

# Operating Procedures

ISO New England Operating Procedure No. 17

*Load Power Factor Correction – Appendix C –  
Instructions for the ISO Power Factory Survey*

Effective Date: May 25, 2011  
Revision No. 10

## APPENDIX C – INSTRUCTIONS FOR THE ISO POWER FACTOR SURVEY

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## INSTRUCTIONS FOR THE ISO POWER FACTOR SURVEY

The purpose of this survey is to gather information to determine the degree to which individual Market Participants have corrected load power factor.

For the purposes of this survey, the New England Reliability Coordinator Area/Balancing Authority Area (RCA/BAA) has been divided into study areas. The study areas were determined by the Voltage Task Force (VTF) based on common reactive/voltage characteristics and established interfaces within. Market Participants, which cover a wide geographic area, may be included in more than one area. For Market Participants in multiple areas, a separate survey form for each area is required. Table 1 of this Appendix lists the study area(s) for each Market Participant and the Reporting Agents.

Figure 1 of this Appendix illustrates how load power factors are calculated using total real and reactive loads. These loads do not necessarily need to be metered; they can be calculated from whatever metering is available as long as they reflect the burden that the load places on the bulk transmission system. Although meter data is not always available, and estimates may be utilized, load data is preferred according to the following priority:

1. Integrated metered data (hourly integrated)
2. Instantaneous metering (an average based on several nearby samples) and
3. Estimates

Market Participants are expected to be as accurate as possible, and report the best available data/estimates.

The following instructions explain each line of the ISO Power Factor Survey (Table 3 of this Appendix):

- Line 1      Column No. - To be entered by ISO.
- Line 2      Date - To be entered by ISO.
- Line 3      Hour Ending - To be entered by ISO.

The data entered for Line 1, Line 2, and Line 3 may be found on the ISO New England External Web site under "Market" – Historic Data.

- Lines 4 & 5    Step-down Transformer Load at Sub transmission/ Distribution Level - Enter the aggregate of the real and reactive loads on the low voltage side of the transmission step-down transformers that feed load from the transmission system (69 kV or higher), incurred on the date and hour shown. Information is to be gathered from actual metered quantities. If actual metered data is not available, please enter your best estimate and enter an "E" next to the number.
- Lines 6 & 7    Step-down Transformer Losses - Enter the aggregate of the real and reactive losses incurred on the transmission step-down transformers. These quantities may be calculated manually or obtained from loadflow simulations.

- Lines 8 & 9 Generation on Sub transmission/Distribution Level - Enter the aggregate amount of real and reactive power actually supplied by generation at the sub transmission/distribution level. Gather information from actual metered quantities. If actual metered data is not available, please enter your best estimate and enter "E" next to the number.
- Line 10 Local Area Transmission Capacitors – Enter the value of “Local Area” Transmission Capacitors that were on line at the time of the survey. Refer to Table 2 of this Appendix for a list of eligible capacitors.
- Lines 11 & 12 Total Load Served from Generation and Transmission System - On Line 11, enter the sum of Lines 4, 6, and 8. On Line 12, enter the sum of Lines 5, 7, and 9 minus the value entered on Line 10.
- Line 13 Enter the calculated power factor. The power factor is to be calculated from the real load (entered on Line 11) and reactive load (entered on Line 12):

$$\text{Power Factor} = \frac{\text{MW}}{(\text{MW}^2 + \text{MVAR}^2)^{1/2}}$$

If any information on Lines 4 - 6 is estimated, please provide, on a separate page, a brief explanation of the basis for each estimate. Please enter the Line number followed by the explanation. Electronic submission of survey is preferred.

Only transmission capacitors that have been evaluated and approved by the VTF as “Local Area” Transmission capacitors may be entered on Line 10. The VTF applies as a general rule the following criteria to determine if a capacitor qualifies a “Local Area” capacitor:

- 1) The capacitor must be evaluated during the area study and deemed to have no significant effect on the Load Power Factor requirements for the area
- 2) Capacitor is not considered a PTF facility. See Table 2 for a listing of capacitors that may be entered on Line 10 as “Local Area” Transmission capacitors.

The area load ratio shall be taken into consideration when evaluating the survey data.

An alternate method may be used to derive the power factor as long as it results in the power factor of the load, which is served, from the transmission bus as illustrated in the drawing and sample calculation shown in Figure 1 of this Appendix. If an alternate method is used, please provide an explanation of the method.

**Table 1**

<b>Company</b>	<b>Area</b>	<b>Reporting Agent</b>
Ashburnham	Harriman/Central	MMWEC
Bangor Hydro	Maine	Bangor Hydro
Boylston	Harriman/Central	MMWEC
Bozrah Light & Power	CT	CMEEC
Braintree	Southeast	Braintree
Chicopee Elect Light	WMASS	MMWEC
CMP	Maine	Central Maine Power
Concord	Boston	NSTAR
CVPS	NH	NGRID
CVPS	Vermont	NGRID
CVPS (Vernon G-33)	Harriman/Central	NGRID
Danvers	Northeast MA	Danvers
Devens	Harriman/Central	NGRID
Fitchburg Gas & EI	Harriman/Central	Fitchburg Gas & EI
Georgetown	Northeast MA	NGRID
GMP (Tarif 1)	Harriman/Central	NGRID
Granite State Electric (GS WEST)	Vermont	NGRID
Granite State Electric	Northeast MA	NGRID
Green Mountain Power	Harriman/Central	NGRID
Green Mountain Power	NH	NGRID
Green Mountain Power	Vermont	NGRID
Groton	Harriman/Central	MMWEC
Groton Utilities	CT	CMEEC
Groveland	Northeast MA	NGRID
Hingham	Southeast	NSTAR
Holden	Harriman/Central	MMWEC
Holyoke Gas and Electric	WMASS	Holyoke Gas and Electric
Hudson	Harriman/Central	Hudson
Hull	Southeast	MMWEC
Ipswich	Northeast MA	MMWEC
Island Corp	Vermont	NGRID
Jewett City Dept of Public Utilities	CT	CMEEC
Littleton	NH	NGRID
Littleton	Northeast MA	Littleton
Mansfield	Southeast	MMWEC
Marblehead	Northeast MA	MMWEC
Mass Electric	Northeast MA	NGRID
Mass Electric (no SBN&G)	Harriman/Central	NGRID
Mass Electric	Southeast	NGRID
Merrimac	Northeast MA	NGRID
Middleboro	Southeast	Middleboro
Middleton	Northeast MA	Middleton

Company	Area	Reporting Agent
Mohegan Tribal Utilities Authority	CT	CMEEC
Nantucket	Southeast	NGRID
Narrangansett	Southeast	NGRID
NH Elec Coop	NH	NGRID
NH Elec Coop	NH	Northeast Utilities
NH Elec Coop	Vermont	NGRID
North Attleborough	Southeast	North Attleborough
Norwich Public Utilities	CT	CMEEC
Norwood	Southeast	NSTAR
NSTAR	Boston	NSTAR
NSTAR	Southeast	NSTAR
NU	WMASS	Northeast Utilities
NU	SWCT	Northeast Utilities
NU	CT	Northeast Utilities
Pascoag	Southeast	NGRID
Paxton	Harriman/Central	MMWEC
Peabody	Northeast MA	Peabody
Princeton	Harriman/Central	NGRID
PSNH	NH	PSNH
RMLD	Northeast MA	Reading
RMLD	Boston	Reading
Rowley	Northeast MA	Rowley
Shrewsbury	Harriman/Central	MMWEC
Sterling	Harriman/Central	MMWEC
South Hadley	WMASS	MMWEC
South NRWLK Electric & Water	SWCT	CMEEC
Taunton	Southeast	Taunton
Templeton	Harriman/Central	MMWEC
The United Illuminating Co	SWCT	United Illuminating
The United Illuminating Co	CT	United Illuminating
Third Taxing Dist-NRWLK	SWCT	CMEEC
Town of Wallingford Electric Division	CT	CMEEC
Town of Wallingford Electric Division	SWCT	CMEEC
TransCanada	Harriman/Central	NGRID
Unitil Energy Systems	NH	Unitil Energy Systems
Velco	Vermont	VELCO
Wakefield	Northeast MA	MMWEC
West Boylston	Harriman/Central	MMWEC
Western Mass Electric	Harriman/Central	NGRID
Westfield	WMASS	MMWEC

**Table 2**

<b>Company</b>	<b>Reporting Area</b>	<b>Capacitor Location</b>	<b>Capacitor Size (MVAR)</b>
Bangor Hydro Electric	Maine	Keene Road	15 MVAR



**Table 3**

<b>NEPOOL LOAD POWER FACTOR SURVEY</b>						
<b>PARTICIPANT:</b>	<b>CONTACT PERSON:</b>		<b>TEL. NO:</b>			
<b>DATE:</b>	<b>AREA:</b>					
	<b>SPRING</b>	<b>SUMMER</b>		<b>FALL</b>	<b>WINTER</b>	
	<u>MW</u>	<u>MW</u>	<u>MW</u>	<u>MW</u>	<u>MW</u>	<u>MW</u>
	<i>Light</i>	<i>Intermediate</i>	<i>Peak</i>	<i>Light</i>	<i>Intermediate</i>	<i>Peak</i>
	<i>Load</i>	<i>Load</i>	<i>Load</i>	<i>Load</i>	<i>Load</i>	<i>Load</i>
<i>(1) Column No.</i>	1	2	3	4	5	6
<i>(2) Date</i>						
<i>(3) Hour Ending</i>						
<i>Step-down Transformer Load at Subtransmission/Distribution Level:</i>						
<i>(4) MW</i>						
<i>(5) Mvar</i>						
<i>Step-down Transformer Losses:</i>						
<i>(6) MW</i>						
<i>(7) Mvar</i>						
<i>Generation on Subtransmission/Distribution Level:</i>						
<i>(8) MW</i>						
<i>(9) Mvar</i>						
<i>Local Area Capacitors</i>						
<i>(10) Mvar</i>						
<i>Total Load Served From Generation and Transmission System:</i>						
<i>(11) MW = (4)+(6)+(8)</i>						
<i>(12) Mvar = (5)+(7)+(9)-(10)</i>						
<i>(13) Power Factor</i>						

## OP 17 Appendix C 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
Rev 1	03/07/03	
Rev 2	02/01/05	Updated to conform to RTO terminology
Rev 3	06/02/05	Revised data resulting from Voltage Task Force review
Rev 4	11/28/06	Clerical revisions made as part of annual review
Rev 5	07/09/07	Revisions made after technical review
Rev 6	05/22/08	Made minor editorial and clarifications changes to App C line 1, added clarifications after Line 3, added clarification just prior to last paragraph. In App C Table 1: remove NSTAR Hopkinton from Company listing; corrected Reporting Agent names; corrected misspelled Company names. Replaced NEPOOL Power Factor Survey form.
Rev 7	06/05/09	In Table 1, change Reporting Agent for Nantucket from NSTAR to NGRID
Rev 8	10/30/09	In Table 1: Deleted note in parenthesis (If different from Company) in the Reporting Agent column; Changed reporting agents for the following: Danvers from MMWEC to Danvers; Hingham from MMWEC to NSTAR; Holden from MMWEC to Holden; Middleton from MMWEC to Middleton; Rowley from MMWEC to Rowley
Rev 9	01/20/11	Biennial review by procedure owner; Editorial changes including font change, format changes, clarification of directed actions, replaced Control Area with Reliability Coordinator Area/Balancing Authority Area and defined acronym RCA/BAA, added Table of Contents, added Uncontrolled disclaimer on page 1 footer and added "Uncontrolled" to the footer on all pages, In Table 1, changed Reporting Agents & added new row of data for South Hadley
Rev 10	05/25/11	Updated to provide, for each applicable Company, the correct reporting entity for the LPF audit participants: Chicopee Elect Light (WMASS) - replaced Northeast Utilities with MMWEC CMP (Maine) – spelled out Central Maine Power; NU (WMASS) - spelled out Northeast Utilities; NU (SWDT) - spelled out Northeast Utilities; NU (CT) - spelled out Northeast Utilities; RMLD (Northeast MA) – replaced North Reading with Reading The United Illuminating Co (SWCT) spelled out United Illuminating The United Illuminating Co (CT) spelled out United Illuminating NH Elec Coop – added 3 <sup>rd</sup> instance for NH load reported by NU