Appendix B - Explanation of Terms and Instructions for Data Preparation of NX-9B

ISO New England Transmission Equipment Rating, Characteristic and Operational Data

Transformer - FIXED/GSU/TCUL

Effective Date: October 26, 2023 Review By Date: October 26, 2025

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I. EQUIPMENT REQUIREMENTS

Data for all transformers designated as part of the Bulk Electric System¹ (BES) or with at least one winding connecting to the New England Transmission System² at a voltage of 69 kV or greater shall be provided by the Transmission Owners and Market Participants who own the equipment.³

- Data for all generator step-up transformers (GSUs) attached to generators 1 MW or greater that participate in the Real-Time Energy Market, including generators connecting via a line of any voltage level that is dedicated solely to the generation interconnection (i.e., via an express feeder), will be evaluated for impact to the ISO EMS Network Model. Based on this evaluation, NX-9B data forms may be required. When required, the NX-9B data forms shall be provided by the Lead MP for the Generator Assets.
- NX-9B data forms are not required for GSUs that connect a generator to the transmission system via a line(s) that also serves customer load.
- NX-9B data forms are not required for GSUs associated solely with Settlement Only Generators.

NX-9B data forms for transformers or individual wind turbine or solar GSUs connected at voltages that are less than 69 kV may be required when ISO determines that the data is necessary for reliable operation of the New England Transmission System. When required by ISO, the TO or MP shall submit the data within thirty (30) calendar days of ISO's notification.

A separate NX-9B form shall be provided for each transformer. All data items shall be completed for each winding unless these instructions specifically indicate otherwise.

A copy of the manufacturer's nameplate, either by document (.pdf format) or digital photograph (.tif or .jpg formats), shall be included as a file attachment to the NX-9B form for new or replaced equipment.

A copy of the manufacturer's test report document (in .pdf format) shall be included as a file attachment to the NX-9B form for all new or replaced equipment and upon revision of existing NX-9B forms for transformers whose low voltage connection is 69 kV or greater.

¹ Bulk Electric System (BES) is defined in the Glossary of Terms Used in NERC Reliability Standards.

² New England Transmission System is defined in the ISO Transmission, Markets, and Services Tariff, Section I.2.2.

³ Generally, under Section I of Operating Procedure No. 16, data shall be provided by Transmission Owners (TOs) and Market Participants, *i.e.* Market Participants who own the equipment or Lead Market Participants for Generator Assets (collectively MPs).

II. GENERAL DATA INSTRUCTIONS

The NX-9B form provides for entry of both ISO and MP/TO data. ISO fields cannot be modified by the MP or TO. The MP or TO is responsible for providing data for all non-ISO fields via the NX Application.

The circuit number shall initially be entered by the MP or TO for new equipment and thereafter maintained by ISO.

Select the terminals that reflect the connection points of the equipment. Terminals are created and maintained by ISO. The user should contact the ISO NX-9 Administrator (<u>nx9admin@iso-ne.com</u>) if terminal additions or changes are needed.

To remove equipment from service, select the Remove Equipment From Service checkbox. Equipment is removed from service either when the equipment is retiring from service or if new forms are being submitted as a replacement due to a change in configuration.

All voltage data item responses are to be in kV unless otherwise indicated in these instructions.

To assist in completing the NX-9B form, sample manufacturer's nameplate data and completed NX-9B forms utilizing that data are attached.

Example 1: Fixed Tap Transformer

Example 2: Generator Step-Up (GSU) Transformer

Example 3a and 3b: Tap Change under Load (TCUL) Three Winding Transformer (developed using the same nameplate data)

3a - TCUL Three Winding Model: Transformer with tertiary loaded.

Any 3-winding transformer whose tertiary winding connects to a generator, a transmission bus, a sub-transmission bus, a distribution bus or a capacitor/reactor bank should be modeled consistent with Example 3a. This example assumes the tertiary is connected to a capacitor bank.

3b - TCUL Two Winding Model: Transformer with tertiary not loaded.

Any 3-winding transformer whose tertiary winding is not loaded should be modeled consistent with Example 3b. If the total station service load served by one or more tertiary windings is less than 1 MW, then the transformer shall be modeled consistent with Example 3b.

If the total station service load served by one or more tertiary windings is greater than 1 MW, then the MP or TO shall confirm with ISO whether the transformer should be modeled consistent with Example 3a or 3b.

All tap position item responses shall indicate tap positions using numbers (1, 2, 3, 4, etc.) as opposed to letters (a, b, c, d, etc.). See examples 3a and 3b where tap positions designated by letter on the nameplate sheet have been designated by number on the sample NX-9B forms.

III. RATING DATA INSTRUCTIONS

Facility rating data shall be provided in MVA (rounded down to the nearest whole number) and determined in accordance with Planning Procedure 7, "Procedures for Determining and Implementing Transmission Facility Ratings in New England" (PP7). The definition of Thermal Ratings is described in PP7 Section 2.0 Collaborative Development of Rating Procedures. Additional information regarding the rating of GSU Transformers and Load Serving Transformers exists in PP7 Appendix D, Power Transformers, Section 3.0 Application Guide. A facility rating shall equal the rating of the most limiting individual equipment, shall reflect relay loadability limits⁴, and shall account for auxiliary support equipment such as wave traps and any other equipment that Good Utility Practice suggests is necessary. This requirement does not remove the TO's obligation to adhere to PRC-023-4, and it successor standards, nor does it suggest a TO be allowed to change a relay setting to create a more limiting thermal rating for a facility.

The NX-9B form provides for entry of both summer (April 1 through October 31) and winter (November 1 through March 31) thermal ratings as well as ratings for special conditions or configurations. The ambient temperature (reported in Fahrenheit) used to establish the normal ratings shall be entered for each rating set. If ratings for special conditions or configurations are added to the NX-9B form, comments that describe the associated circumstances for use of the special ratings are required. The MP or TO is also responsible for providing a statement as to the authority of ISO and the Local Control Center (LCC) for use and distribution of these special ratings.

IV. CHARACTERISTIC AND OPERATIONAL DATA INSTRUCTIONS

Complete the following fields as instructed below:

Nameplate kV – Provide the transformer voltage rating for utilized connections as listed on the nameplate document.

Impedance Data – Provide the positive sequence resistance (R) and reactance (X) calculated at the kV of the no load tap position in use for the fixed tap, and the Nameplate kV on the tap change side, in percent on a 100 MVA base. Do not adjust values to nominal system voltage. Impedance on new or revised NX-9B forms shall be calculated and provided out to at least the 3rd decimal place.

⁴ The term "relay loadability limits", as used in this Appendix, represents the minimum flow at which the relay acts.

For transformers with different fixed normal tap settings at Heavy and Light Load, provide the impedance calculated at the Heavy Load fixed tap setting.

For transformers whose test report does not provide impedance at each tap, provide the impedance at the closest tap for which impedance is provided on all new or revised NX-9B forms. Provide a statement in the Equipment Notes field of the NX-9B form indicating the tap position at which the impedance is calculated.

Impedance data for three (3) winding transformers being modeled consistent with Section I Example 3a should be submitted using a wye configuration. Refer to diagram below.



Impedance data for three (3) winding transformers being modeled consistent with Section I Example 3b should be submitted in two (2) winding format.

Transformer Type – Enter the type of the transformer based upon the descriptions below:

GSU – Generator Step-Up transformer.

FIXED – Transformer without a load tap changer (LTC). Tap changes for these transformers typically require the transformer be out of service.

TCUL-Non Auto – Transformer has an LTC but it is disabled.

TCUL-Auto⁵ – Transformer has an enabled LTC.

Normal Operating Mode – For a TCUL-Auto type transformer, enter the normal operating mode based upon the descriptions below. The normal operating mode selected should reflect the operational state that the transformer is expected to be in the majority of the time.

If the operational mode is dependent upon local generation, load level or other system condition, provide this information in the Equipment Notes field of the NX-9B form (example: transformer is operated in automatic mode when generator XYZ is offline or when load level is above xx mw). The Normal Operating Mode field shall still reflect the operational state that the transformer is expected to be in the majority of the time.

⁵ The term TCUL-Auto as used in this appendix, represents a transformer with an enabled LTC that may or may not be an autotransformer. An autotransformer has only a single voltage winding which is common to both primary and secondary.

Manual-Local – LTC is operated locally at the substation.

Manual-Remote –Tap changes are made using the SCADA system and are manually initiated by an LCC System Operator⁶ or a TO control room operator remotely.

Auto – Transformer has enabled controls for automatic operation that allow the equipment to respond to a contingency, typically within 2 minutes, without manual intervention. Tap changes for normal operation occur without LCC System Operator or TO control room operator intervention.

Tap Switching Time Delay – For a TCUL-Auto type transformer with the Normal Operating Mode field set to Auto, enter the tap switching time delay in seconds.

Voltage Schedules – Voltage schedule data is required for all TCUL-Auto transformers with Auto and Manual-Remote control types and is optional for transformers with the Normal Operating Mode field set to Manual-Local. Voltage schedule data is not accepted for GSU, Fixed and TCUL Non-Auto transformers.

- The Controlled Winding and Controlling/LTC Side Winding flags shall be set when entering voltage schedule data.
- Typically a transformer operates to the same schedule in both on peak⁷ and off peak⁸ hours so the prevalent schedule shall be entered as both on and off peak in the voltage schedule table. If a transformer operates to a different schedule during on-peak and off-peak hours, the different schedules shall be entered in the voltage schedule table and a brief explanation shall be provided in the Equipment Notes field describing how the voltage schedule is modified in the field.
- A transformer with the technology to use SCADA to modify the programmed target voltage shall enter the single most prevalent scheduled voltage and minimum/maximum voltage range for both on and off peak and shall provide all other minimum, scheduled and maximum settings available in either the Equipment Notes field or as a file attachment (referenced in the Equipment Notes field).

TCUL-Auto transformer with the Normal Operating Mode field set to Auto (voltage schedule data is required):

• Schedule data entered in the voltage schedule table shall equal the field programmed target voltage and the minimum and maximum voltages shall equal the control bandwidth settings from the field.

⁶ System Operator is defined in the Glossary of Terms Used in NERC Reliability Standards.

⁷ On-Peak is from 0700-2300 on weekdays that are not NERC holidays.

⁸ Off-Peak is from 2300-0700 on weekdays, all weekends and NERC holidays.

TCUL-Auto transformer with the Normal Operating Mode field set to Manual-Remote (voltage schedule data is required):

- The voltage schedule data entered shall equal the most prevalent target voltage and range used by the operators.
- If there is no typical voltage schedule or range used by the operators:
 - Enter a scheduled voltage that matches the overall area voltage profile and/or any nearby regulating devices such as generators, STATCOMs or synchronous condensers.
 - Enter a generic 100% and 105% of nominal system voltage for the minimum and maximum voltages.

TCUL-Auto transformer with the Normal Operating Mode field set to Manual-Local (voltage schedule data is optional):

- If the optional voltage schedule data is provided, it shall equal the most prevalent target voltage and range used by the operators.
- If there is no typical voltage schedule or range used by the operators:
 - Enter a scheduled voltage that matches the overall area voltage profile and/or any nearby regulating devices such as generators, static synchronous compensators (STATCOMs) or synchronous condensers.
 - Enter a generic 100% and 105% of nominal system voltage for the minimum and maximum voltages.

Heavy/Light Load Normal Tap - This is required for all windings with taps. Enter zero (0) for windings without taps.

For the purposes of this document, heavy load shall mean the summer months of June through August and light load shall mean the remaining calendar months of January through May and September through December.

For no load windings with fixed tap positions - Enter the seasonal no load tap position (position number) as the normal tap number for each load period.

For other windings with fixed tap positions - Enter the fixed tap position (position number) as the normal tap number for each load period.

For LTC windings on TCUL-Auto transformers (the Normal Operating Mode field is set to Manual-Local, Manual-Remote or Auto):

- Enter the typical heavy load tap position as the normal tap number for both load periods.
- If no typical heavy load tap position exists, enter the tap number corresponding with the nameplate voltage of that winding as the normal tap number for both load periods.

Step Size (per unit) – Enter the step size for each winding (per unit). This data can usually be taken from the manufacturer's nameplate information and should be calculated as follows. Enter zero (0) for windings without taps.

Step Size = <u>(maximum voltage - minimum voltage)</u> (nameplate voltage)(# of taps - 1)

Nameplate Tap Number – Enter the tap number for each winding at which nameplate voltage is achieved. Enter zero (0) for windings without taps.

Minimum Tap No. – Enter the tap number for each winding at which minimum kV is achieved. Enter zero (0) for windings without taps.

Minimum kV – Indicates the voltage of the windings when at minimum tap position. Value is calculated based on nameplate voltage and associated tap number, minimum tap number and step size.

Maximum Tap No. – Enter the tap number for each winding at which maximum voltage is achieved. Enter zero (0) for windings without taps.

Maximum kV – Indicates the voltage of the windings when at maximum tap position. Value is calculated based on nameplate voltage and associated tap number, maximum tap number and step size.

Controlled and Controlling/LTC Side Winding (TCUL-Auto transformers only):

These fields are required for all TCUL-Auto transformers with the Normal Operating Mode field set to Auto or Manual-Remote.

These fields are required for transformers with the Normal Operating Mode field set to Manual-Local when the optional voltage schedule has been entered.

These fields are not enterable for GSU, Fixed and TCUL Non-Auto transformers.

Select with a ($\sqrt{}$) the Controlling/LTC Side Winding (the winding on which the tap changer is located).

Select with a ($\sqrt{}$) the Controlled Winding (the winding for which desired voltages/voltage schedules are established).

V. EXPLANATION OF DATA CHANGES

Any time an NX-9B form is modified or created, a brief description of the reason(s) for the entry shall be provided in the Revision Comments field. It will provide a written record of the change and clearly identify the equipment changes made in the field and/or other reasons that necessitated the update of the NX-9B form. For example: Tap information corrected to match nameplate.

This data is utilized by ISO in the NX-9B form review and approval process.

VI. EQUIPMENT NOTES

The Equipment Notes field is used to provide explanations of data or other pertinent or operational information. For example: This transformer is operated in automatic mode when generator XYZ is offline or when load level is above xx MW.

For transformers that are part of a dynamic reactive device control scheme, a brief description of the control scheme is required to provide clarity regarding the manner in which the transformer is operated.

Fields are provided for both ISO and MP/TO notes. An additional private field is available to the MP or TO for internal notes that can be edited and viewed only by the MP or TO owning the record.

Equipment notes are carried forward when an NX-9B form is updated. MPs and TOs should review and modify or delete any MP or TO note that is no longer pertinent. ISO is responsible for maintaining ISO notes.

ISO New England Equipment Rating, Characteristic, and Operational Data Implementation Form Transformers (NX-9B) Participant ID Station11X Reference 1234 Participant Test Company ISO ID STATION1 1X Form State Approved Ckt 1 Primary Station1115 kV Bus# 111222 EMS STATION1 EMS STATION1 Secondary Station1 34.5 kV Bus# 222333 Transformer Type Fixed Normal Operating Mode (TCUL) Number of Windings 2 Tap Switching Time Delay if Normal Mode is Auto (TCUL only) (Seconds) Default Summer 77 F MVA Limiting Device / Description Location Normal 49 Transformer - 1X Station1 Station1 LTE 49 Transformer - 1X STE 49 Transformer - 1X Station1 DAL 49 Transformer - 1X Station1 Default Winter 41 F Limiting Device / Description Location MVA Normal Station1 49 Transformer - 1X LTE 49 Transformer - 1X Station1 STE Transformer - 1X Station1 49 DAL 49 Transformer - 1X Station1 Nameplate kV of Impedance Data (%) (100 MVA Base) Windings High kV Low kV R X 115 34.5 1.4001 35.812 kV of Winding 115 Step Size 0.025 Controlling Side Winding(TCUL Only) N Heavy Load Norm Tap# 2 Heavy Load Normal Tap (p.u.) 1 Controlled Side Winding(TCUL Only) N Light Load Norm Tap# 2 Nameplate Minimum Maximum 2 Tap Number 5 1 106.375 115 117.875 Voltage (kV) kV of Winding 34.5 Controlling Side Winding(TCUL Only) N Step Size 0 Controlled Side Winding(TCUL Only) N Heavy Load Norm Tap# 17 Heavy Load Normal Tap (p.u.) 1 Light Load Norm Tap# 17 Nameplate Maximum Minimum Tap Number 1 17 33 Voltage (kV) 31.05 34.5 37.95 Critical Energy Infrastructure Information (CEII) Hard Copy Is Uncontrolled WEDNESDAY, JULY 16, 2014 10:56 AM Page 1

EXAMPLE 1, NX-9B FIXED TAP TRANSFORMER

IS	O New England Eq	uipment	Rating, Cha	aracteristic	7		
	and Operational	Data Im	olementatio	n Form			
	Trans	formers	(NX-9B)				
Reference	Reference 1234 Participant ID Station11X						
Participant	icipant TestCompany ISO ID STATION1 1X						
Form State	Approved		Ckt 1	I			
			, ,.	4 · 10/07 - 5			
Revision Comments	changes in relay settings which were	previously limitir	n for revising or creatin ng equipment.	ig this NA-9 Iolm. Exa	ample. Ratings updated o	lueto	
Equipment Notes	Optional text field available for Partic information about the equipment or the	pant to supply ex ne manner in whi	xplanations regarding t ch it is operated.	he data provided or to	provide any pertinent		
Data Revision Number	1 Date Created	mm/dd/yyyy	Prepared By	Participant Usernam	e		
Requested Effective Date	mm/dd/yyyy Date Received	mm/dd/yyyy	Approved By	ISO NX9 Administrat	or Username		
Actual Effective Date	mm/dd/yyyy	ISO EMS	Implementation Date	mm/dd/yyyy			
Critical Energy Infra	structure Information (CEII)			ŀ	Hard Copy Is Uncon	trolled	
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EXAMPLE 1 (CONTINUED), NX-9B FIXED TAP TRANSFORMER

Revision 11, Effective Date: October 26, 2023



EXAMPLE 1 (CONTINUED), MANUFACTURER'S NAMEPLATE

EXAMPLE 2, NX-9B GENERATOR STEP-UP (GSU) TRANSFORMER

Pafarance 1	034			Participa	nt ID Statio	1 G1X		
Particinant T	estCompany		ISO ID STATIONI GIX					
Form State A	oproved			Ckt 1				
Primary St	ation1 345 kV				Bus	# 111222	EMS STATION1	
Secondary St				Bus	# 222333	EMS STATION1		
Transformer Type G Number of Windings 2	SU		No Tap S Mode i	ormal Operating M witching Time De	Aode (TCUL lay if Norma	.) 11		
Dofault Summar 77 E			Woden		y) (Seconde	•)		
MVA	Limiting Device / D	escription				Location		
Normal 709	Transformer - G1X					Station1		
LTE 709	Transformer - G1X					Station1		
STE 709	Transformer - G1X					Station1		
DAL 709 Default Winter 41 E	Transformer - G1X					Station1		
MVA	Limiting Device / D	escription				Location		
Normal 709	Transformer - G1X	<u> </u>				Station1		
LTE 709	Transformer - G1X					Station1		
STE 709	Transformer - G1X					Station1		
DAL 709	Transformer - G1X					Station1		
		Nameplate kV	of	Impedance D	ata (%)			
		Windings		(100 MVA E	Base)			
		High kV	<u>ow kV</u>	<u>R</u>	X			
		345	21.3	0.031	1.28			
kV of Winding	345	Step Size	0.025		Co	ntrolling Side	Winding(TCUL Only)	N
Heavy Load Norm Tap#	2	Heavy Lo	ad Normal 1	Tap (p.u.) 1.025	C	ontrolled Side	Winding(TCUL Only)	Ν
Light Load Norm Tap#	2						3 (***** 5),	
		Minimum	n	Nameplate		Maximum		
	Tap Number	5		3		1		
	Voltage (kV)	327.75		345		362.25		
kV of Winding	21.3	Step Size	0		Co	ntrolling Side	Winding(TCUL Only)	N
Heavy Load Norm Tap#	0	Heavy Lo	ad Normal 1	Гар (р.u.) 1	C	ontrolled Side	Winding(TCUL Only)	Ν
Light Load Norm Tap#	0							
		Minimum	n	Nameplate		Maximum		
	Tap Number	0		0		0		
	Voltage (kV)	21.3		21.3		21.3		

EXAMPLE 2 (CONTINUED), NX-9B GENERATOR STEP-UP (GSU) TRANSFORMER

	Trans	formers (NX-9B)					
Reference	1234	Participant ID	Station1 1X				
Participant	TestCompany	ISO ID	STATION1 1X				
Form State Approved Ckt 1							
Revision Comments	Required text field for Participant to p replaced in June, 2013.	uired text field for Participant to provide the reason for revising or creating this NX-9 form. Example: Transformer to be aced in June, 2013.					
Equipment Notes	Optional text field available for Partici information about the equipment or the	pant to supply explanations regarding e manner in which it is operated.	g the data provided or to provide any pertinent				
Data Revision Number	1 Date Created	mm/dd/yyyy Prepared E	By Participant Username				
Requested Effective Date	mm/dd/yyyy Date Received	mm/dd/yyyy Approved E	By ISO NX9 Administrator Username				
Actual Effective Date	mm/dd/yyyy	ISO EMS Implementation Da	te mm/dd/yyyy				

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EXAMPLE 2 (CONTINUED), MANUFACTURER'S NAMEPLATE

EXAMPLE 3A, NX-9B TCUL 3-WINDING TRANSFORMER WITH TERTIARY LOADED

DAL 543 Default Winter 41	1 F							
DAL 543 DefaultWinter 44 <u>MVA</u> Normal 598	1 F Limiting Device / De Transformer - 1X	scription				Location Station1		
DAL 543 Default Winter 4 <u>MVA</u> Normal 598 LTE 672 STE 672 DAL 672	Transformer - 1X Transformer - 1X Transformer - 1X Transformer - 1X Transformer - 1X	escription				Location Station1 Station1 Station1 Station1		
DAL 543 Default Winter 4 MVA Normal 598 LTE 672 STE 672 DAL 672	Transformer - 1X Transformer - 1X Transformer - 1X Transformer - 1X Transformer - 1X	escription Nam	ne Plate kV of Windings	Impedance [(100 MVA I	Data (%) Base)	Location Station1 Station1 Station1 Station1		
DAL 543 Default Winter 4 MVA Normal 598 LTE 672 STE 672 DAL 672	Transformer - 1X Transformer - 1X Transformer - 1X Transformer - 1X Transformer - 1X Transformer - 1X	Nam Nam	ne Plate kV of Windings kV	Impedance [(100 MVA I R	Data (%) Base) X	Location Station1 Station1 Station1 Station1		
DAL 543 Default Winter 4 <u>MVA</u> Normal 598 LTE 672 STE 672 DAL 672	Transformer - 1X Transformer - 1X Transformer - 1X Transformer - 1X Transformer - 1X Win	Nam Nam	he Plate kV of Windings <u>kV</u> 245	Impedance [(100 MVA I <u>R</u>	Data (%) Base) <u>X</u> 0 174	Location Station1 Station1 Station1 Station1		
DAL 543 Default Winter 4 MVA Normal 598 LTE 672 STE 672 DAL 672	Transformer - 1X Transformer - 1X Transformer - 1X Transformer - 1X Transformer - 1X Win Prir	Nam Nam Nam Nam	ne Plate kV of Windings <u>kV</u> 345	Impedance [(100 MVA I <u>R</u> 0.002	Data (%) Base) <u>X</u> 0.174	Location Station1 Station1 Station1 Station1		
DAL 543 Default Winter 4 <u>MVA</u> Normal 598 LTE 672 STE 672 DAL 672	Transformer - 1X Transformer - 1X Transformer - 1X Transformer - 1X Transformer - 1X Win Prir Secon	Nam Nam nding mary dary	ne Plate kV of Windings <u>kV</u> 345 115	Impedance ((100 MVA I <u>R</u> 0.002 0.04	Data (%) Base) <u>X</u> 0.174 2.555	Location Station1 Station1 Station1 Station1		
DAL 543 Default Winter 4 <u>MVA</u> Normal 598 LTE 672 STE 672 DAL 672	Transformer - 1X Transformer - 1X Transformer - 1X Transformer - 1X Transformer - 1X Win Prir Secon Ter	Nam Nam nding mary dary tiary	ne Plate kV of Windings <u>kV</u> 345 115 13.8	Impedance ((100 MVA I 0.002 0.04 0.2	Data (%) Base) <u>X</u> 0.174 2.555 5.628	Location Station1 Station1 Station1 Station1		
DAL 543 Default Winter 4 <u>MVA</u> Normal 598 LTE 672 STE 672 DAL 672	Transformer - 1X Transformer - 1X Transformer - 1X Transformer - 1X Transformer - 1X Win Prir Secon Ter	Nam Nam Maing Mary dary tiary	ne Plate kV of Windings <u>kV</u> 345 115 13.8	Impedance I (100 MVA I B 0.002 0.04 0.2	Data (%) Base) X 0.174 2.555 5.628	Location Station1 Station1 Station1 Station1		
DAL 543 Default Winter 4 Normal 598 LTE 672 STE 672 DAL 672	Transformer - 1X Transformer - 1X Transformer - 1X Transformer - 1X Transformer - 1X Win Prir Secon Ter	Nam Nam nding mary dary tiary Step Size	e Plate kV of Windings <u>kV</u> 345 115 13.8 • 0.00625	Impedance I (100 MVA 1 <u>R</u> 0.002 0.04 0.2	Data (%) Base) <u>X</u> 0.174 2.555 5.628 Cont	Location Station1 Station1 Station1 Station1	Winding(TCUL	Only) Y
DAL 543 Default Winter 47 Normal 598 LTE 672 STE 672 DAL 672 DAL 672	I F Limiting Device / De Transformer - 1X Transformer - 1X Transformer - 1X Transformer - 1X Win Prir Secon Ter ng 345 p# 17	Nam Nam Maing mary dary tiary Step Size Heavy Loa	e Plate kV of Windings <u>kV</u> 345 115 13.8 0.00625 ad Normal Tap	Impedance I (100 MVA I <u>R</u> 0.002 0.04 0.2 p.u.) 1	Data (%) Base) <u>X</u> 0.174 2.555 5.628 Cont Con	Location Station1 Station1 Station1 Station1 rolling Side ¹ trolled Side ¹	Winding(TCUL Winding(TCUL	Only) Y Only) N
DAL 543 Default Winter 47 <u>MVA</u> Normal 598 LTE 672 STE 672 DAL 672 DAL 672 KV of Windit Heavy Load Norm Ta	I F Limiting Device / De Transformer - 1X Transformer - 1X Transformer - 1X Transformer - 1X Win Prir Secon Ter ng 345 p# 17 p# 17	Nam Nam nding mary dary tiary Step Size Heavy Loa	e Plate kV of Windings <u>kV</u> 345 115 13.8 • 0.00625 • 0.00625 • d Normal Tap	Impedance I (100 MVA I <u>R</u> 0.002 0.04 0.2 p.u.) 1	Data (%) Base) 0.174 2.555 5.628 Cont Con	Location Station1 Station1 Station1 Station1 rolling Side ¹ trolled Side ¹	Winding(TCUL Winding(TCUL	Only) Y Only) N
DAL 543 Default Winter 47 <u>MVA</u> Normal 598 LTE 672 STE 672 DAL 672 DAL 672 kV of Windit Heavy Load Norm Ta Light Load Norm Ta	I F Limiting Device / De Transformer - 1X Transformer - 1X Transformer - 1X Transformer - 1X Win Prir Secon Ter ng 345 p# 17 p# 17	Nam Nam nding mary dary tiary Step Size Heavy Loa	e Plate kV of Windings <u>kV</u> 345 115 13.8 0.00625 ed Normal Tap	Impedance [(100 MVA <u>R</u> 0.002 0.04 0.2 p.u.) 1	Data (%) Base) <u>X</u> 0.174 2.555 5.628 Cont Con	Location Station1 Station1 Station1 Station1 rolling Side ¹ trolled Side ¹	Winding(TCUL Winding(TCUL	Only) Y Only) N
DAL 543 Default Winter 4 Normal 598 LTE 672 STE 672 DAL 672 DAL 672 kV of Windit Heavy Load Norm Ta Light Load Norm Ta	I F Limiting Device / De Transformer - 1X Transformer - 1X Transformer - 1X Transformer - 1X Win Prir Secon Ter ng 345 p# 17 p# 17	Nam Nam Nam Nading mary dary tiary Step Size Heavy Loa Minimum	ne Plate kV of Windings <u>kV</u> 345 115 13.8 0.00625 ad Normal Tap	Impedance I (100 MVA 1 0.002 0.04 0.2 p.u.) 1 Nameplate	Data (%) Base) 0.174 2.555 5.628 Cont Con	Location Station1 Station1 Station1 Station1 rolling Side ¹ trolled Side ¹ Maximum	Winding(TCUL Winding(TCUL	Only) Y Only) N
DAL 543 Default Winter 4 <u>MVA</u> Normal 598 LTE 672 STE 672 DAL 672 DAL 672 kV of Windii Heavy Load Norm Ta Light Load Norm Ta	I F Limiting Device / De Transformer - 1X Transformer - 1X Transformer - 1X Transformer - 1X Win Prin Secon Ter ng 345 p# 17 p# 17 Tap Number	escription Nam Maing mary dary tiary Step Size Heavy Loa Minimum 33	ne Plate kV of Windings <u>kV</u> 345 115 13.8 • 0.00625 • 0.00625 • od Normal Tap	Impedance ((100 MVA) <u>R</u> 0.002 0.04 0.2 p.u.) 1 Nameplate 17	Data (%) Base) 0.174 2.555 5.628 Cont Con	Location Station1 Station1 Station1 Station1 rolling Side trolled Side ¹ Maximum 1	Winding(TCUL Winding(TCUL	Only) Y Only) N
DAL 543 Default Winter 4 <u>MVA</u> Normal 598 LTE 672 STE 672 DAL 672 DAL 672	I F Limiting Device / De Transformer - 1X Transformer - 1X Transformer - 1X Transformer - 1X Win Prir Secon Ter ng 345 p# 17 p# 17 Tap Number Volume 610	Nam Nam Maing mary dary tiary Step Size Heavy Loa Minimun 33	ne Plate kV of Windings <u>kV</u> 345 115 13.8 0.00625 ad Normal Tap	Impedance ((100 MVA (0.002 0.04 0.2 p.u.) 1 Nameplate 17 245	Data (%) Base) <u>X</u> 0.174 2.555 5.628 Cont Con	Location Station1 Station1 Station1 Station1 station1 rolling Side' trolled Side' Maximum 1	Winding(TCUL Winding(TCUL	Only) Y Only) N
DAL 543 Default Winter 4 Normal 598 LTE 672 STE 672 DAL 672 Worf Windin Heavy Load Norm Ta Light Load Norm Ta	I F Limiting Device / De Transformer - 1X Transformer - 1X Transformer - 1X Transformer - 1X Win Prir Secon Ter ng 345 p# 17 p# 17 Tap Number Voltage (FV)	Nam Nam Maing mary dary tiary Step Size Heavy Loa Minimum 33	ne Plate kV of Windings <u>kV</u> 345 115 13.8 0.00625 sd Normal Tap	Impedance ((100 MVA) 0.002 0.04 0.2 p.u.) 1 Nameplate 17 345	Data (%) Base) <u>X</u> 0.174 2.555 5.628 Cont Con	Location Station1 Station1 Station1 Station1 rolling Side ¹ trolled Side ¹ Maximum 1 379 5	Winding(TCUL Winding(TCUL	Only) Y Only) N
DAL 543 Default Winter 4 <u>MVA</u> Normal 598 LTE 672 STE 672 DAL 672 DAL 672	I F Limiting Device / De Transformer - 1X Transformer - 1X Transformer - 1X Transformer - 1X Win Prir Secon Ter ng 345 p# 17 p# 17 Tap Number	Nam Nam Maing mary dary tiary Step Size Heavy Loa Minimun 33	ne Plate kV of Windings <u>kV</u> 345 115 13.8 0.00625 od Normal Tap	Impedance ((100 MVA (0.002 0.04 0.2 p.u.) 1 Nameplate 17	Data (%) Base) <u>X</u> 0.174 2.555 5.628 Cont Con	Location Station1 Station1 Station1 Station1 station1 rolling Side' trolled Side' Maximum 1	Winding(TCUL Winding(TCUL	Only) Y Only) N
DAL 543 Default Winter 4 Normal 598 LTE 672 STE 672 DAL 672 DAL 672 kV of Windin Heavy Load Norm Ta	I F Limiting Device / De Transformer - 1X Transformer - 1X Transformer - 1X Transformer - 1X Win Prin Secon Ter ng 345 p# 17 p# 17 Tap Number	Nam Nam ding mary dary tiary Step Size Heavy Loa Minimun 33	ne Plate kV of Windings <u>kV</u> 345 115 13.8 • 0.00625 ad Normal Tap	Impedance [(100 MVA 1 0.002 0.04 0.2 p.u.) 1 Nameplate 17	Data (%) Base) 0.174 2.555 5.628 Cont Con	Location Station1 Station1 Station1 Station1 rolling Side trolled Side Maximum 1	Winding(TCUL Winding(TCUL	Only) Y Only) N
DAL 543 Default Winter 4 <u>MVA</u> Normal 598 LTE 672 STE 672 DAL 672 DAL 672 kV of Windii Heavy Load Norm Ta Light Load Norm Ta	I F Limiting Device / De Transformer - 1X Transformer - 1X Transformer - 1X Transformer - 1X Win Prir Secon Ter ng 345 p# 17 p# 17 Tap Number	Nam Nam Maing mary dary tiary Step Size Heavy Loa Minimun 33	ne Plate kV of Windings kV 345 115 13.8 0.00625 ad Normal Tap	Impedance ((100 MVA) 0.002 0.04 0.2 p.u.) 1 Nameplate 17	Data (%) Base) <u>X</u> 0.174 2.555 5.628 Cont Con	Location Station1 Station1 Station1 Station1 rolling Side ¹ trolled Side Maximum	Winding(TCUL Winding(TCUL	Only) Y Only) N
DAL 543 Default Winter 4 <u>MVA</u> Normal 598 LTE 672 STE 672 DAL 672 DAL 672 kV of Windin Heavy Load Norm Ta Light Load Norm Ta	I F Limiting Device / De Transformer - 1X Transformer - 1X Transformer - 1X Transformer - 1X Win Prin Secon Ter ng 345 p# 17 p# 17	Nam Nam Maing mary dary tiary Step Size Heavy Loa Minimum	ne Plate kV of Windings <u>kV</u> 345 115 13.8 0.00625 ad Normal Tap	Impedance ((100 MVA) <u>R</u> 0.002 0.04 0.2 p.u.) 1 Nameplate	Data (%) Base) 0.174 2.555 5.628 Cont Con	Location Station1 Station1 Station1 Station1 rolling Side ¹ trolled Side ¹ Maximum	Winding(TCUL Winding(TCUL	Only) Y Only) N
DAL 543 Default Winter 47 <u>MVA</u> Normal 598 LTE 672 STE 672 DAL 672 DAL 672 KV of Windii Heavy Load Norm Ta Light Load Norm Ta	I F Limiting Device / De Transformer - 1X Transformer - 1X Transformer - 1X Transformer - 1X Win Prir Secon Ter ng 345 p# 17 p# 17	Nam Nam Maing mary dary tiary Step Size Heavy Loa Minimum	e Plate kV of Windings <u>kV</u> 345 115 13.8 0.00625 ad Normal Tap	Impedance [(100 MVA 0.002 0.04 0.2 p.u.) 1 Nameolate	Data (%) Base) <u>X</u> 0.174 2.555 5.628 Cont Con	Location Station1 Station1 Station1 Station1 rolling Side trolled Side	Winding(TCUL Winding(TCUL	Only) Y Only) N
DAL 543 Default Winter 41 <u>MVA</u> Normal 598 LTE 672 STE 672 DAL 672 DAL 672 kV of Windii Heavy Load Norm Ta Light Load Norm Ta	I F Limiting Device / De Transformer - 1X Transformer - 1X Transformer - 1X Transformer - 1X Win Prir Secon Ter ng 345 p# 17 p# 17	Nam Nam nding dary tiary Step Size Heavy Loa	Ne Plate kV of Windings <u>kV</u> 345 115 13.8 0.00625 ed Normal Tap	Impedance ((100 MVA I 0.002 0.04 0.2 p.u.) 1	Data (%) Base) <u>X</u> 0.174 2.555 5.628 Cont Con	Location Station1 Station1 Station1 Station1 rolling Side ¹ trolled Side ¹	Winding(TCUL Winding(TCUL	Only) Y Only) N
DAL 543 Default Winter 4 <u>MVA</u> Normal 598 LTE 672 STE 672 DAL 672 DAL 672 kV of Windii Heavy Load Norm Ta	I F Limiting Device / De Transformer - 1X Transformer - 1X Transformer - 1X Transformer - 1X Win Prir Secon Ter ng 345 p# 17 = 17	Nam Nam Maing mary dary tiary Step Size Heavy Loa	e Plate kV of Windings <u>kV</u> 345 115 13.8 0.00625 ed Normal Tap	Impedance ((100 MVA) <u>R</u> 0.002 0.04 0.2 p.u.) 1	Data (%) Base) <u>X</u> 0.174 2.555 5.628 Cont Con	Location Station1 Station1 Station1 Station1 rolling Side trolled Side	Winding(TCUL Winding(TCUL	Only) Y Only) N
DAL 543 Default Winter 4 MVA Normal 598 LTE 672 STE 672 DAL 672 DAL 672	I F Limiting Device / De Transformer - 1X Transformer - 1X Transformer - 1X Win Prir Secon Ter ng 345 p# 17	Nam Nam nding mary dary tiary Step Size Heavy Loa	e Plate kV of Windings <u>kV</u> 345 115 13.8 0.00625 sd Normal Tap	Impedance ((100 MVA I 0.002 0.04 0.2 p.u.) 1	Data (%) Base) <u>X</u> 0.174 2.555 5.628 Cont Con	Location Station1 Station1 Station1 Station1 rolling Side trolled Side	Winding(TCUL Winding(TCUL	Only) Y Only) N
DAL 543 Default Winter 4 Normal 598 LTE 672 STE 672 DAL 672 World Heavy Load Norm Ta	Transformer - 1X I F <u>Limiting Device / De</u> Transformer - 1X Transformer - 1X Transformer - 1X Win Prin Secon Ter ng 345 p# 17	Nam Nam ding mary dary tiary Step Size Heavy Loa	e Plate kV of Windings <u>kV</u> 345 115 13.8 0.00625 ad Normal Tap	Impedance ((100 MVA) <u>R</u> 0.002 0.04 0.2 p.u.) 1	Data (%) Base) <u>X</u> 0.174 2.555 5.628 Cont Con	Location Station1 Station1 Station1 Station1 rolling Side ¹ trolled Side ¹	Winding(TCUL Winding(TCUI	Only) Y Only) N
DAL 543 Default Winter 4 Normal 598 LTE 672 STE 672 DAL 672 NAL 672	I F Limiting Device / De Transformer - 1X Transformer - 1X Transformer - 1X Transformer - 1X Win Prir Secon Ter	Nam Nam nding mary dary tiary Step Size	e Plate kV of Windings <u>kV</u> 345 115 13.8 0.00625	Impedance [(100 MVA <u>R</u> 0.002 0.04 0.2	Data (%) Base) <u>X</u> 0.174 2.555 5.628 Cont	Location Station1 Station1 Station1 Station1	Winding(TCUL	Only) Y
DAL 543 Default Winter 4 Normal 598 LTE 672 STE 672 DAL 672	Transformer - 1X Transformer - 1X Transformer - 1X Transformer - 1X Transformer - 1X Win Prir Secon Ter ng 345	Nam Nam nding mary dary tiary Steo Size	te Plate kV of Windings <u>kV</u> 345 115 13.8 0.00625	Impedance I (100 MVA I <u>R</u> 0.002 0.04 0.2	Data (%) Base) <u>X</u> 0.174 2.555 5.628 Cont	Location Station1 Station1 Station1 Station1	Winding(TCUL	Only) Y
DAL 543 Default Winter 4 <u>MVA</u> Normal 598 LTE 672 STE 672 DAL 672	I F Limiting Device / De Transformer - 1X Transformer - 1X Transformer - 1X Transformer - 1X Win Prin Secon Ter	Nam Nam Maing Mary dary tiary	ne Plate kV of Windings <u>kV</u> 345 115 13.8	Impedance I (100 MVA 1 0.002 0.04 0.2	Data (%) Base) <u>X</u> 0.174 2.555 5.628	Location Station1 Station1 Station1 Station1		
DAL 543 Default Winter 4 MVA Normal 598 LTE 672 STE 672 DAL 672	Transformer - 1X Transformer - 1X Transformer - 1X Transformer - 1X Transformer - 1X Win Prir Secon Ter	Nam Nam nding mary dary tiary	ne Plate kV of Windings <u>kV</u> 345 115 13.8	Impedance ((100 MVA) <u>R</u> 0.002 0.04 0.2	Data (%) Base) <u>X</u> 0.174 2.555 5.628	Location Station1 Station1 Station1 Station1		
DAL 543 Default Winter 4 <u>MVA</u> Normal 598 LTE 672 STE 672 DAL 672	I F Limiting Device / De Transformer - 1X Transformer - 1X Transformer - 1X Transformer - 1X Win Prin Secon	Nam Nam Maing Mary dary	ne Plate kV of Windings <u>kV</u> 345 115 12 °	Impedance I (100 MVA I <u>R</u> 0.002 0.04	Data (%) Base) <u>X</u> 0.174 2.555 5.629	Location Station1 Station1 Station1 Station1		
DAL 543 Default Winter 47 <u>MVA</u> Normal 598 LTE 672 STE 672 DAL 672	Transformer - 1X Transformer - 1X Transformer - 1X Transformer - 1X Transformer - 1X Win Prir Secon	Nam Nam Maing Mary dary	ne Plate kV of Windings <u>kV</u> 345 115	Impedance [(100 MVA <u>R</u> 0.002 0.04	Data (%) Base) <u>X</u> 0.174 2.555	Location Station1 Station1 Station1 Station1		
DAL 543 Default Winter 4 <u>MVA</u> Normal 598 LTE 672 STE 672 DAL 672	Transformer - 1X Transformer - 1X Transformer - 1X Transformer - 1X Transformer - 1X Win Prin Secon	Nam Nam Nam Nam Nam Nam Nam Nam Nam Nam	he Plate kV of Windings <u>kV</u> 345 115	Impedance I (100 MVA I <u>R</u> 0.002 0.04	Data (%) Base) <u>X</u> 0.174 2.555	Location Station1 Station1 Station1 Station1		
DAL 543 Default Winter 47 <u>MVA</u> Normal 598 LTE 672 STE 672 DAL 672	Transformer - 1X Transformer - 1X Transformer - 1X Transformer - 1X Transformer - 1X Win Prir	Nam Nam Nam Nam	he Plate kV of Windings <u>kV</u> 345	Impedance ((100 MVA) <u>R</u> 0.002	Data (%) Base) <u>X</u> 0.174	Location Station1 Station1 Station1 Station1		
DAL 543 Default Winter 4 <u>MVA</u> Normal 598 LTE 672 STE 672 DAL 672	Transformer - 1X Transformer - 1X Transformer - 1X Transformer - 1X Transformer - 1X Win	Nam Nam	he Plate kV of Windings <u>kV</u> 245	Impedance [(100 MVA I <u>R</u>	Data (%) Base) <u>X</u> 0 174	Location Station1 Station1 Station1 Station1		
DAL 543 Default Winter 4 <u>MVA</u> Normal 598 LTE 672 STE 672 DAL 672	Transformer - 1X Transformer - 1X Transformer - 1X Transformer - 1X Transformer - 1X Win	Nam Nam	he Plate kV of Windings <u>kV</u>	Impedance [(100 MVA <u>R</u>	Data (%) Base) <u>X</u>	Location Station1 Station1 Station1 Station1		
DAL 543 Default Winter 4 <u>MVA</u> Normal 598 LTE 672 STE 672 DAL 672	Transformer - 1X Transformer - 1X Transformer - 1X Transformer - 1X Transformer - 1X	escription Nam	ne Plate kV of Windings	Impedance D (100 MVA I	Data (%) Base)	Location Station1 Station1 Station1 Station1		
DAL 543 Default Winter 4 <u>MVA</u> Normal 598 LTE 672 STE 672 DAL 672	Transformer - 1X Transformer - 1X Transformer - 1X Transformer - 1X Transformer - 1X	escription Nam	ne Plate kV of Windings	Impedance [(100 MVA I	Data (%) Base)	Location Station1 Station1 Station1 Station1		
DAL 543 Default Winter 4 <u>MVA</u> Normal 598 LTE 672 STE 672 DAL 672	Transformer - 1X Transformer - 1X Transformer - 1X Transformer - 1X Transformer - 1X	scription	n Dista Mart	Impodence)_4_ /0/1	Location Station1 Station1 Station1 Station1		
DAL 543 Default Winter 4 <u>MVA</u> Normal 598 LTE 672 STE 672 DAL 672	Transformer - 1X Transformer - 1X Transformer - 1X Transformer - 1X Transformer - 1X	scription				Location Station1 Station1 Station1 Station1		
DAL 543 Default Winter 4 <u>MVA</u> Normal 598 LTE 672 STE 672	Transformer - 1X Transformer - 1X Transformer - 1X Transformer - 1X Transformer - 1X	scription				Location Station1 Station1 Station1		
DAL 543 Default Winter 41 MVA Normal 598 LTE 672	Transformer - 1X Transformer - 1X Transformer - 1X	scription				Location Station1 Station1		
DAL 543 Default Winter 4 <u>MVA</u> Normal 598 LTE 672	Transformer - 1X Transformer - 1X	scription				Location Station1 Station1		
DAL 543 Default Winter 47 <u>MVA</u> Normal 598	1 F Limiting Device / De Transformer - 1X	scription				Location Station1		
DAL 543 Default Winter 41 <u>MVA</u>	1 F Limiting Device / De	scription				Location		
DAL 543 Default Winter 41	1 F							
DAL 543	1 F							
DAL 543	ALC: STREET OF THE PLAN							
	Transformer - 1X					Station1		
STE 543	Transformer - 1X					Station1		
LTE 543	Transformer - 1X					Station 1		
NOTINAL 024	Transformer - IA					Station1		
Normal 524	Transformer - 1X					Station1		
MVA	Limiting Device / De	scription				Location		
Default Summer 71	7 F							
			Mode is Au	to (TCUL only) (Seconds)			
Number of Windings	: 3		Tap Switc	ning Time Dela	ay if Normal	45		
Transformer Type	TCUL-Auto		Norm	al Operating M	lode (TCUL)	Auto		
mapoint	Colacion in 17, whilepoint 35	(B. 1			ous#	000111	LING STAT	
Midnoint	Station1 1X Midnoint 99	kV			Bus#	333444	EMS STAT	ION1
Tertiary	Station1 13.8kV				Bus#	334455	EMS STAT	ION1
Secondary	Station1 115kV				Bus#	111222	EMS STAT	ION1
Primary	Station1 345KV				Bus#	123400	EMS STAT	UNI
Deine	Station1 2/EhV				Due #	102465	EMC OTAT	
Form State	Approved				CKII			
Farm State	Account							
Participant	TestCompany			150	DID STATIO	N1 1X		
Reference	12.04			Participan	tID Station	1 1X		

EXAMPLE 3A (CONTINUED), NX-9B TCUL 3-WINDING TRANSFORMER WITH TERTIARY LOADED

ISO New England Equipment Rating, Characteristic, and Operational Data Implementation Form Transformers (NX-9B)						
Peterson 1224 Participant ID Station 14						
Pasticipant	1234 Test Commonw			Farticipant ID		
Farticipant	Test Company			13010	STATIONT IX	
Porin State	Approved			CKI	1	
kV of Windin	g 13.8	Step Size	0		Controlling Si	de Winding(TCUL Only) N
Heavy Load Norm Tap	# 0	Heavy Loa	d Normal Tap (j	p.u.) 1	Controlled Si	de Winding(TCUL Only) N
Light Load Norm Tap	# 0					
		Minimum	1	Nameplate	Maximu	m
	Tap Number	0		0	0	
	Voltage (kV)	13.8		13.8	13.8	
<u> </u>	oltage Schedule	Data for Auto	omatically O Scheduled	perated (AVR)	TCUL Transfo	rmers Maximum
Contro	lad Side	On Peak	110.51	117	05	121.07
Vo	ltage	OILLEAK	113.01	10.	55	121.07
Sched	lules (kV)	Off Peak	119.51	117.	95	121.07
Equipment Notes Data Revision Number Requested Effective Date Actual Effective Date	Optional text field ava information about the 1 mm/dd/yyyy mm/dd/yyyy	ailable for Participa equipment or the Date Created n Date Received n	int to supply exp manner in which nm/dd/yyyy nm/dd/yyyy ISO EM S In	lanations regarding it is operated. Prepared E Approved E nplementation Da	the data provided of Participant Use ISO NX9 Admin te mm/dd/yyyy	or to provide any pertinent rname istrator Username
Critical Energy Infras	tructure Informat	ion (CEII)				Hard Copy Is Uncontrolled

EXAMPLE 3B, NX-9B TCUL 2-WINDING TRANSFORMER WITH TERTIARY NOT LOADED

			Tran	sformer	s (NX-9B)			
Refer	ence	1234			Participa	ntID Station	1 1X		
Partici	pant 1	lest Company			19	SO ID STATIC	DN1 1X		
Form	State /	Approved				Ckt 1			
Prir	mary S	Station1 345kV				Bust	123456	EMS	STATION1
Secon	dary S	Station1 115kV					111222	EMS	STATION1
Transformer	Туре	TCUL-Auto		N	ormal Operating I	Mode (TCUL) Auto		
Number of Wind	ings 2	2		Tap S Mode i	witching Time De is Auto (TCUL on	elay if Norma ly) (Seconds	45 		
Default Summer	77 F	:							
<u>!</u>	AVN	Limiting Device / I	Description				Location		
Normal 524 Transformer - 1X							Station1		
LIE	543	Transformer - 1X					Station1		
	543	Transformer - 1X					Station1		
Default Winter	41 F	nansionner - TA					JUGUNIT		
1	AVA	Limiting Device / I	Description				Location		
Normal	598	Transformer - 1X					Station1		
LTE	672	Transformer - 1X					Station1		
STE	672	Transformer - 1X					Station1		
DAL	672	Transformer - 1X					Station1		
			Nameplate kV of Impedance Da Windings (100 MVA B:			Data (%) Base)			
			<u>High kV</u>	Low kV	<u>R</u>	X			
			345	115	0.042	2.729			
kV of W	inding	345	Step 5	Size 0.00625		Cor	trolling Side	e Winding	(TCULOnly) Y
Heavy Load Norr	- m Tap f	≢ 17	Heavy	Load Normal T	ap (p.u.) 1	Co	ntrolled Side	e Winding	(TCULOnly) N
Light Load Nor	m Tap#	≢ 17	,						
			Minir	num	Nameplate		Maximum	I I	
		Tap Number	33	3	17		1		
		Voltage (kV)	310	.5	345		379.5		
kV of W	inding	115	Step \$	Size O		Cor	Controlling Side Winding(TCUL Only) N		
Heavy Load Norr	m Tap i	¥ 0	Heavy	Load Normal T	ap (p.u.) 1	Co	ntrolled Side	e Winding	(TCUL Only) Y
Light Load Nor	m Tap#	¥ 0							
			Minir	num	Nameplate		Maximum	1	
Tap Number Voltage (kV)		0		0		0			
		11	5	115		115			

EXAMPLE 3B (CONTINUED), NX-9B TCUL 2-WINDING TRANSFORMER WITH TERTIARY NOT LOADED

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<text><section-header> Constraint Constraint Constra</section-header></text>	Farticipant	Account			13010		
<section-header><section-header><section-header><section-header><section-header></section-header></section-header></section-header></section-header></section-header>	Form state	Approved			CKI		
<section-header><section-header><section-header> Special procession of the second procession of the</section-header></section-header></section-header>							
Scheduled Minimum Maximum Voltage Schedules (M) On Pask 115.51 117.55 121.07 Revision Comments Regulate fact field for participant to participant to provide the samo for revising or notating this N/S-form. Example: Ratings updated due to Comment to be provide and provide the samo for revising or notating this N/S-form. Example: Ratings updated due to Comment to be provide and pr	<u>v</u>	oltage Schedule	Data for Au	tomatically Ope	rated (AVR) T	CUL Transfe	ormers
Optionage Schedules (kV) Op Peak 19.51 17.95 121.07 Revision Comments Required text field for participant to provide the reason for revising or creating this NX-9 form. Example: Ratings updated due to changes in relay settings where previously limiting equipment. Revision Comments Required text field for participant to provide the reason for revising or creating this NX-9 form. Example: Ratings updated due to changes in relay settings where previously limiting equipment. Data Revision Number 1 Date Created middlyyyy Prepared By Participant Usemame Requested Effective Date middlyyyy Date Created middlyyyy Approved By 150 NX9 doministrator Usemame Actual Effective Date middlyyyy Date Created middlyyyy Approved By 150 NX9 doministrator Usemame Actual Effective Date middlyyyy Date Created middlyyy Approved By 150 NX9 doministrator Usemame Actual Effective Date middlyyyy Date Revision Date middlyyy Revision Bate middlyyyy Date Revision Number 1 Date Revision Date middlyyyy Repreved By 150 NX9 doministrator Usemame Actual Effective Date middlyyyy Date Created middlyyy Repreved By 150 NX9 doministrator Usemame Represented Effective Date middlyyyy To Effective Date middlyyy Represented Effective Date middlyyyy Represented Effective Date middlyyyy Represented Effective Date middly Middly				Scheduled	Minimu	m	Maximum
<text> Wollage Schedules (N) Of Peak 19.51 17.95 12.07 Revision Comments Revision Comments Represented to the data provides for participant to provide to season for revising the data provide do to provide any particles Captionent Nucles Control Lett Revision Visioner Data Revision Number 1 Data Created inmiddlypy Data Revision Number 1 Data Created inmiddlypy Data Revision Number 1 Data Revision Mumber 1</text>	Cont	trolled Side	On Peak	119.51	117.95	5	121.07
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EXAMPLE 3A+B (CONTINUED), MANUFACTURER'S NAMEPLATE

VII. OP-16 APPENDIX B 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
	10/26/23	For previous revision history, refer to Rev 10 available through Ask ISO.
Rev 11	10/26/23	Periodic review completed by procedure owner; Add footnote to define "relay loadability limits" as used in this Appendix; Update Normal Operating Mode field labels from Manual + SCADA to Manual-Local + Manual- Remote as previously requested by the Reliability Committee; Add requirement for control scheme information to Equipment Notes for transformers connecting dynamic reactive devices.