# Consumer protection performance standards in Connecticut 

Quat Nguyen

Connecticut Public Utilities Regulatory Authority
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## TOPICS

- Electric Metering Regulations in Connecticut
- Voltage Regulations
- Samples


## Advancement of Meters

## Past - 40 years ago

- Mechanical Meter
- Pedestrian meter routes
- Manual data entry
- Only recorded consumption


## Recent Past - 20 years ago

- Transition - from mechanical meters \& manual data entry to remotely read meters
- Two different paths:

1) CL\&P - AMR (Automated Meter Reading) driven by technology
2) UI - outfit meters with cellular technology

- Transition achieves savings - reduced labor costs
- Transition improves accuracy - eliminates human error


## Current - 2007 to Present

- Advances in technology provide opportunity for change
- Meters can collect significant data, and provide remote access for data retrieval \& more
- Policy decisions drive the desire to install advanced meters
- Requires significant investment
- Need to select the 'right' technology


## Connecticut Light \& Power (CL\&P)

- CL\&P - AMR meters do not easily adapt to new standard
- CL\&P - Only recently completed the AMR upgrade and would scrap many meters
- Decision to begin converting to advanced meters on hold


## United Illuminating (UI)

Begins deployment as meters fail or new customers are added Reduces stranded investment
Gradual deployment avoids consumer anxiety
Gradual deployments spreads the cost - avoids rate shock (no pun intended

## Future

Smart grid, etc.

## Meter Types

- Hybrid meters, also referred to as electro-mechanical meters, have a turning disc, bearings, gears and dials for a display that are retrofitted with an ERT.*
- Solid state meters do not have any moving parts. The display is digital, and the ERT is built into the meter and is manufactured to a standard requiring greater accuracy than a hybrid meter. They have a 15-20 year life. Solid state installations began in 1999.
*An electronic receiver and transmitter installed on a circuit board under the glass is referred to as an ERT. It allows the meter to be read remotely, including meters located indoors and within areas secured by fences.


## Electric Metering Regulations

- Electric meters are required to be within $1 \%$ for mechanical or $0.5 \%$ for solid state of true accuracy per PURA regulations.
- Three phase meters (industrial and commercial accounts) are required to be balanced within 2\% of true accuracy, phase-tophase.
- Meters with a demand component are required to have the demand component accurate within $2 \%$.
- An electric distribution company must test a meter on request once per year at no charge.


## Electric Metering (cont.)

- If a meter is found to be over-registering by more than $1 \%$, a refund is due to the customer.
- On request and receipt of a $\$ 10$ fee, the PURA witnesses a test of an electric meter.
- The electric distribution companies also periodically test electric meters per regulations.
- Electric distribution companies test meters on a selective testing program, in which meters are tested based on meter age and failure history.


## Electric Metering (cont.)

- The purpose of selective testing is to determine if any meter class is beginning to become inaccurate due to age or a generic problem.
- Selective tests involve testing a number of installed meters for each class of meter.
- The sample of meters tested in each class is based on the number of meters in operation during the previous year (10\%).
- The results of meter tests are reported to the PURA each year.


## Sample of Meter History Report



## Sample of Meter Lab Results

Meter Calibration Accuracy Test Report

| MeterID: | 890450932 | Test Setup Code: | 077 | Kh: | 1 |
| :--- | :--- | :--- | :--- | :--- | :--- |
| Meter Type: | C2SR | Mode: | Kwh | Test Amps: | 30 |
| Form: | 2 | Stock Code: | 27013238 | Test Volts: | 240 |
| Base: | S | Reg. Type: | R300 |  |  |

Percent Registration


## Sample of Annual Meter Test Summary - Total



## Sample of Annual Meter Test Summary - Selective



## Sample of Annual Meter Test Summary - Periodic

| 2014 Periodic Meter Test Results with Revised Accuracy Ranges |  |  |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Hybrid Meter Tests - 1\% |  | $\begin{aligned} & \hline<98 \% \\ & \text { Failed } \\ & \hline \end{aligned}$ | $\begin{gathered} \hline 98 \%-<99 \% \\ \text { Failed } \\ \hline \end{gathered}$ | $\begin{aligned} & \hline 99 \%-100 \% \\ & \text { Passed } \\ & \hline \end{aligned}$ | $\begin{gathered} \hline>100 \%-101 \% \\ \text { Passed } \\ \hline \end{gathered}$ | $\begin{gathered} >101 \%-102 \% \\ \text { Failed } \end{gathered}$ | $\begin{gathered} \hline>102 \%-104 \% \\ \text { Failed } \\ \hline \end{gathered}$ | $\begin{aligned} & >104 \% \\ & \text { Failed } \\ & \hline \end{aligned}$ |  |  |
| \# Passed | 373 |  |  | 62 | 311 |  |  |  |  |  |
| \# Failed | 8 | 1 | 6 |  |  | 1 | 0 | 0 |  |  |
| Total Tests 381 |  |  |  |  |  |  |  |  |  |  |
| $\%$ of Group Passed | 97.9\% |  |  | 16.3\% | 81.6\% |  |  |  |  |  |
| \% of Group Failed | 2.1\% | 0.3\% | 1.6\% |  |  | 0.3\% | 0.0\% | 0.0\% |  |  |
|  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |
| Solid State Meter Tests - 0.5\% |  | $\begin{aligned} & \hline<98 \% \\ & \text { Failed } \end{aligned}$ | $\begin{gathered} \hline 98 \%-<99 \% \\ \text { Failed } \end{gathered}$ | $\begin{gathered} \hline 99 \%-<99.5 \% \\ \text { Failed } \end{gathered}$ | $\begin{aligned} & 99.5 \%-100 \% \\ & \text { Passed } \end{aligned}$ | $\begin{gathered} >100 \%-100.5 \% \\ \text { Passed } \end{gathered}$ | $\begin{gathered} >100.5 \%-101 \% \\ \text { Failed } \end{gathered}$ | $\begin{gathered} >101 \%-102 \% \\ \text { Failed } \end{gathered}$ | $\begin{gathered} >102 \%-104 \% \\ \text { Failed } \end{gathered}$ | $\begin{aligned} & \hline>104 \% \\ & \text { Failed } \end{aligned}$ |
|  |  |  |  |  |  |  |  |  |  |  |
| \# Passed | 0 |  |  |  | 0 | 0 |  |  |  |  |
| \# Failed | 0 | 0 | 0 | 0 |  |  | 0 | 0 | 0 | 0 |
| Total Tests |  |  |  |  |  |  |  |  |  |  |
| \% of Group Passed | 0.0\% |  |  |  | 0.0\% | 0.0\% |  |  |  |  |
| \% of Group Failed | 0.0\% | 0.0\% | 0.0\% | 0.0\% |  |  | 0.0\% | 0.0\% | 0.0\% | 0.0\% |
|  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |
| Solid State Meter Tests - 0.2\% |  | $\begin{aligned} & \hline<98 \% \\ & \text { Failed } \end{aligned}$ | $\begin{gathered} \hline 98 \%-<99 \% \\ \text { Failed } \end{gathered}$ | $\begin{gathered} \hline 99 \%-<99.8 \% \\ \text { Failed } \end{gathered}$ | $\begin{aligned} & 99.8 \%-100 \% \\ & \text { Passed } \end{aligned}$ | $\begin{gathered} >100 \%-100.2 \% \\ \text { Passed } \end{gathered}$ | $\begin{gathered} >100.2 \%-101 \% \\ \text { Failed } \end{gathered}$ | $\begin{gathered} \gg 101 \%-102 \% \\ \text { Failed } \end{gathered}$ | $\begin{gathered} >102 \%-104 \% \\ \text { Failed } \end{gathered}$ | $\begin{aligned} & \hline>104 \% \\ & \text { Failed } \end{aligned}$ |
|  |  |  |  |  |  |  |  |  |  |  |
| \# Passed | 1,045 |  |  |  | 58 | 987 |  |  |  |  |
| \# Failed | 12 | 3 | 0 | 8 |  |  | 1 | 0 | 0 | 0 |
| Total Tests 1,057 |  |  |  |  |  |  |  |  |  |  |
| \% of Group Passed | 98.9\% |  |  |  | 5.5\% | 93.4\% |  |  |  |  |
| \% of Group Failed | 1.1\% | 0.3\% | 0.0\% | 0.8\% |  |  | 0.1\% | 0.0\% | 0.0\% | 0.0\% |
|  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |
| 2014 Periodic Meters Tested Summary |  |  |  |  |  |  |  |  |  |  |
|  |  | Passed/Failed <br> based on <br> Revised <br> Accuracy <br> Ranges |  | Passed/Failed based on +/-1\% |  | Passed/Failed based on +/-2\% |  |  |  |  |
| \# Passed |  | 1,418 |  | 1,427 |  | 1,434 |  |  |  |  |
| \# Failed |  | 20 |  | 11 |  | 4 |  |  |  |  |
|  |  | 1,438 |  | 1,438 |  | 1,438 |  |  |  |  |
| Total Tests  <br> $\%$ of Group Passed  |  | 98.6\% |  | 99.2\% |  | 99.7\% |  |  |  |  |
| \% of Group Failed |  | 1.4\% |  | 0.8\% |  | 0.3\% |  |  |  |  |

## Sample of Annual Meter Test Summary - Customer Requested



## Sample of Annual Meter Test Summary - Company Requested (Initiated)



## Sample of Annual Meter Test Summary - Other Meters



## Voltage Regulations - Regs 16-11-115

Voltage variations:

- The PURA's regulations require voltage to be maintained within $-5 \%$ and $+3 \%$ of nominal voltage which is typically 120 V or 240 V for residential service.
- Electric utilities rarely have difficulty complying with these voltage limitations, except in parts of the distribution system that have extensive distributed generation (e.g., solar and wind) interconnected.


## Voltage Regulations (cont.)

- Regulations allow deviations from these limits as follows:
- Voltage excursions above the upper limit shall not exceed one minute.
- Providing voltage below the lower limit shall be limited in extent, frequency and duration. Corrective action shall be promptly taken whenever deviations result from other than temporary conditions.
- Temporary conditions, such as automatic switching to supply interrupted feeders, should not exceed 24 hours where practical. American National Standards Institute (ANSI) Standard c84-1 shall be used to determine the lowest temporary voltage excursions permissible.


## Voltage Variation Waiver

- National Standard ANSI C84.1 establishes the nominal voltage ratings and operating tolerances for $60-\mathrm{Hz}$ electric power systems above 100 volts (steady-state voltage levels only).
- ANSI C84.1 tolerances for 120-600 V service is also plus/minus 5\%.


## Voltage Variation Waiver (cont.)

- Twice a year, the Independent System Operator (ISO) conducts a test to determine the reduction in load that can be achieved by implementing a $5 \%$ reduction of normal voltage.
- This test causes the voltage on some parts of distribution circuits to fall below the minimum voltage threshold allowed by Reg. 16-11-115(a).
- Therefore, this test requires approval by the regulatory agency.


## Sample Letters

EVERS $=$ URCE
ENERGY

107 Selden Street
Berlin, CT 06037
Joaquina Borges King
Senior Counsel
880-885-3878
joaquina.borgesking@eversource.com

February 25,2015
Mr. Nicholas E. Neeley
Acting Executive Secretary
Public Utilities Regulatory Authonty
10 Franklin Square
New Britain, CT 06051
Re: Request for Temporary Waiver of or Exemption from CT Agencies Regs. §16-11-115(a)
Dear Mr. Neeley:
On Tuesday, May 5, 2015, ISONew England, Inc., ("ISO-NE") proposes to conduct a test to detemine the reduction in load that can be achieved by implementing a five percent reduction of normal voltage. The ConnecticutLight and Power Company d/b/a/ Eversource Energy ("Eversource") intends to participate in the test that is scheduled to commenceat 10:00 a m and conclude at 10:30 a.m In the event that systemconditions exist that prevent the test fromoccuring on May 5th, ISO-NE has set an altemate date of Wednesday, May 6,2015.

Except as otherwise already pemittedby the Public Utilities Regulatory Authonty ("PURA" or "Authority"), Eversource is currently providing service to customers within the voltage variationlimits prescribed by CT Agencies Regs. §16-11-115(a), that is within a range of from three percent (3\%) above to five percent (5\%) below the standard voltage. A voltage reduction of five percent ( $5 \%$ ) of normal voltage will cause the voltage on some limited portions of distribution circuits to fall below the minimum voltage permitted by the regulation. However, Exersource believes that such voltage for the half-hour periods of the test will cause no inconverience to customers or damage to their electrical equipment or systems.

In order to cany out the test Eversource a cting pursuant to CT Agencies Regs §16-1-3, respectfully requests a waiver of, or an exemption fromCTAgencies Regs. §16-11-115(a) to permit it to reduce normal voltages by five percent ( $5 \%$ ) (with the exceptions noted above) for the period of the ISO-NE test. The last such test was conducted on October 28,2014, pursuant to the Authonity's October 27, 2014 approval (reference ISO Waiver: EN-ILB). If you require additional information in considering this request, please do not hesitate to contact me.

Sincerely yours,

Fegyusina Sorgen Ting
Jeaquina Borges King

Energy Resources,
United States
Department of State

STATE OF CONNECTICUT

## PUBLIC UTILITIES REGULATORY AUTHORITY

March 3, 2015
In reply, please referto
ISO Waiver EN: SMC

Joaquina Borges King, Esq
Senior Counsel
Eversource Energy
P. O. Box 270

Hartford, CT 06141-0270
Re: Request for Temporary Waiver of, or Exemption from, Regulations of Connecticut State Agencies Section 16-11-115(a)

Dear Ms. King:
The Public Utilities Regulatory Authority is in receipt of a letter from The Connecticut Light and Power Company d/b/a Eversource Energy (CL\&P) dated February 25, 2015, requesting a waiver of, or exemption from, the Regulations of Connecticut State Agencies (Conn. Agencies Regs.) §16-11-115(a) voltage
 (ISO-NE). Approval is hereby granted for a temporary exemption from Conn. Agencies Regs. §16-11-115(a) as required for CL\&P to participate in the voltage reduction test proposed by ISO-NE to be conducted on May 5, 2015. In the event conditions exist that prevent the test from occurring on May 5, 2015, the test may be performed on May 6, 2015.

Sincerely,
PUBLIC UTILITIES REGULATORY AUTHORITY

# Nicholas E. Neeley <br> Acting Executive Secretary 

