Appendix A -
ISO New England ICCP CNP Node Requirement

Effective Date: August 21, 2023

Review By Date: August 21, 2025

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I. Introduction

This Appendix A to ISO New England Operating Procedure No. 18 - Metering and Telemetering Criteria ("OP-18A") defines the communications network processor (CNP) requirements that Local Control Centers (LCCs) and Supervisory Control and Data Acquisition (SCADA) Control Centers (referred to herein as "sites") shall comply with for any Inter-Control Center Communications Protocol (ICCP) server operating on the ISO New England (ISO) ICCP network.

The following main topics are discussed within this document:

- Configuring and testing a new ICCP server

- The format of the data exchange bilateral table

- Data quality and status bit conventions

- Coordinated database maintenance

II. ICCP Server Requirements

The ICCP software shall be certified by its vendor as compliant to the IEC 60870-6 TASE.2 standard (1996-8 or above).

Server redundancy is required with a minimum of 2 production servers; 1 production server at the Enabled Control Center (ECC) and 1 production server at the Standby Control Center (SCC) as applicable. Additionally, there shall be at least 1 development/test server for use in verifying software and database changes prior to production implementation.
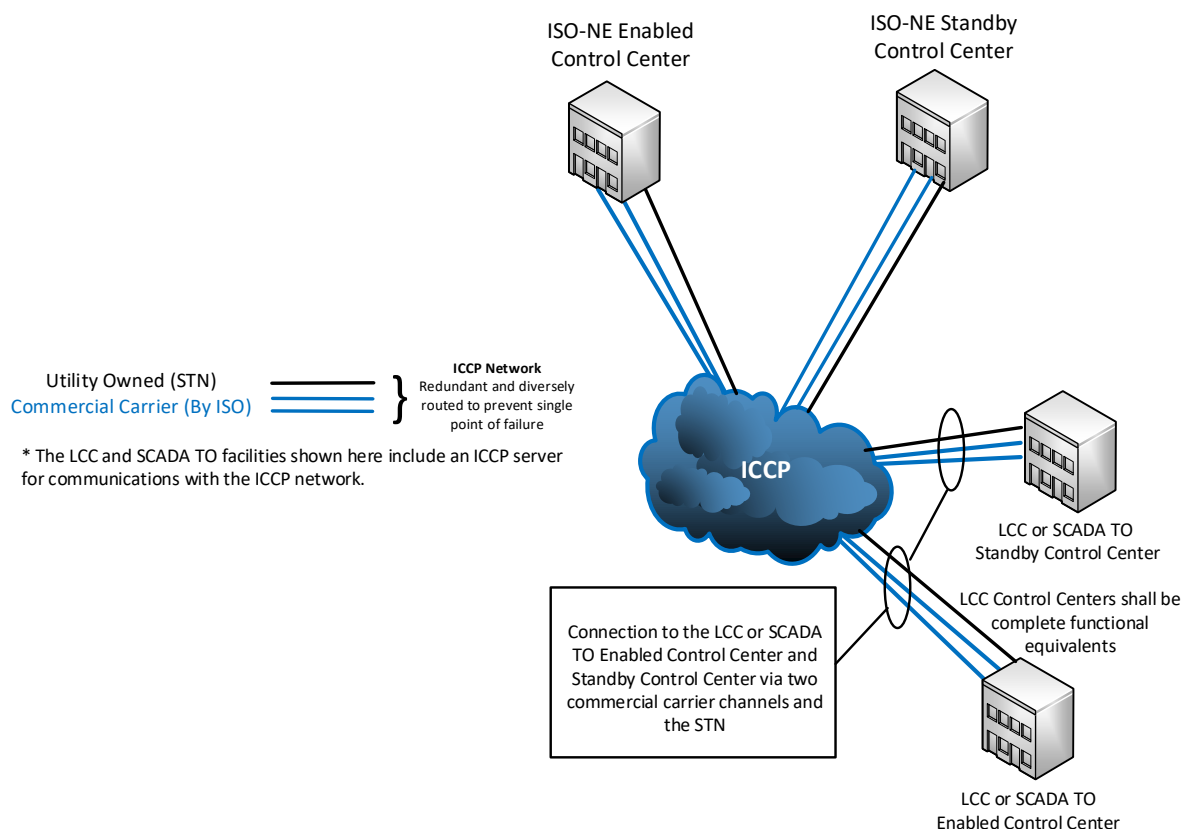
III. ICCP Network Configuration

The ICCP network for LCCs and SCADA TOs shall utilize diverse routing and redundancy to ensure there is no single point of failure, consisting of three (3) distinct communications paths. Each path shall include one router per network for each LCC and SCADA TO. Two paths shall be telecom circuits and a third path with STN. All ICCP network failovers shall occur automatically.

LCCs and SCADA TOs shall physically separate ISO-NE provided ICCP routers (i.e. underlying electrical/environmental infrastructure, adjacent network infrastructure, etc.) to eliminate single points of failure.

LCCs and SCADA TOs shall provide maximum physical diversity for all incoming telecom & STN ICCP circuits to eliminate single points of failure.

Diagram 1 illustrates the ICCP network configuration for Control Centers.

Any exceptions and conditions upon variations from the network as described and shown in Figure 1 shall be made by request for ISO approval.

Diagram 1 – New England ICCP Network

IV.   ICCP Site / Server Configuration

Server connection parameters for all new or modified servers shall be published in the ICCP "Association Information Exchange Form" (AIEF) through an electronically secure method. A blank template of this form is provided as Attachment 1 to this OP-18A.

All ICCP sites shall connect to, and retrieve data from, the site in which the data source originates. Data shall **not** be passed through from site A to site C through any other site. Site C should get the data directly from site A. (i.e., data shall **not** be relayed through any site.) See Diagram 2.
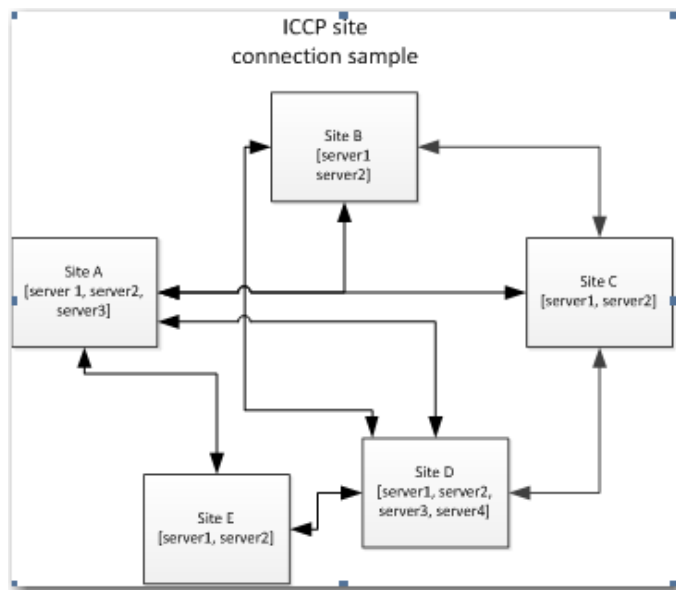
Diagram 2

All dataset requests shall be configured in the most efficient manner with the following criteria:

A. Similar data shall be grouped in the same dataset(s) such as analog versus status.

B. Datasets shall **not** exceed 600 data items unless agreed upon by all the ICCP sites.

C. Appropriate dataset properties shall be configured for each dataset to optimize efficiency.

   1. Statuses shall be reported by 'exception' (RBE) processing.

   2. Analogs shall be reported in 'periodic' mode.

   3. Data update rates shall **not** exceed those specified in OP-18.

V. Testing

The following testing shall be completed before a new server is placed into service as a production system.

A. Network connectivity - verify firewall and routing

   1. For new circuit installations, once the ICCP circuits are in place, ISO shall verify communications to the router.

   2. The remote site shall verify that it can ping the ICCP router at its local site from each of its servers.

   3. The remote site shall verify that it can ping all other remote site routers.

B. Association testing - verify AIEF connection parameters

   1. For each new server, a connection shall be established to the development/test server at each entity to which it connects. After all development/test server testing is complete, a similar connection-testing scheme shall be developed for each production server based on remote

server capabilities.

    2. Use of ICCP analyzer software may be necessary to debug issues at this level.

C. Dataset testing

    1. Verify partial dataset creation functionality.

    2. Verify that periodic datasets update at the defined rate.

    3. Verify that RBE datasets update only when data changes and at the defined integrity poll time.

D. Data value testing

    1. If the site has a live data feed to its new server, then point-to-point testing shall occur for analog and status points.

    2. The site shall confirm with all applicable associations that the same value and polarity (for analogs) is received.

E. Data quality testing

    1. If the site has a live data feed to its new server, then quality code testing shall occur for analog and status points.

    2. The site shall confirm with all applicable associations that the appropriate quality codes are sent and received.

VI. Data Quality Flags

Typically, telemetered data is of good quality. However, there are a few common scenarios in which manual intervention of quality codes shall be performed by the entity that owns the data. The scenarios and recommended actions are as follows:

A. Scenario A - The analog values have a "BAD" quality code due to a communication line, remote terminal unit (RTU), or other supporting equipment failure and the data value is **not** updating. In this case, the value shall be manually updated as frequently as appropriate or state estimator (SE) replacement data shall be provided in its place. If the data is **not** critical, then it is acceptable to leave it as "BAD" quality unless requested by another site. The determination of whether or **not** data is critical is made jointly by ISO and the LCCs or the SCADA Control Centers (SCCs).

B. Scenario B - The analog values have a "GOOD" quality code but the actual values are wrong. This may be due to equipment that has "stalled" or is possibly being worked on and is sending incorrect values. In this case, the data quality should be modified to be either "BAD" quality, manually replaced, or SE replaced. If the value is manually replaced, then it should be updated as frequently as appropriate.

For either scenario, OP-2 specifies the priority and timeframe in which repair efforts shall be made. Repairs that do **not** comply with OP-2 requirements are subject to ISO review and compliance investigation.

VII.   Data Definitions

Each site shall develop a data table for the following categories of power system data to aid in the identification of the data to other interested parties. The definition in the data table shall match the device name that exists in the field and in the one-line drawings.

     A.   Transmission station names

     B.   Transmission lines

     C.   Transformers

     D.   Generating stations/Resources

     E.   Breakers/switches

     F.   Other

VIII.   Data Definition Updates

Each site shall be required to prepare an initial data table of ICCP data point identifiers in Microsoft Excel format prior to connecting to the ICCP network. This data table is also known as the bilateral table file. Subsequent updates shall be required as data definitions are changed via additions, deletions, or modifications. ICCP IDs for new equipment shall be published at least one (1) week prior to equipment energization. Each site shall assume the responsibility for distributing its definition updates.

The ISO ShareFile web portal hosts the data file storage and distribution for these files. To request access to the ShareFile site, each individual must contact the "Security Administrator" representative from their entity and have them request "Citrix ShareFile LCC Intercontrol Center Protocol" access for the individual through the ISO Customer and Asset Management System (CAMS). Any update to these data files shall consist of the following actions:

     A.   An email notice with a summary listing of changes shall be sent to the data communication task force (DCTF) email distribution list.

     B.   The updated data file shall be uploaded to the ShareFile web portal.

     C.   The data file shall consist of one (1) tab that follows the descriptions further described in section VIII of this document.

IX.   ICCP Bilateral Table Data Description

	ICCP ID	PtDesc	Station	KV	Equip	DataType	Units	Source	ChgCode	ChgDate
Header:	**ICCP ID**	**PtDesc**	**Station**	**KV**	**Equip**	**DataType**	**Units**	**Source**	**ChgCode**	**ChgDate**
Properties:	**(10-char ID)**	**(40-char free text)**	**(20-char)**	**(5-char)**	**(2-char)**	**(4-char)**	**(4-char)**	**(3-char)**	**(3-char)**	**(mm/dd/yyyy)**
Example 1:	CX12_3456	1007_16C_5_Motorized_Disconnect	Great Falls	12.47	SW	STAT	STAT	MAN	CHG	12/31/1996
Example 2:	NX56789	WEST_PT_BUS_345_1_KV	West Point	345	BN	VOLT	KV	RAW		
Example 3:	NE8675309	Chester Road 115 A123 MW	Chester Road	115	LN	FLOW	MW	CAL	ADD	02/07/2011

	Freq	OldPtDesc	Comments
Header (cont.):	**Freq**	**OldPtDesc**	**Comments**
Properties (cont.):	**(seconds or RBE)**	**(40-char free text)**	**(40-char free text)**
Example 1 (cont.):	N/A	1007_16C_5_Manual_Disconnect	Manual switch replaced with motorized
Example 2 (cont.):	4		
Example 3 (cont.):	3		Expected in service 03/12/2011

A. Field #1 – **ICCP ID**; is a ten (10) character field for ICCP Point Identifier. Up to the first four (4) characters can represent the entity identifier. The remaining characters are free-form and shall be unique (and capitalized if alphabetic). See above table for examples.
The following defined entity identifiers shall be used (additions will be made as other sites join the ICCP network):

BE - Eversource/East (NSTAR)

BH – Versant Power

CX - Eversource/West (CONVEX)

NE – NGRID

NH - Eversource/North (PSNH)

NX - ISO-NE

ME – AVANGRID (CMP)

RI – PPL Rhode Island Energy

UI – AVANGRID (UI)

VE - VELCO

B. Field #2 – **PtDesc**; is a free-form field for up to forty (40) characters for the point description. See above table for examples.

C. Field #3 – **Station**; is a free-form field of up to twenty (20) characters for the station name at which the data point is measured.

D. Field #4 – **KV**; is a free-form field of up to five (5) characters for the voltage level in kiloVolts of the data point.

E. Field #5 – **Equip**; is a two (2) character field for the equipment type. The following defined equipment types shall be used:

BN - BUS Node

CB - CIRCUIT BREAKER

CP - CAPACITOR

CM - COMMUNICATIONS

CS - CIRCUIT SWITCHER

GD - GROUND DEVICE

GN - GENERATION

IF - INTERFACE

LN - LINE

MT - METEOROLOGICAL DATA

OT - OTHER

PS - PHASE SHIFTER

RD - REACTIVE DEVICE

SC - SYNCHRONOUS CONDENSER

SD - SERIES DEVICE

SW - SWITCH

SY - SYSTEM

TR - TRANSFORMER

UN - UNIT

F. Field #6 – **Data Type**; this is a four (4) character field for the data type. The following
defined data types shall be used:

AEMN - ACTUAL ECONOMIC MINIMUM

AEMX - ACTUAL ECONOMIC MAXIMUM

ANGL - ANGLE

CL10 -   CLAIMED 10-MIN RESERVE

CL30 -   CLAIMED 30-MIN RESERVE

CRR -   CURRENT RESPONSE RATE

CURC - CURRENT CAPACITY

ELEV -   ELEVATION

ENGY - ENERGY

FLOW - ACTUAL FLOW

FREQ - FREQUENCY

GEN -   GENERATION

GIC -   GEOMAGNETICALLY INDUCED CURRENT

HUM -   HUMIDITY

IRR -   IRRADIANCE

INTG -   INTERCHANGE

LIMT -   LIMITS

LOAD - LOAD

OTHR - OTHER

PRES - PRESSURE

PUL -   PULSE DATA

QTY -   QUANTITY

RHOL - REAL-TIME HIGH OPERATING LIMIT

SAED - ECONOMIC DISPATCH POINT

SCTL -   SETPOINT CONTROL

SDEV - STANDARD DEVIATION

SP - SETPOINT

STAT - STATUS

TAP - TRANSFORMER TAP POSITION

TEMP - TEMPERATURE

UCM - UNIT CONTROL MODES

VOLT - VOLTAGE

WDIR - WIND DIRECTION

WSPD - WIND SPEED

G. Field #7 – **Units**; this is a four (4) character field for the units in which the point is measured. The following defined measured point units shall be used:

ACT - ACTUAL

ANDC - DC NEUTRAL AMPERES

AS - ACRES

CFS - CUBIC FEET/SECOND

CNT - COUNT

DEG - DEGREES (ANGULAR)

DEGF - DEGREES FAHRENHEIT

DEGC - DEGREES CENTIGRADE

DHZ - DELTA HZ

FT - FEET

HZ - HERTZ

KPA - KILOPASCALS

KV - KILOVOLTS

LIMT - LIMIT

MPH - MILES/HOUR

MPS - METERS/SECOND

MW - MEGAWATTS

MWH - MEGAWATTHOUR

MWPM - MW PER MINUTE

MVAR - MEGAVARS

MVA -   MVA

NET -   NET

OTHR-   OTHER

PCT -   PERCENT

PF -   POWER FACTOR

POS -   TAP POSITION

PU -   PER UNIT

PUL -   PULSE

REQ -   REQUIRED RESERVE

SCHD - SCHEDULED

STAT - STATUS * [See section VIII.N for expected bit conventions]

VOLT - VOLTAGE

WMSQ -WATTS/METER SQUARE

XSTA - NON STANDARD STATUS * [See section VIII.N for expected bit conventions]

H. Field #8 – **Source**; this is a three (3) character field for the source description of the data. The following defined data source descriptions shall be used:

CAL -   CALCULATED DATA

MAN -   MANUALLY ENTERED DATA

RAW -   ACTUAL FIELD DATA

STE -   STATE ESTIMATOR

I. Field #9 – **ChgCode**; this field is a three (3) character code used to distinguish the types of changes made to entries in the bilateral table. The following defined bilateral table entry change codes shall be used:

ADD -   Adding a new point (This field remains "ADD" until changed to one of the below)

CHG -   Changing an existing point

DEL -   Points to be deleted from the table in current review cycle (detail below)

RIP -   Points to be deleted from the table in the next review cycle (detail below)

J. Field #10 – **ChgDate**; is a ten (10) character field in MM/DD/YYYY format that is used to indicate the last date a change was made to this point (other than if original addition).

K. Field #11 – **Freq**; is a three (3) character field indicating the frequency with which data values will be updated and be available for transmission via ICCP. The following defined data value update frequencies shall be used:

1, 2, 4, 10, etc. – seconds (typically analogs)

RBE – report by exception (typically statuses)

N/A – not applicable (for manual {MAN} sources)

L. Field #12 – **OldPtDesc**; is a free-form field for up to forty (40) characters that lists this point's previous description. See the table above for examples.

M. Field #13 – **Comments**; is a free-form field for up to forty (40) characters that describes some attributes of the entry such as why it may have changed. See the table above for examples.

N. **Status representation conventions** – The following are the expected ICCP bit conventions for specific status types. All bits are represented in decimal form. The Energy Management System (EMS) bit representation may vary from site-to-site. The ICCP values transmitted shall align with the expected ICCP convention and the corresponding bit state definition. Any status **not** adhering to the expected ICCP convention shall be identified in the bilateral table by entering "XSTA" for Field #7 and by detailing the defined states in Field #13.

Status Type	Typical EMS / RTU representation	Expected ICCP convention	Bit state definition
Switch/CB	0 = open 1 = closed 2 = between	1 = open 2 = closed 0 = between	open = device is open closed = device is closed between = device is stuck or in transit
Unit/Asset automatic voltage regulator (AVR)	0 = off 1 = on	1 = off 2 = on	off = AVR is out-of-service or is in-service and running in power factor mode or MVAR mode. on = AVR is in-service and is in voltage control mode controlling constant voltage.
XF LTC AVR	0 = off 1 = on	1 = off 2 = on	off = the transformer load tap changer (LTC) is out-of-service or in-service but in the SCADA or MANUAL mode on = the transformer LTC is in-service and in the automatic voltage regulation mode controlling to a voltage schedule
PSS	0 = out (off) 1 = in (on)	1 = out 2 = in	out = the power system stabilizer is **not** in-service in = the power system stabilizer is in-service and operating.
Comm link	0 = off 1 = on	1 = off 2 = on	off = the datalink is down on = the datalink is up
Other 2-state	custom	custom	custom defined states should be listed in the comments field (#13)
Custom 3 or 4-state	**not** allowed	**not** allowed	**no** 3 or 4-state statuses are to be created beyond those with pre-existing ICCP IDs

X. Coordinated Database Maintenance

A. Annual deletion process

Beginning in January and continuing through May of each year, each ICCP site shall identify host data items to be deleted in November/December by marking them in the bilateral table using the format specified in this OP-18A. This includes updating the change code field from "RIP" to "DEL" and the change date field to 11/01/YYYY (where YYYY represents the current year).

By June 30th, a list of the data items to be deleted, including their ICCP IDs and point descriptions, shall be sent to the DCTF email distribution list. An updated bilateral table showing these changes shall also be posted to the ISO ShareFile web portal by this date. **No** new points shall be allowed for deletion in the current year's cycle after this date. Any additional items shall become orphans - meaning that their IDs shall remain on the host ICCP server, but **no** longer have live data behind them. Such points shall be indicated in the bilateral table with "RIP" in the change code field along with the date (in the change date field) when the points stopped receiving live updates. These "RIP" points shall then become the starting "DEL" points for the next year.

The months of July and August shall be used for review and coordination. All client sites shall review the proposed data value deletions. Each client site shall review the information and coordinate any issues with host sites proposing the deletions. Any required changes shall be made by the host site in its bilateral table, published to the ISO ShareFile web portal, and an update notification shall be sent to the DCTF email distribution list.

The months of September and October shall be used for client sites to stop requesting all data items marked for deletion. In November, the host site shall resend the June 30th list of points to be deleted, to the DCTF email distribution list, along with a date within the current year in which they will be removed. Following the removal from their ICCP server, the host site shall notify the DCTF email distribution list that the work is complete.

B. Deletion yearly overview

1. January through May: each site shall identify host data items for deletion in November/December and change its state to "RIP".

2. By June 30th: each site shall publish an updated bilateral table and email summary of "DEL" points to be deleted, to the DCTF email distribution list. All "RIP" points may be changed to "DEL" at this time.

3. July through August: each client site reviews other host sites' bilateral tables and coordinates any issues concerning data item deletions.

4. September through October: each site modifies its data set requests (client's requests) by removing the data items marked for current year deletion.

5. November through December: host site resends June 30th list of points to be deleted, specifying a date when this will occur. After deletion, e-mail confirmation is sent to the DCTF email distribution list.

NOTE

Any and all necessary outages associated with the above work are required to be scheduled through the normal OP-2 outage process.

XI. Attachment 1 - ICCP Association Information Exchange Form

Association Information Exchange Form
Supplied by Entity A to Entity B

The attached ICCP Association Information Exchange Form has been created to facilitate ICCP associations between ICCP servers. ICCP server administrators shall complete this form using their own setup information. Thus, this form shall contain information supplied by Entity A to Entity B detailing the parameters needed during Entity B ICCP association configuration. Note that similar information shall be supplied by Entity B to Entity A.

Date:

Entity A:

Contact for Entity A:

Entity B:

Contact for Entity B:

General Notes:

Table 1: Entity-wide / Server Independent Information

1. ICCP vendor and platform The name of the Entity A ICCP vendor, vendor software version, as well what operating system and hardware platform is used for the ICCP server.	
2. Number of possible ICCP servers: This is the total number of ICCP servers that may be available to a remote client to access (association). Include backup servers if they have unique addresses. This number should equal the number of copies of Table 2 included in this form. Typically 1 - 10.	
3. Entity A domain name: The domain name of Entity A. Recommended to be the 4 character ISN site name of Entity A.	
4. Entity B domain name: The domain name of Entity B. Recommended to be the 4 character ISN site name of Entity B. NOTE: This is the only entry on these forms that refers to the Entity B ICCP site.	
5. Association type "Single direction client-server": Enter this if Entity A and Entity B ICCP servers act as either client or server over one association. Information may be sent in only one direction per association. The client must initiate the association. "Dual direction client-server": Enter this if Entity A and Entity B ICCP servers act as client and server over one association. Information may be sent in either direction per association. The association type is determined by prior agreement between the two users. Typically "Dual direction client-server".	
6. Association initiation: This field is only used if the association type is "Dual direction client-server" and indicates which ICCP site shall initiate the association (e.g., Entity A). The initiator of the association is determined by prior agreement between the two users.	
7. Bilateral table ID: Entity A bilateral table name used when Entity B is accessing Entity A data (e.g., "1.1").	

8. Supported ICCP services: A list of the conformance blocks supported by the server (e.g., Blocks 1, 2).	
9. ICCP version: The version of ICCP running on the server (e.g., TASE.2 Version 1996-08).	
10. Shortest periodic interval: Time in seconds at which Entity A data is being updated. Typically 10 seconds.	
11. IP address of the WAN port on the Entity A router. If you are using TCP/IP, this field is either a fully qualified domain name or a 12 integer number delimited with periods.	
12. Transport layer acknowledgement time: This field indicates a maximum time in seconds that can elapse between receipt of a TPDU by transport from the network layer and the transmission of the corresponding acknowledgment.	
13. Transport layer retransmission time: This field indicates the maximum time in seconds transport will wait for an acknowledgment before retransmitting a TPDU.	
14. Transport layer window time: This field indicates a maximum time in seconds that transport will wait before retransmitting up-to-date window information.	
15. Number of retries: This field indicates the maximum number of attempts to retransmit a TPDU before issuing a disconnect request. Typically 6.	
16. Maximum MMS PDU size. Size in bytes of the maximum MMS protocol data unit. Typically 8k bytes or more.	
17. Maximum datasets: This field indicates the maximum number of datasets that Entity A will serve to Entity B.	

Table 2: ICCP Server specific information
(This table should be duplicated for each ICCP server installed)

1. **Server name:** The name by which Entity A refers to this server. This field is **not** electronically transmitted during any ICCP transactions, but is only here to facilitate verbal communication between Entity A and Entity B.	
2. **Server number:** "1" if this is the primary server, "2" if this is the first backup, etc.	
3. **IP network address:** If you are using TCP/IP, this optional field is the IP address for this ICCP server if TCP/IP can be used as the network transport.	
4. **AP title:** Object identifier representing the application process title (AP Title) given to this application. The standardized format of the AP Title is found in Addendum A.	
5. **AE qualifier:** A long integer (32 bit signed) is used to qualify the application entity.	
6. **Presentation selector (PSEL):** 2 or 4 byte number used to select the correct instance of the presentation layer (e.g., 00 09 or 00 00 00 09).	
7. **Session selector (SSEL):** 2 or 4 byte number used to select the correct instance of the session layer (e.g., 00 09 or 00 00 00 09).	
8. **Transport selector (TSEL):** 2 or 4 byte number used to select the correct instance of the session layer (e.g., 00 09 or 00 00 00 09).	

XII.   Addendum A: Mandatory AP Title Standard

The AP Title is used by some ISO applications to determine what application is calling since the TSEL, SSEL and PSEL of the caller may **not** be passed to applications upon association. The AP Title consists of nine (9) 16 bit decimal numbers:

Field Name	1	2	3
Field format	One single 16 bit decimal integer)	One 16 bit decimal integer	Seven (7) 16 bit decimal integers
Required value in decimal	2 (joint-iso-ccitt)	16 (country based naming hierarchy)	3826 XXXX XXXX XXXX XXXX YYYY 0073 (3826 is the abbreviated NERC org ID used to specify ISN applications). XXXX XXXX XXXX XXXX is for the registered ISN site ID in decimal (one 16 bit decimal number for each ASCII character in the site ID including padding underscores). YYYY is for the server number (one 16 bit decimal number). The last 16 bit number is an application specification where decimal 0073 identifies the ICCP.)

For example: An ICCP application at MAIN1 would have an AP Title of:

0002 0016 3826 0077 0065 0073 0078 0049 0073

NOTE: Some ICCP vendors do **not** provide a user interface for setting AP Titles.

In this case, the user may be required to manually edit a Directory Information Base ASCII file.

ASCII to Hex and Decimal Conversion Table:

ASCII	Dec	ASCII	Dec	ASCII	Dec	ASCII	Dec
_	95	9	57	I	73	R	82
1	49	A	65	J	74	S	83
2	50	B	66	K	75	T	84
3	51	C	67	L	76	U	85
4	52	D	68	M	77	V	86
5	53	E	69	N	78	W	87
6	54	F	70	O	79	X	88
7	55	G	71	P	80	Y	89
8	56	H	72	Q	81	Z	90

NOTE: Only use this ASCII conversion table to calculate the AP Title.

OP-18 Appendix A Revision History

Document History (This Document History documents action taken on the equivalent NEPOOL Procedure prior to the RTO Operations Date as well revisions made to the ISO New England Procedure subsequent to the RTO Operations Date.)

Rev. No.	Date	Reason
- -	08/21/23	For previous revision history, refer to Rev 10.1 available through Ask ISO.
Rev 11	08/21/23	Periodic review completed by procedure owner; Added Section III ICCP Network Configuration and renumbered remaining sections; Added RI – PPL Rhode Island Energy as ICCP entity; Added OP-18 Figure 6-1 as Diagram 1 showing ICCP arrangement in the ISO New England RC area and renumbered old Diagram 1.