search defaults to listing all non-expired one-line forms the user is allowed to view. The data returned in a one-line search is automatically restricted based upon the user's role(s). Figure 14, below, illustrates the One-Line Search display.

To view expired forms, the user checks the *Include Expired Forms* box at the top left of the display. This automatically re-queries the data and returns both expired and non-expired one-line forms.

The *One-Line Search* display lists many of the parameters on the one-line form including the reference number and form state, the form owner (participant), the associated LCC and transmission owner, the form owner's identifier for the set of diagrams (One-Line Set ID), the ISO's identifier (ISO Station ID), the one-line type (station or overview) as well as all the effective dates and two ISO fields used internally.

The file names for the active file attachments on the form are also included. These files are listed in the column *File Name List*. This list excludes file names for terminated attachments.

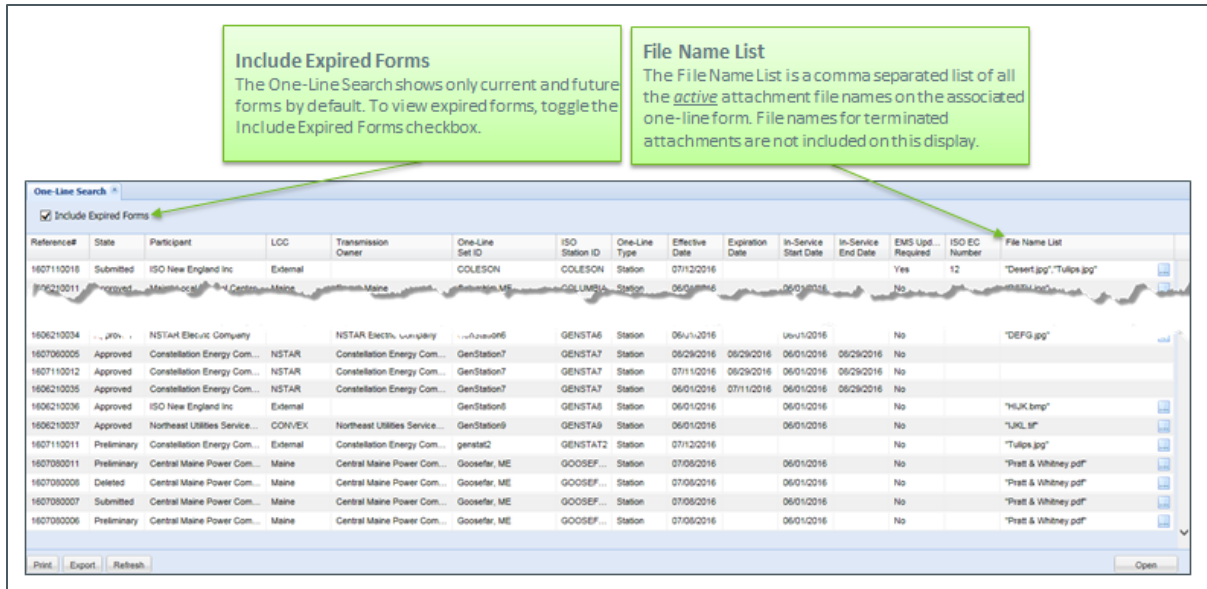


Figure 14: One-Line Search display

7.2. One-Line Search display column view settings

At the far right of each column header is a drop-down menu that provides the ability to modify the data displayed. The options available are listed below.

- Reset View – this refreshes the data and returns the display to the default view
- Sort Ascending
- Sort Descending
- Columns – de-select columns to hide these columns from view
- Filters – filter data within the column to that which includes the entered text

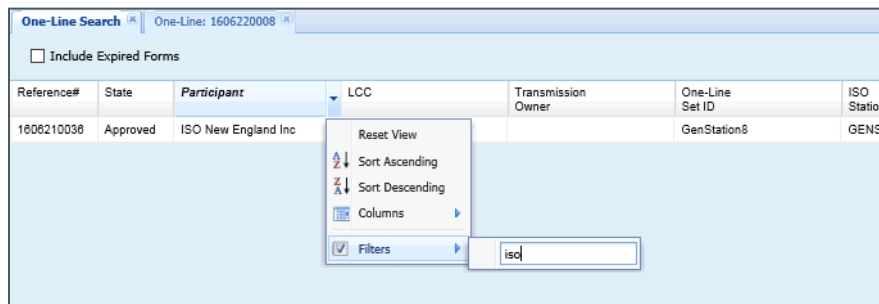


Figure 15: One-Line Search display column view settings

7.3. One-Line Search display control buttons

As a list display, the one-line search contains many of the standard list display control buttons. The display also includes a selection at the top of the display allowing the user to include expired one-line forms in the search output. The default is to exclude expired forms.

The buttons in the bottom left section of the display allow the user to execute controls such as print, export or refresh. These controls apply to the list of data displayed. For example, *Export* will send the list of items displayed to Excel.

Buttons on the bottom right of the display will perform an action on the specific data selection made on the display. The user can open a one-line form by double clicking on a row in the search output or by selecting a row and clicking the *Open* button.

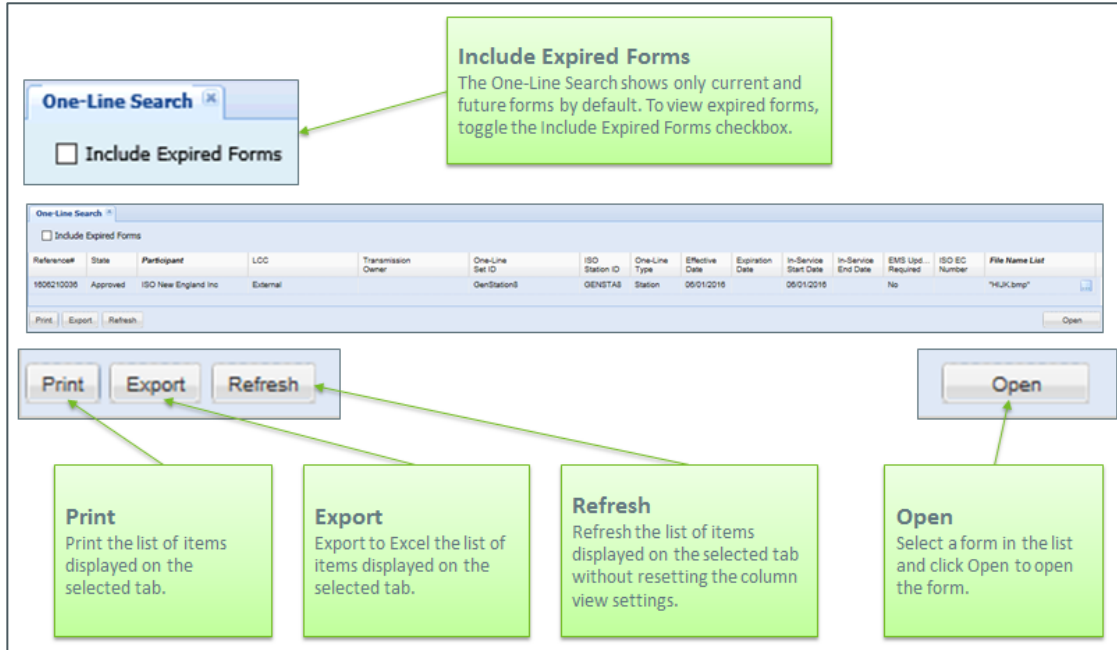


Figure 16: One-Line Search display control buttons

8. One-line form

One-line equipment is the name used to describe the group of all one-line forms and one-line diagram attachments associated with a single station, generator or overview area. File attachments are common to all one-line forms of the same one-line equipment. The only difference between the one-line forms are the revision comments and form effective dates.

The one-line equipment is linked to a station record through the *ISO Station ID* field on the one-line form. Each station record can be associated with only one set of active one-line forms. In other words, each station record can be associated with only one active one-line equipment.

The station record, which is created by ISO administrators, has a transmission owner and LCC associated with it. Only an ISO administrator or an administrator from the associated transmission owner or LCC will be able to create or modify one-line equipment for that station. When a new one-line form is created, the administrator has the ability to link the form to a station that they are associated with. Again, the association between administrator and station is established on the station record. The ISO administrator has the ability to modify the transmission owner and LCC associated with a station record when necessary as well as the ability to modify the owner of a form when responsibility for providing data changes from one participant to another.

The one-line diagrams themselves are files (PDF, JPG, etc.) loaded as attachments to the one-line equipment. Each attachment has effective and termination dates to allow users to identify which diagram(s) are current and which are historical or terminated.

8.1. One-line form ownership:

One-line equipment ownership is determined when a form is created for new equipment. The ownership is assigned to the same company as the user who created it. Future revisions can only be created by the ISO administrator or an administrator for the owning company. Ownership can be modified by the ISO administrator when necessary.

8.2. One-line form header:

The form header contains the form’s identifying information. Figure 17 shows the one-line form header and the fields it contains. Table 7, below, describes the data contained in each of the fields and who is responsible for entering this data.

The screenshot shows a web form titled "One-Line: 1607140001". The fields are as follows:

- Reference Number: 1607140001
- Form State: Preliminary
- Form is Valid: (checkbox)
- Participant: ISO New England Inc
- One-Line Set ID: Test Station
- ISO Station ID: WOOD_ST
- Transmission Owner: ISO New England Inc
- LCC: ISO New England Inc
- One-Line Type: Station

Figure 17: One-line form header

**Table 7
One-line form header fields**

Field Label	Entry By	Description
Reference Number	System	The reference number is a unique form number assigned by the application.
Form State	System Participant/ISO administrator	The initial starting state of a new one-line form is Preliminary. Participant and LCC administrators can edit data and upload diagrams on one-line forms in this state. Depending on the current state, the form state can be modified by either the Participant or ISO administrator.
Valid/Invalid status	System	Validation is run on each form when requested by the user or when the form is saved. The valid or invalid status from the last validation is displayed.
Participant	System	The form owner. This is determined by the system based upon the company associated with the initial user who created the form. The form owner corresponds to either the transmission owner or LCC of the station record which is linked through the ISO Station ID.
One-Line Set ID	Participant administrator	A unique 50 character description to define the set of one-line diagrams attached to this equipment.
ISO Station ID	Participant/ISO administrators	The ISO Station ID can be selected by the participant initially but will be verified by the ISO administrator and modified if necessary. The list of available stations is limited to those associated with the user’s company

		and not already in use by another one-line set.
Transmission Owner	ISO administrator	The owner as defined on the linked station record (ISO Station ID). This parameter is set by the ISO administrator.
LCC	ISO administrator	The LCC as defined on the linked station record (ISO Station ID). This parameter is set by the ISO administrator.
One-Line Type	ISO administrator	The one-line type (overview or station) as defined on the linked station record (ISO Station ID). This parameter is set by the ISO administrator.

8.3. One-line form data tabs

The middle portion of a one-line form contains a series of tabs containing additional data about the diagrams or the equipment. Information about each tab and which users can view the tab is described in this section.

- File Attachments, General Information
 - The *File Attachments* tab, visible to all users, is used to add and terminate the one-line diagrams associated with the one-line set. Each form revision for a one-line set will show all attachments in their most current state regardless of which revision added or terminated the attachment.
 - Attachments can be added or terminated with a form revision.
 - An attachment is effective for all subsequent revisions until terminated.
 - All attachments are visible from any revision of the equipment.
- File Attachments, Attachment parameters
 - *File Name* – the full file name and extension of the file.
 - *Attachment Type* – required field, one of Final, Preliminary or Information
 - Final – Print which reflects the current state of the substation or area
 - Preliminary – Print which reflects a future state of the substation or area
 - Information – any file provided to add supporting information
 - *Description* – optional field, used to clarify the contents of the file
 - *Expected Effective Date* – required when attachment type is Preliminary, not enterable for other attachment types. Date entered should reflect the date the print information is expected to be effective in the field.
 - *Effective Date* – assigned by software and set to the effective date of the one-line revision on which the attachment was added.
 - *Termination Date* – assigned by software and set to the effective date of the one-line revision on which the attachment was terminated.
- File Attachments, Control buttons
 - *Add* – Select add, browse for the desired file and select OK to add a File Attachment. Allowable file types: .pdf, .tif, .bmp, .jpg, .doc, .docx, .xls, and .xlsx
 - *View* – Select an existing File Attachment and click the View button to open or save the attachment to your PC.
 - *Terminate* – Select the attachment to be terminated, and then select the *Terminate* button. The termination date will be set, but the form will continue to be visible to maintain the history.

File Name	Attachment Type	Description	Expected Effective Date	Effective Date	Termination Date
Detroit.pdf	Final			07/12/2016	
ABCD.jpg	Final			07/12/2016	
ABCD.jpg	Information	test information type		07/12/2016	
ABCD.jpg	Preliminary	test prelim type	07/11/2016	07/12/2016	

Figure 18: File Attachments tab

- Equipment Notes
 - *Equipment Notes*, visible to all users, are used by ISO and participant administrators to provide any pertinent information about the equipment represented on the form which might be helpful to users viewing the form.
 - *Participant Private Notes* are visible only to users of the company owning the form.
 - *Equipment Notes* are copied to the next form revision and remain unless removed by the comment owner.

Figure 19: Equipment Notes tab

- Admin comments
 - The *Admin Comments* tab is visible only to participant and ISO administrators. This tab is used to provide information that may be helpful between administrators in the form review and approval process.
 - Admin comments are not copied to the next form revision.
 - A participant user can enter *Admin Comments* while the form is in the *Preliminary* state.
 - Private – Checking this box ensures the comment is visible only to administrators for the company who created it.
 - Attachments can be added to a comment to provide backup information.

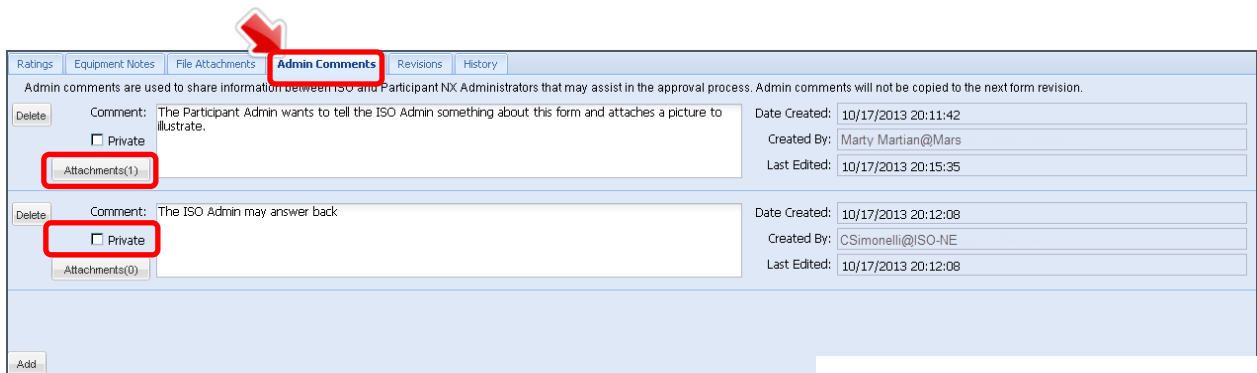


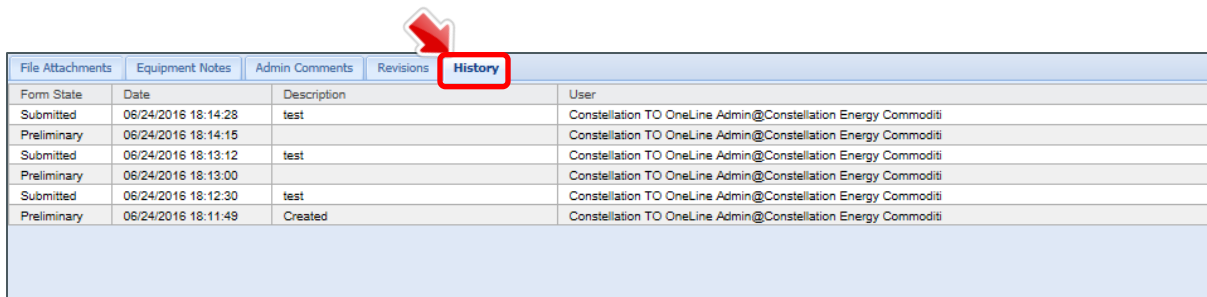
Figure 20: Admin Comments tab

- Revisions
 - Visible to all users.
 - Provides a summary of existing forms for the equipment. Forms listed are filtered based on the user’s role(s).
 - Orders revisions with most current date first.
 - Provides reference number, effective dates, and revision comments for each form.
 - Allows the user to determine what form is currently effective and if future revisions are pending.
 - The list of forms visible on the revisions tab is the same on all form revisions.

Reference #	State	Effective Date	Expiration Date	Revision Comments
1606220008	Submitted	06/24/2016		add construction print for future project
1606210002	Approved	06/22/2016		replaced station print due to addition of new switch at station
1606200001	Approved	06/21/2016	06/22/2016	Initial Upload on 21-JUN-2016

Figure 21: Revisions tab

- History
 - Visible to all users.
 - Provides a summary of all form state changes for a form allowing the user to review the form history from creation to current state.
 - Ordered by date with most current date first.
 - For each state change the form has gone through, this tab lists the form state, the date of change, the user entered state change description, and the user making the change.



Form State	Date	Description	User
Submitted	06/24/2016 18:14:28	test	Constellation TO OneLine Admin@Constellation Energy Commoditi
Preliminary	06/24/2016 18:14:15		Constellation TO OneLine Admin@Constellation Energy Commoditi
Submitted	06/24/2016 18:13:12	test	Constellation TO OneLine Admin@Constellation Energy Commoditi
Preliminary	06/24/2016 18:13:00		Constellation TO OneLine Admin@Constellation Energy Commoditi
Submitted	06/24/2016 18:12:30	test	Constellation TO OneLine Admin@Constellation Energy Commoditi
Preliminary	06/24/2016 18:11:49	Created	Constellation TO OneLine Admin@Constellation Energy Commoditi

Figure 22: History tab

8.4. Form Footer

The form footer contains all the form effective dates, the revision comments and the form control buttons. All effective dates on one-line forms are system entered.

8.4.1. Form Footer effective dates

- All effective dates on the form footer are automatically set by software. The user is not responsible for entering these effective dates.
- *Effective Date* is set to the current date each time a preliminary form is saved. Once submitted, the date is not changed unless modified by the ISO administrator.
- *Expiration Date* is set to the effective date of the next effective form.
- The field, *Equipment In Service Start*, is set to the effective date of the first approved form for the one-line set.
- The field, *Equipment In Service End*, is set to the effective date of the approved form which removes the one-line set from service.

8.4.2. Form Footer control buttons

- *Form* button functions:
 - *Refresh* screen to see any changes that have been made to the form in another tab or browser session.
 - *Validate* to confirm that data entered meets data validation rules without saving.
- *Open* button: *Open* another one-line form by entering the reference number.
- *New* button functions:
 - *New Equipment* creates a one-line form for a new piece of equipment.
 - *New Version* creates a revision of the opened form to update for the equipment.
- *Save* button: *Save* and validate the data entered. Invalid data can be saved.
- *Cancel* button: *Cancel* all changes and redisplay the form as last saved.

8.4.3. Form Footer - other data

- *Revision Comments* identify the reason the form was updated. Users must include a summary which identifies what changes were made to the attached diagram(s). This is necessary to inform users of the specific changes to the diagrams.
- *Remove Equipment from Service* is set by the user to retire the equipment.
- *Data Revision* is assigned upon form creation. The revision number is incremented as each form is created. The revision number order is not necessarily the same as the effective date order.

Figure 23: One-line form footer and control buttons

8.5. Create and submit one-line forms and diagram attachments

General rules and information about creating and revising one-line forms:

- It is not possible to create a one-line form for a new piece of equipment from an existing one. The user must start with a new equipment form.
- Users must be aware of the status of all future forms BEFORE creating any new revisions.
- The *Revisions* tab provides the reference number, current state, effective dates and revision comments for each one-line form.
- Submitting a form with the *Remove Equipment from Service* flag set will effectively retire the equipment and the entire set of revisions associated with it.
- Once equipment has been removed from service, new revisions can't be created and existing future revisions can't become effective.
- State changes are not saved if the form is invalid at the time of the save. The user must correct all errors and when the form is valid, make and save the state change.

8.5.1. Create one-line forms for a new station or overview

To create the first one-line form for a station or overview, open an existing one-line form or a blank one-line form from the equipment menu. From the form, select the *New* button and then select the *New Equipment* option. The new form will automatically open and be available for editing.

The *One-Line Set ID*, *Revision Comments*, and at least one file attachment are required to create a valid form. Users must include a summary which identifies what changes were made to the attached diagram(s) in the *Revision Comments* field. This is necessary to inform users of the specific changes to the diagrams.

The *One-Line Set ID* is a unique 50 character description used to define the set of one-line diagrams attached to this equipment. This may represent a substation, an area overview or a generating station. The *One-Line Set ID* will be the primary field used when searching for the forms associated with this equipment.

Additionally, the participant may optionally choose an *ISO Station ID* from the list of available stations in this field's drop down list. This list will include station and overview entities owned by the user's Participant that are not currently associated with an active one-line form. The ISO administrator will review any selection made by the participant and make changes if necessary. If you don't see the station or overview entity needed, please contact the ISO administrator for assistance.

When all changes are complete, change the form state to *Submitted* and save the form.

8.5.2. *Revise the currently effective one-line form*

To revise an existing one-line form, open the form and select the *New* button at the bottom right of the form display and then select the *New Version* option. The new form will automatically open and be available for editing.

Users must include a summary which identifies what changes were made to the attached diagram(s) in the *Revision Comments* field. This is necessary to inform users of the specific changes to the diagrams.

When all changes are complete, including the addition of new attachments or the termination of existing attachments, change the form state to *Submitted* and save the form.

8.5.3. *Correct an existing one-line form revision*

If a revision needs to be corrected, the action taken depends upon the state of the form to be corrected:

- **If the form state is *Preliminary*:** The user can modify the form as necessary before changing the state to *submitted*.
- **If the form state is *Submitted*:** The user can change the state to *preliminary*, modify as necessary and change the state back to *submitted*.
- **If the form state is *Approved*:** The user creates a new revision.

8.5.4. *Retire a set of one-line forms*

When a station is removed from the field or a set of forms needs to be retired for another reason, the user takes the following steps to retire the equipment:

- Create a new version of the form.
- Select the *Remove Equipment from Service* checkbox in the form footer.
- Enter the appropriate *Revision Comments*.
- Change the form state to *Submitted* and save the form.

8.5.5. *Understanding error codes and field colors*

The application uses visual indications to show data that has been entered but not saved and data fields with invalid information.

- Field colors
 - Fields with a gray background are not enterable. Data in these fields is entered by either the ISO administrator or software.
 - Check boxes always appear white regardless of whether or not they can be selected.
 - Most fields that are white are enterable by the participant administrator.

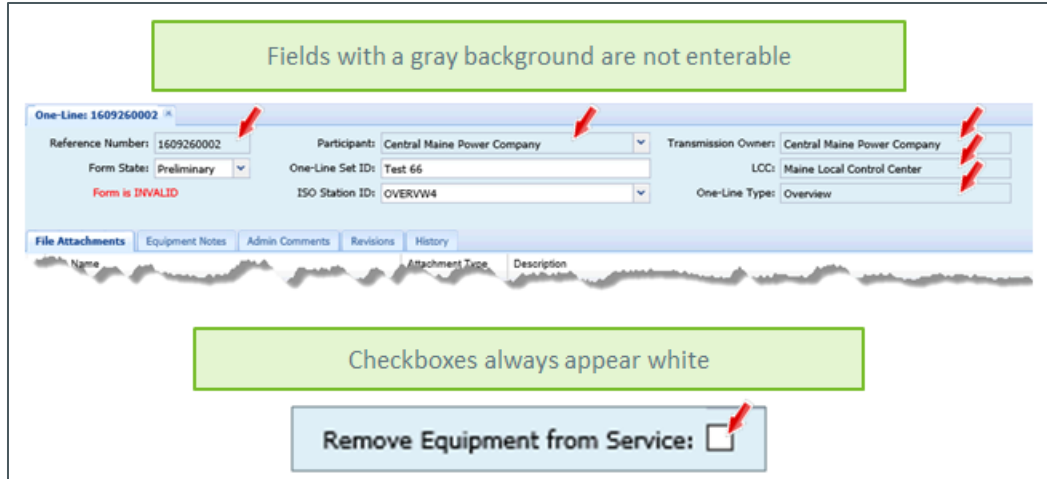


Figure 24: Field colors

- Field colors during data entry
 - Upon entering or changing data in a field, it will turn the field background red. The text on the main form tab and associated sub tab(s) will also turn red to indicate unsaved changes exist.
 - Clicking *Save* will perform validation, save the data, and reset the background and tab colors.

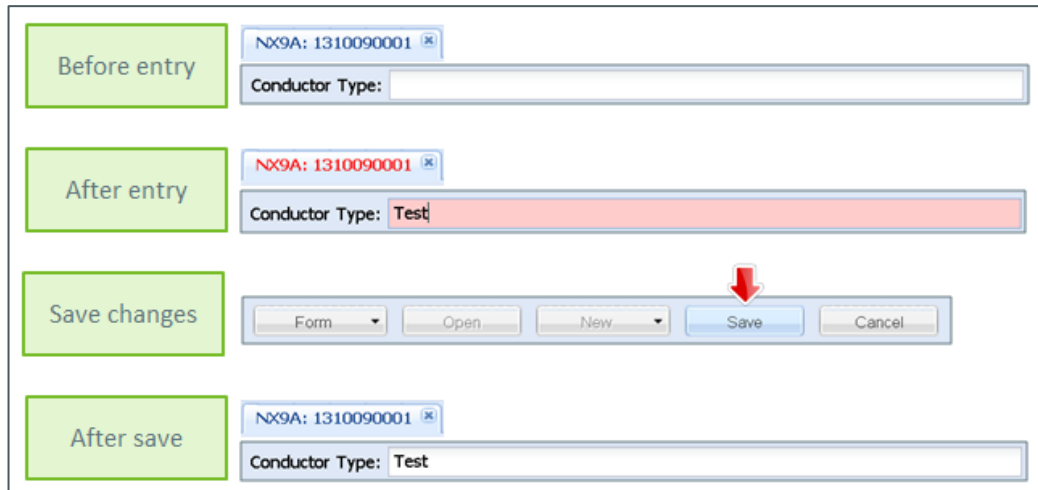


Figure 25: Field colors during data entry

- Form validation
 - Select the *Validate* option from the *Form* button to manually check your form for validation errors.
 - After a manual validation, the background and tab colors will remain red because the changes have not been saved; only validated.
 - Saving a form automatically performs validation.

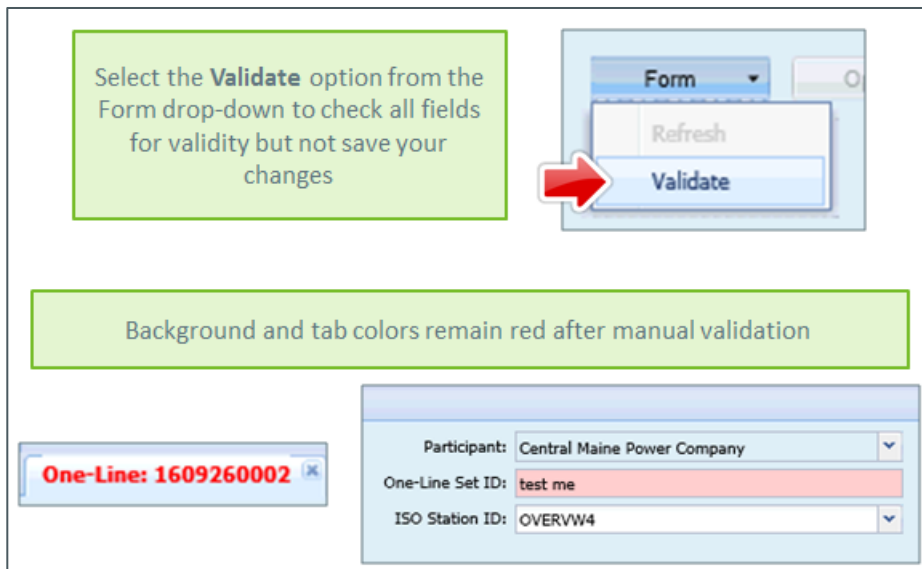


Figure 26: Validate without saving

- Validation status of cell data
 - After validation, cells that are missing required data or have inaccurate data will be outlined in red with a saw tooth line at the bottom the cell.
 - The user can mouse over a cell to get cell requirement information.
 - Errors will prevent the form from moving from one state to another.

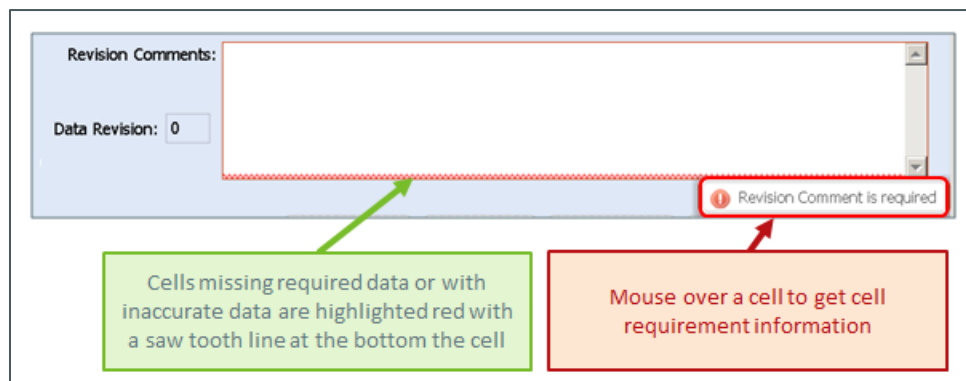



Figure 27: Invalid cell data

- Validation status on form tabs
 - Tabs that contain inaccuracies will show a red exclamation mark. 
 - The user can mouse over the tab to determine how many errors exist on the tab.
 - Both the main form tab and any sub tabs on the form will show indication of errors contained in the data that is within the tab.

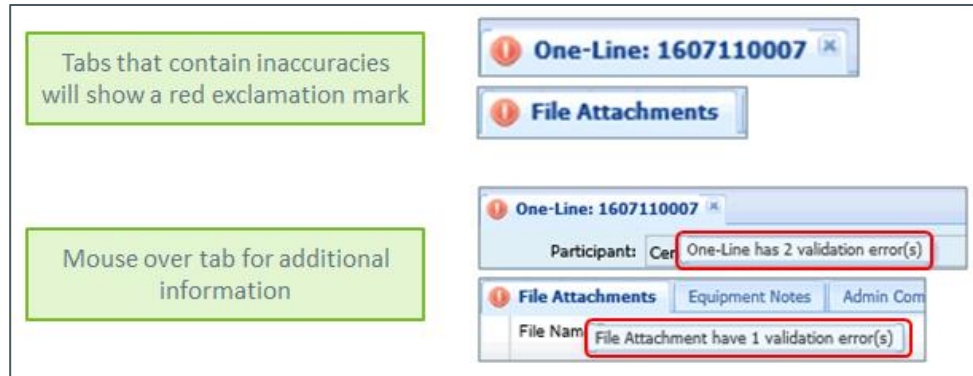


Figure 28: Invalid tab data

- Validation status on forms
 - If there is inaccurate data in the form, the **Form is INVALID** message will be displayed on the left side of the form header.
 - Once valid, the text will change to **Form is Valid**.
 - Upon initial call-up of a form, the individual errors will not be displayed. If the form shows an INVALID status, the user can run a manual validation to see the individual errors.
 - Validation errors will prevent the form from moving from one state to another.

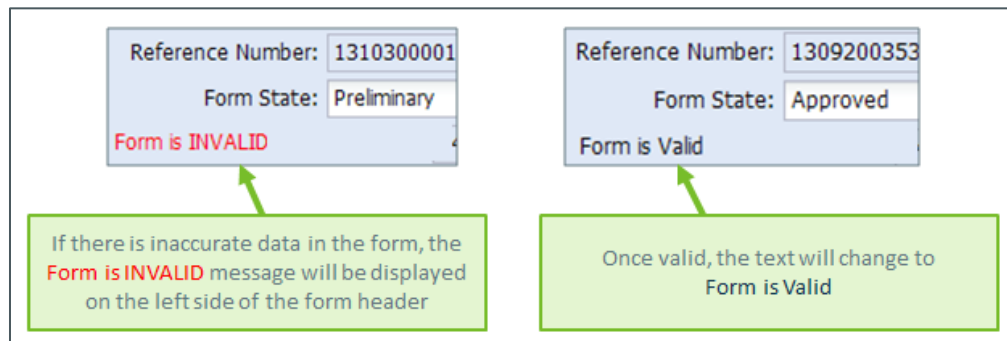


Figure 29: Invalid form data

8.6. One-line form review and approval at ISO

Once submitted, a form is considered complete and is available to all users with access to one-line forms. An additional form state change from *Submitted* to *Approved* is made by the ISO administrator once a review has been completed. This state change simply indicates that the ISO staff has reviewed the new attachments to assess whether changes are necessary to the ISO network model.

9. Other displays available to users of one-line forms

The displays described in this section are available to participant one-line administrators and some users with the ability to view one-line forms. Displays which are available only to administrators are noted as such.

9.1. Terminals and Stations

Users with only one-line form access will see only the *Refresh Terminal List* option in the *Terminals* and *Stations* display. Selecting this option updates the user's cache with current terminal information so any new or modified terminals are properly displayed on the forms they are used on.

The station record, which is created by ISO administrators, has a transmission owner and LCC associated with it. Only an ISO administrator or an administrator from the associated transmission owner or LCC will be able to create or modify one-line forms for that station. When a new one-line form is created, the administrator has the ability to link the form to a station that they are associated with. Again, the association between administrator and station is established on the station record. The ISO administrator has the ability to modify the transmission owner and LCC associated with a station record when necessary as well as the ability to modify the owner of a form when responsibility for providing data changes from one participant to another.

9.2. Application Log

The *Application Log*, available from the *System* menu, is visible only to administrators. The display offers visibility to four *Log Types*.

The application log display is a list display and as such, provides display control buttons (export, print, refresh) and column view setting options (sort, filter, hide, unhide, reset). See sections 7.2 and 7.3 for more information on the functionality available on list displays.

- Start/End Dates
 - Start Date and Time
 - End Date and Time
- Log Types
 - NX State Changes
 - Lists all one-line and NX forms which have changed state during the time period entered by the user.
 - Each entry displays the date/time of the change, the form type, the form reference number, information to describe the change, and the participant and user who made the change.

The screenshot shows the 'Application Log' interface. It includes a search area with 'Start Date and Time' (10/06/2014 00:00:00) and 'End Date and Time' fields. A 'Log Types' section has four checkboxes: 'NX State Changes' (checked), 'NX Form Changes', 'EMS Transfers', and 'Notifications'. A 'Participants' section has a 'Select from List' dropdown. Below is a table with columns for Time, Type, Text, Participant, and User. The table contains several entries related to NX forms and equipment creation.

Time	Type	Text	Participant	User
09/19/2016 16:14:27	NX	ONELN: 160910004 created by copying reference#: 1609300043.		
09/19/2016 16:13:57	NX	ONELN: 1609180003 changed state from Preliminary to Deleted.		
09/18/2016 16:13:42	NX	ONELN: 1609160003 created by copying reference#: 1609300045.		
09/18/2016 08:43:56	NX	ONELN: 1607280003 changed state from Preliminary to Submitted.		
09/17/2016 15:20:39	NX	ONELN: 1608230004 changed state from Preliminary to Submitted.		
09/17/2016 11:55:46	NX	NXGB: 1408260005 changed state from Submitted to Preliminary.		
09/17/2016 10:29:10	NX	NXGA: 1409170002 changed state from Submitted to Preliminary.		
09/10/2016 13:45:29	NX	NXGB: 1908100002 created by copying reference#: 1407210016.		
07/09/2016 16:28:08	NX	ONELN: 1607080018 created for new equipment.		

Figure 30: Application Log – NX State Changes

- NX Form Changes
 - Lists all one-line forms which have had a change to the *ISO Station ID* during the time period entered by the user.
 - Lists all NX forms with modified *Requested Effective* and *Actual Effective* dates that have been made during the time period entered by the user.
 - Each entry displays the date/time of the change, the form type, the form reference number, information to describe the change, and the participant and user who made the change.

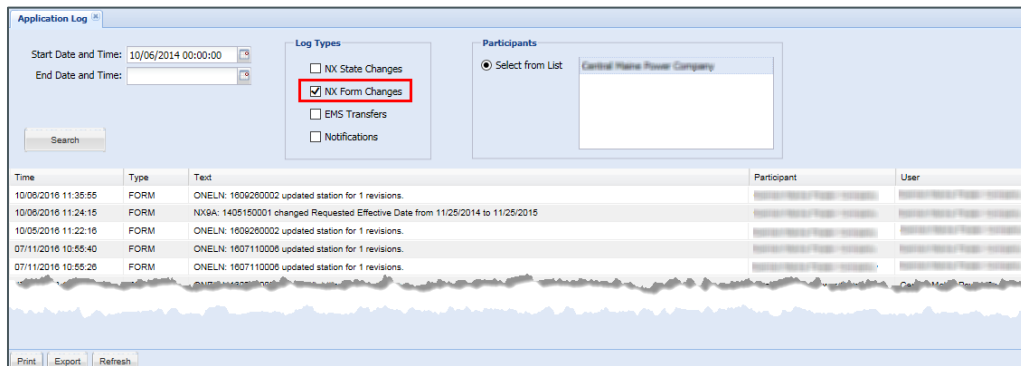


Figure 31: Application Log – NX Form Changes

- EMS Transfers
 - Option is selectable but provides data only for ISO administrator users.
- Notifications
 - Lists all email notifications which were sent during the time period entered by the user.
 - Each entry displays the date/time the notification was sent, the user and email address to whom the notification was sent, and the participant.

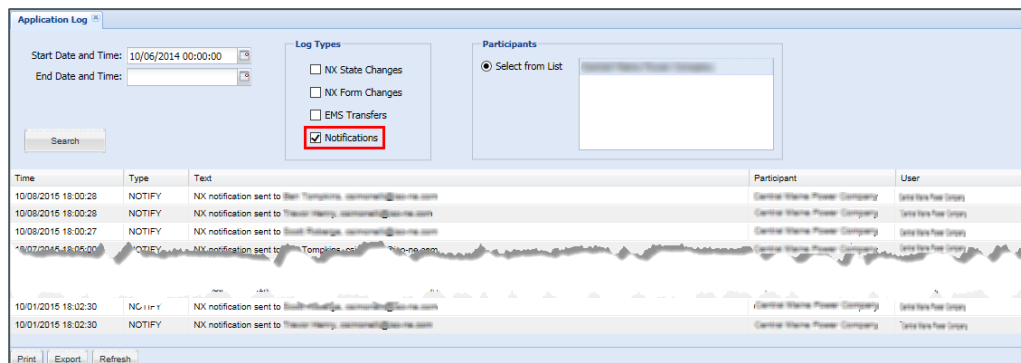


Figure 32: Application Log – Notifications

10. FAQ and troubleshooting

Use this section to define common problems/solutions and FAQ

Question: *Why can't I see all the data on the form?*

Answer: This occurs when using Internet Explorer if the user's compatibility view settings are not correct. See section 4.3, Technical requirements – browsers, screen size, and resolution for compatibility view setting instructions.

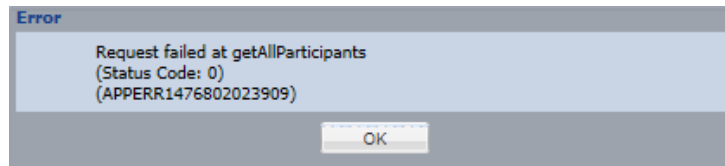
Question: *The station name I need is not listed in the ISO Station ID dropdown.*

Answer: Only stations or overviews associated with the user's participant and which are not currently used by an active set of one-line forms are available for selection. Contact the ISO administrator for assistance.

Question: *The effective date on my preliminary one-line form changes every time I open it. Why?*

Answer: The effective date is automatically set to the current date each time the form is opened on any one-line form in the Preliminary state.

Question: *I got an error similar to the one pictured that indicates the system was unable to return the data I requested. What do I do?*



Answer: The immediate fix for this is to close and re-open your browser session. You must close the entire browser session and not just the NX Application tab. If you receive this or a similar error, please notify the ISO NX Admins at NXApplication@iso-ne.com to help ISO track and address these issues.

11. Revision History

Revision #	Date	Explanation of changes
Revision 0	11/17/16	Initial release of document
Revision 1	12/15/16	Form footer, Revision Comment instructions: add need for comments to specify changes made on diagrams