

CT Loading Assessment - The Way Forward

Revenue Metering Standing Committee Meeting - October 28, 2010
Settlements, Metering Installations



- ❑ Compliance with Market Rules & Hardware Standard
 - To review and establish principles to assess conformance to the Wholesale Revenue Metering Standard – Hardware w.r.t. operating range of current transformers (CTs) in registered *metering installations* and to comply with the Chapter 6 of the *Market Rules*
- ❑ IESO Role
 - Administrator of the market; fulfill Market Rule obligations
 - Regulator – watchdog/auditor role
 - Technical competence
- ❑ Market Participant Role
 - Compliance with Market Rules and metering standards
 - Metering obligations/metering upgrades
 - Financial obligation

❑ Regulatory & Business Drivers

- 0.15 accuracy standards formalized and widely available – IEEE ANSI C57.13 -2008 and CAN/CSA-C60044 - 2007
- EG/DG (Embedded/Distributed generation)
 - Solar farms; wind farms; biogas generators
- Cogeneration facilities
 - Hospitals; Universities; Industrial Complexes; Business Parks
- FIT (Feed-In Tariff) Program
- GEA (Green Energy Act)

What impacts to the host metering?

What design criteria to build into new metering?

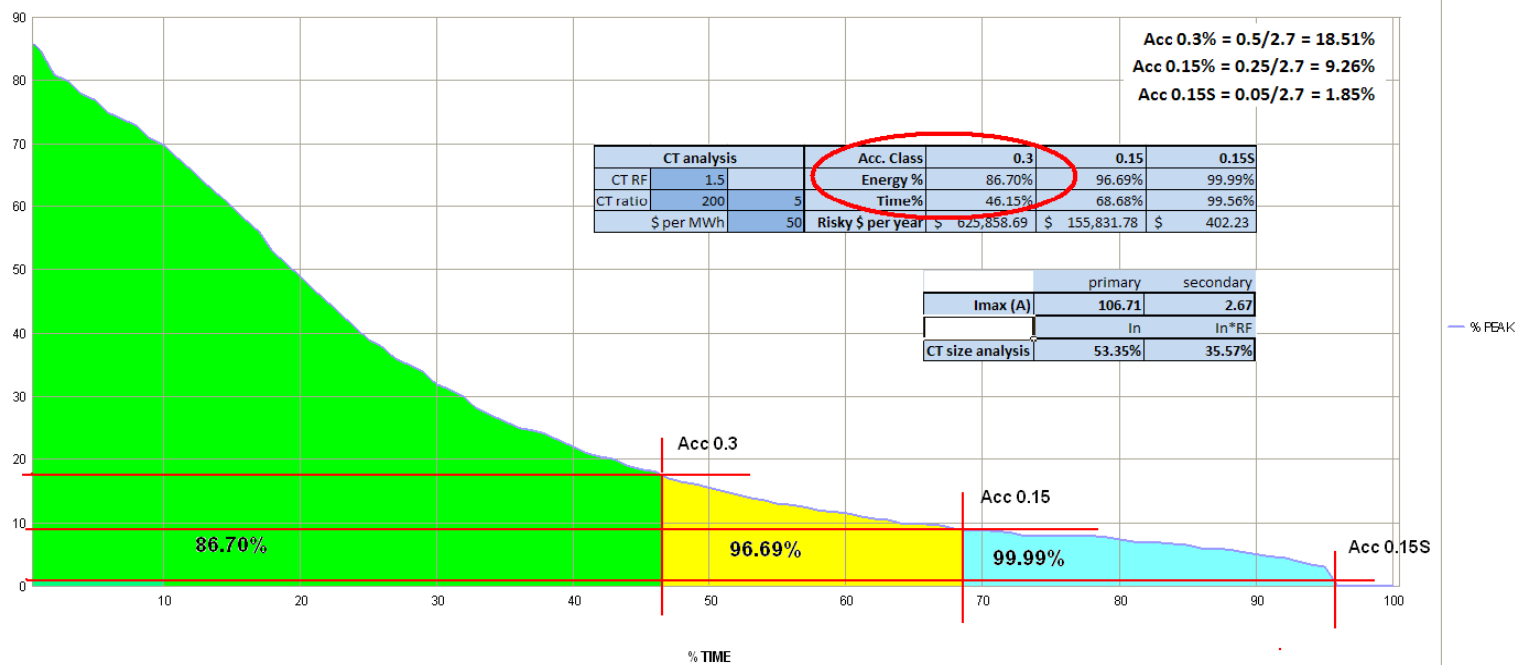
How to handle existing metering for ongoing compliance?

- ❑ Current/time loading assessment presently uses time based 80/20 rule.
 - 100% requirement is not practical
 - 80% of the time operating within CT accuracy class
 - 80/20 provides for flexibility in metering design
 - Assessed at time of audit (typically)
 - Current/time based is not necessarily good indicator of adherence to standard or financial risk

□ Future % energy assessment basis

- 80/20 time/current based to 80/20 energy threshold based
- 80% of the energy operating within CT accuracy class
- New method kWh metric is intuitive and readily accepted
- Supports hardware standard 'minimum sustained current requirements'
- Enables compliance to Market Rules ANSI accuracy requirements
- Why is 80/20 energy a better method?
 - A passing 80/20 time based result will meet or better the 80/20 energy based method proposed.
 - However a failing 80/20 time based result may also pass on the 80/20 energy based method proposed.
 - 80/20 energy based method is the better indicator of conformance to the standard and financial risk

□ Model example



LOAD DURATION PLOT

Chan: 8

Start: 09/01/01 00:01

Stop: 09/12/31 24:00

Max: 2.75QRTI2

Min: .05QRTI2

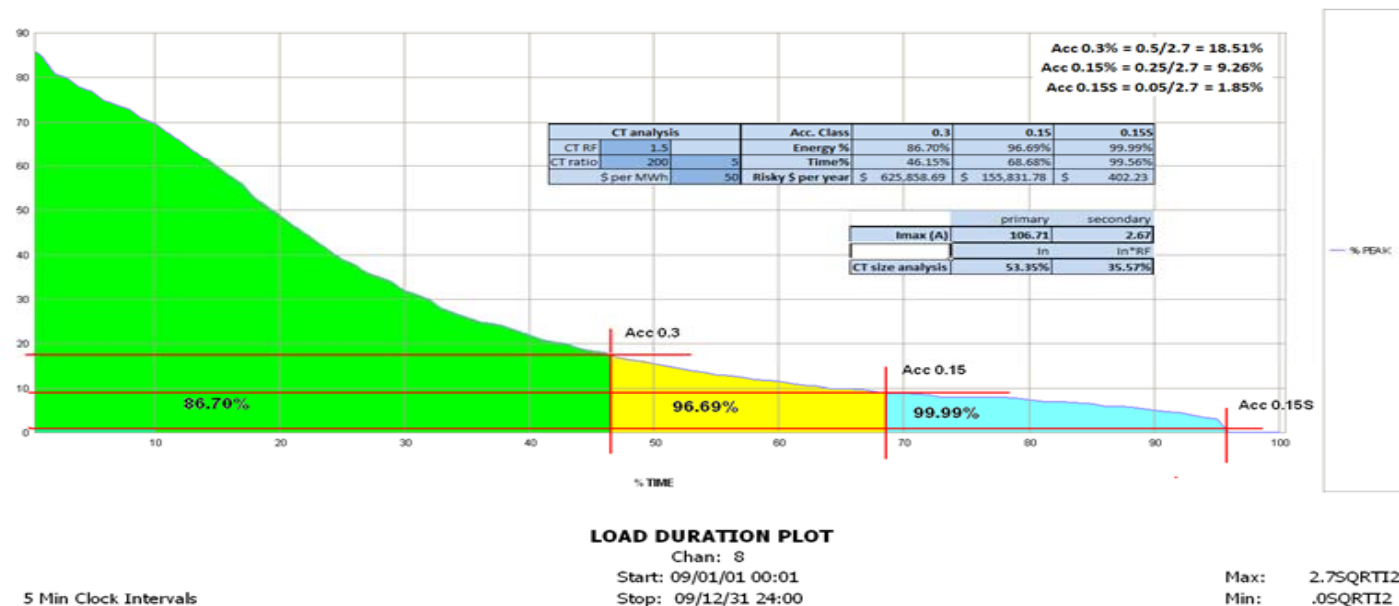
5 Min Clock Intervals

- ❑ Case examples exhibit mixed but generally positive results for load/generation category at both ANSI 0.3 and 0.15 class
 - Wind Turbine GS: Current/Time @ 46.15% & Energy @ 86.70% (0.3 ANSI)
 - Hydraulic GS: Current/Time @ 46.72% & Energy @ 98.57% (0.3 ANSI)
 - Generator SS: Current/Time @ 51.52% & Energy @ 66.84% (*0.15 ANSI)
 - LDC TS: Current/Time @ 14.91% & Energy @ 16.70% (*0.15 ANSI)
 - Large Industrial CTS #1: Current/Time @ 70.67% & Energy @ 87.04% (*0.15 ANSI)
 - Large Industrial CTS #2: Current/Time @ 38.16% & Energy @ 93.51% (0.3 ANSI)
 - LDC Feeder PME #1: Current/Time @ 82.13% & Energy @ 96.53% (*0.15 ANSI)
 - LDC Feeder PME #2: Current/Time @ 5.87% & Energy @ 81.44% (*0.15 ANSI)

I. WIND TURBINE GENERATION STATION

Example # 1

In this example, the assessment parameters are presented as:



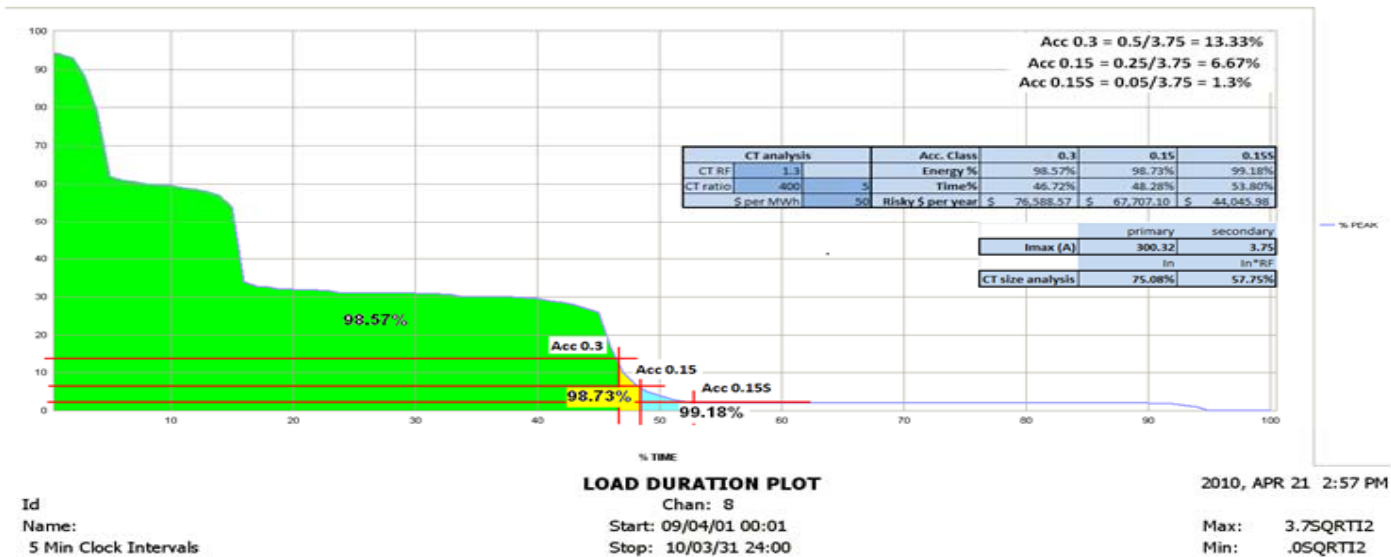
0.3 class: 46.15% @ Current/Time criteria
86.70% @ Class kWh Energy criteria
\$625,858 @ At Risk Dollars criteria

0.15 class: 68.68% @ Current/Time criteria
96.69% @ Class kWh Energy criteria
\$155,831 @ At Risk Dollars criteria

0.15S class: 99.56% @ Current/Time criteria
99.99% @ Class kWh Energy criteria
\$402 @ At Risk Dollars criteria

II. HYDRAULIC GENERATION STATION

Example # 2

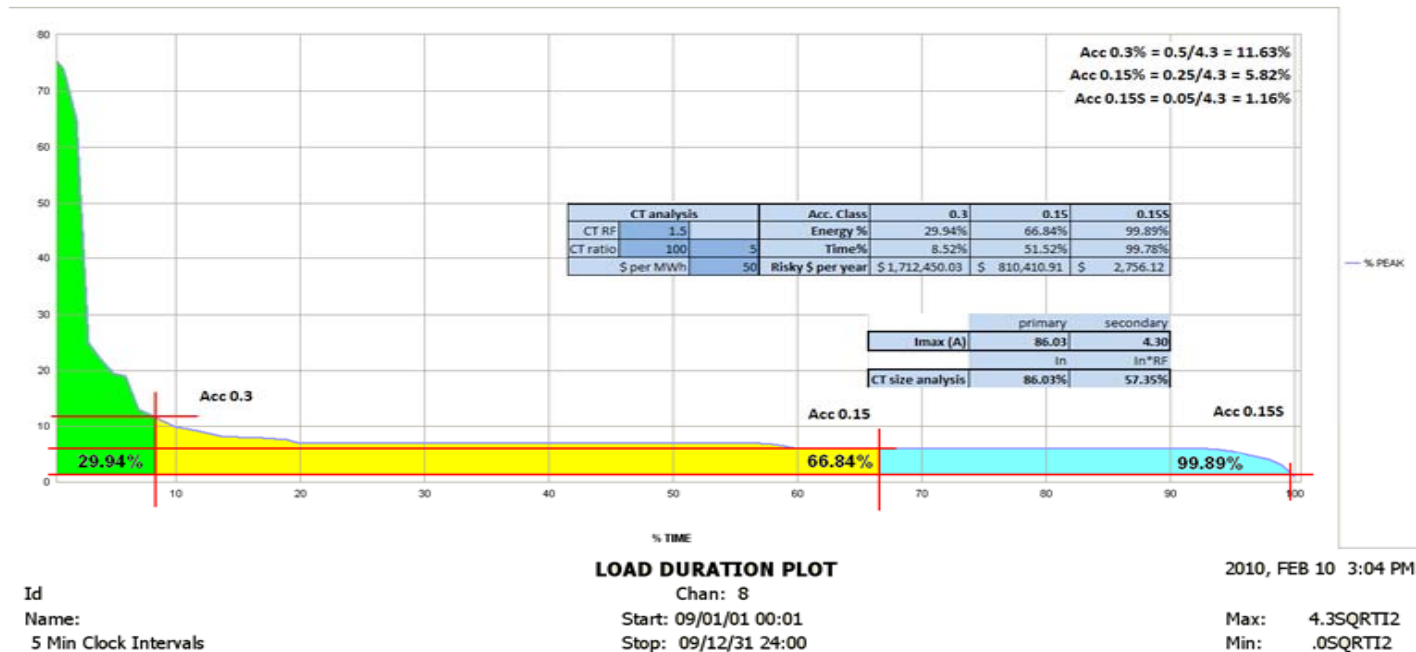


In this example, the assessment parameters are presented as:

- 0.3 class:** 46.72% @ Current/Time criteria
98.57% @ Class kWh Energy criteria
\$76,588 @ At Risk Dollars criteria
- 0.15 class:** 48.28% @ Current/Time criteria
98.73% @ Class kWh Energy criteria
\$67,707 @ At Risk Dollars criteria
- 0.15S class:** 53.80% @ Current/Time criteria
99.18% @ Class kWh Energy criteria
\$44,045 @ At Risk Dollars criteria

III. GENERATOR STATION SERVICE

Example # 3



In this example, the assessment parameters are presented as:

0.3 class: 8.52% @ Current/Time criteria
29.94% @ Class kWh Energy criteria
\$1,712,450 @ At Risk Dollars criteria

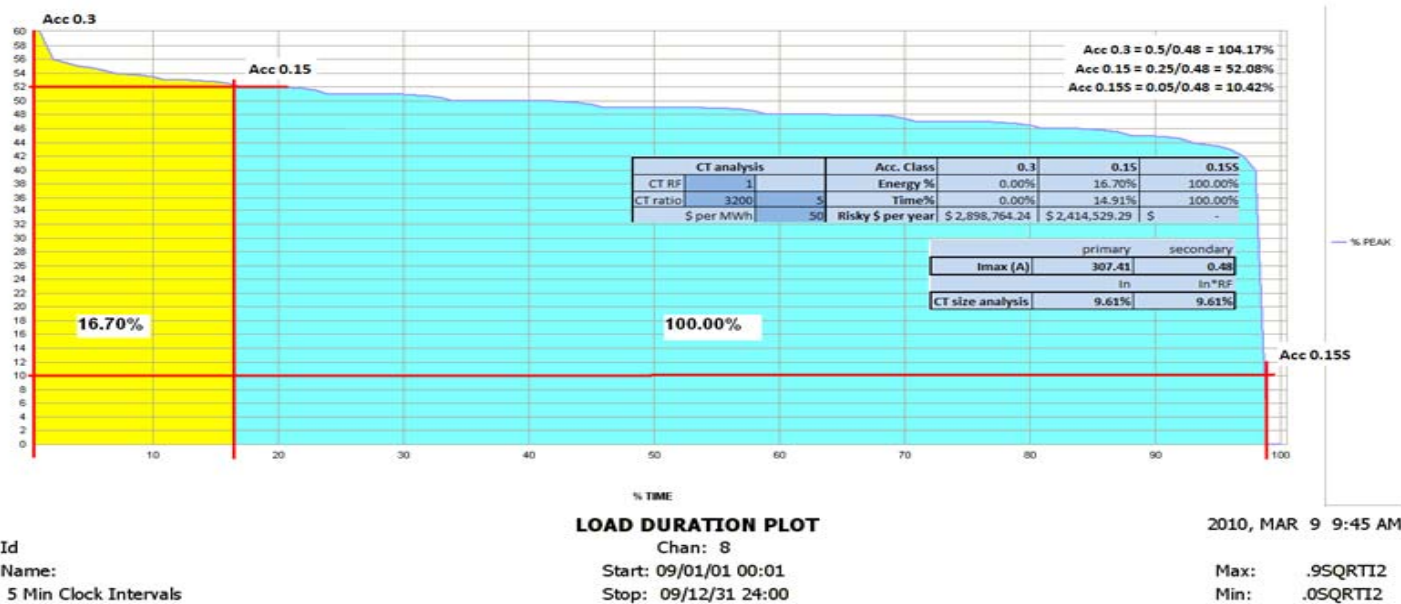
0.15 class: 51.52% @ Current/Time criteria
66.84% @ Class kWh Energy criteria
\$810,410 @ At Risk Dollars criteria

0.15S class: 99.78% @ Current/Time criteria
99.89% @ Class kWh Energy criteria
\$2,756 @ At Risk Dollars criteria

IV. LDC TRANSFORMER STATION

Example # 4

In this example,

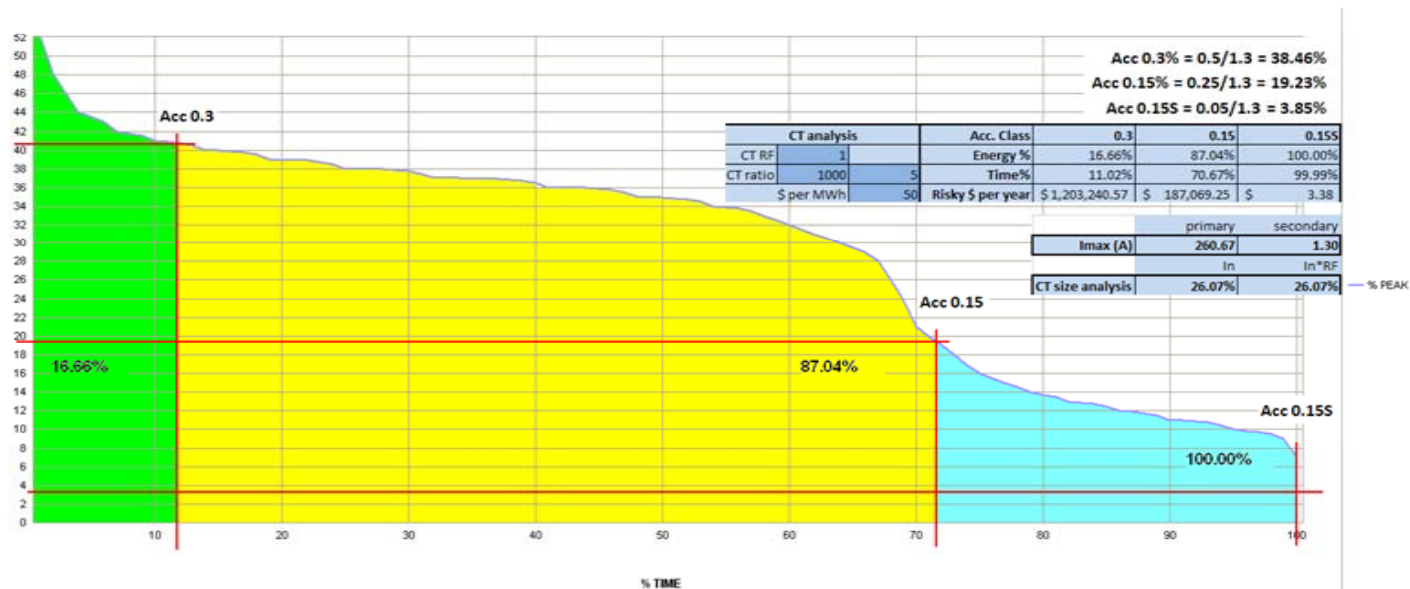


In this example, the assessment parameters are presented as:

- 0.3 class:** 0.0% @ Current/Time criteria
0.0% @ Class kWh Energy criteria
\$2,898,764 @ At Risk Dollars criteria
- 0.15 class:** 14.91% @ Current/Time criteria
16.70% @ Class kWh Energy criteria
\$2,414,529 @ At Risk Dollars criteria
- 0.15S class:** 100% @ Current/Time criteria
100% @ Class kWh Energy criteria
Nil @ At Risk Dollars criteria

V. LARGE INDUSTRIAL CUSTOMER TRANSFORMER STATION

Example # 5a



LOAD DURATION PLOT

2010, FEB 11 10:35 AM

Id
Name:
5 Min Clock Intervals

Chan: 8
Start: 09/01/01 00:01
Stop: 09/12/31 24:00

Max: 1.3SQRTI2
Min: .05SQRTI2

In this example, the assessment parameters are presented as:

0.3 class: 11.02% @ Current/Time criteria
 16.66% @ Class kWh Energy criteria
 \$1,203,240 @ At Risk Dollars criteria

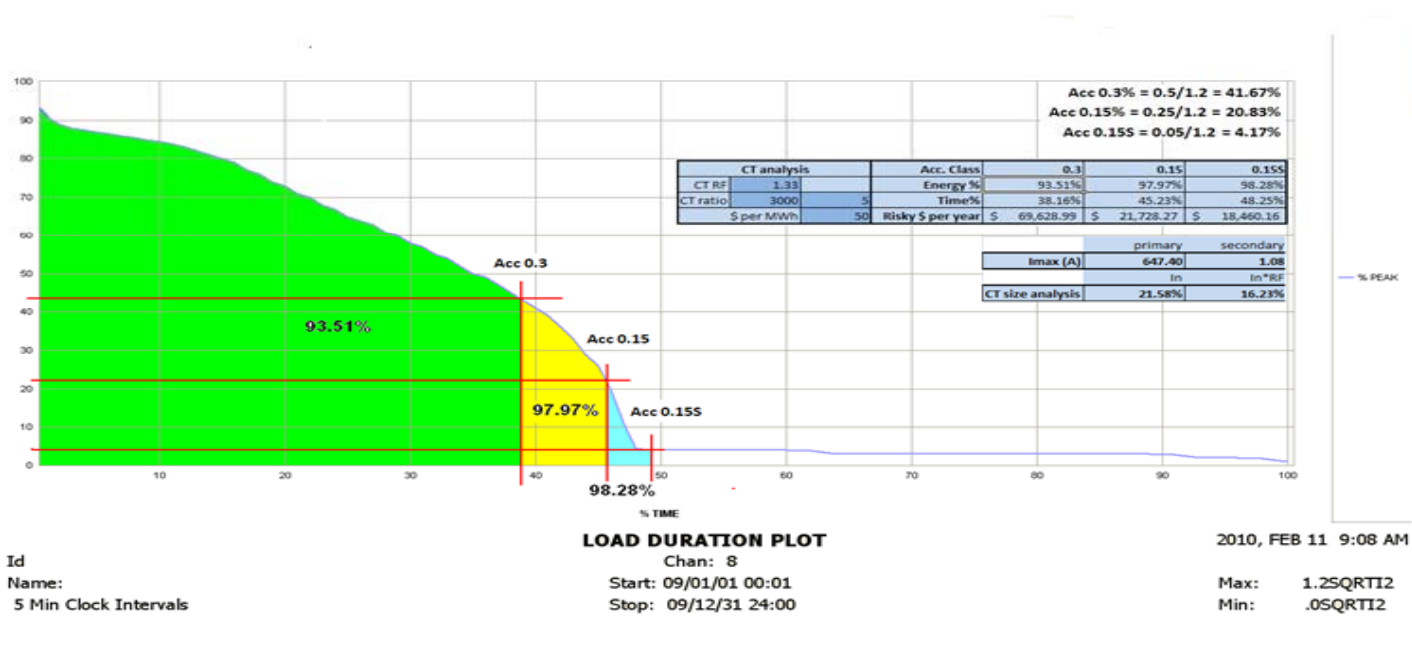
0.15 class: 70.67% @ Current/Time criteria
 87.04% @ Class kWh Energy criteria
 \$187,069 @ At Risk Dollars criteria

0.15S class: 99.99% @ Current/Time criteria
 100.0% @ Class kWh Energy criteria
 \$3.00 @ At Risk Dollars criteria

I

V. LARGE INDUSTRIAL CUSTOMER TRANSFORMER STATION

Example # 5b



In this example, the assessment parameters are presented as:

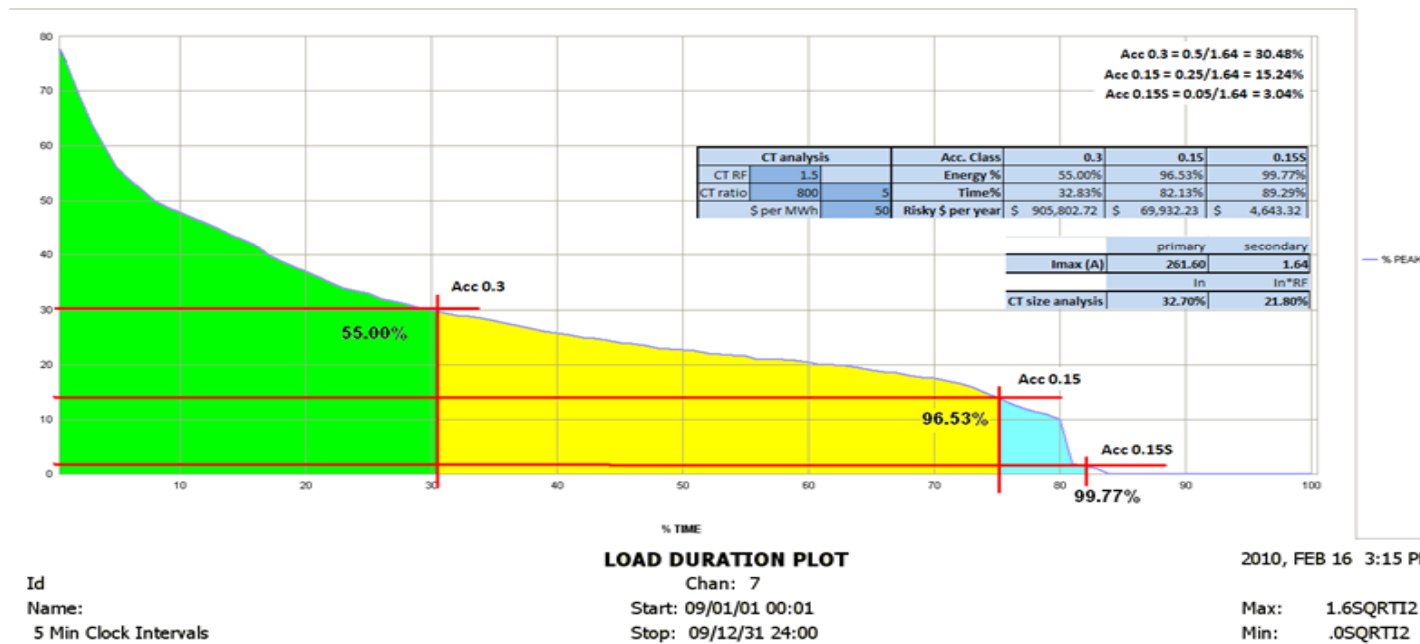
0.3 class: 38.16% @ Current/Time criteria
93.51% @ Class kWh Energy criteria
\$69,629 @ At Risk Dollars criteria

0.15 class: 45.23% @ Current/Time criteria
97.97% @ Class kWh Energy criteria
\$21,728 @ At Risk Dollars criteria

0.15S class: 48.25% @ Current/Time criteria
98.28% @ Class kWh Energy criteria
\$18,460 @ At Risk Dollars criteria

VI. LDC FEEDER/PME METER INSTALLATION

Example #6a



Id
Name:
5 Min Clock Intervals

LOAD DURATION PLOT
Chan: 7
Start: 09/01/01 00:01
Stop: 09/12/31 24:00

2010, FEB 16 3:15 PM

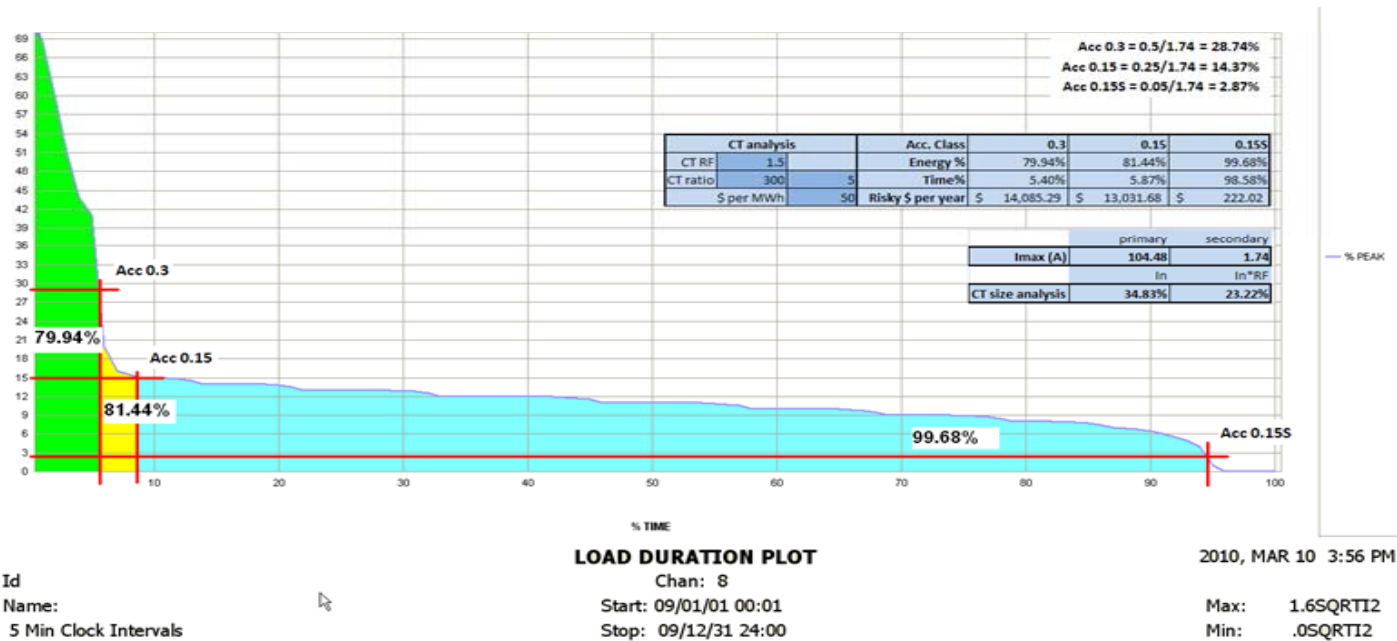
Max: 1.65QRTI2
Min: .05QRTI2

In this example, the assessment parameters are presented as:

- 0.3 class:** 32.83% @ Current/Time criteria
55.00% @ Class kWh Energy criteria
\$905,802 @ At Risk Dollars criteria
- 0.15 class:** 82.13% @ Current/Time criteria
96.53% @ Class kWh Energy criteria
\$69,932 @ At Risk Dollars criteria
- 0.15S class:** 89.29% @ Current/Time criteria
99.77% @ Class kWh Energy criteria
\$4,643 @ At Risk Dollars criteria

VI. LDC FEEDER/PME METER INSTALLATION

Example #6b



In this example, the assessment parameters are presented as:

0.3 class: 5.40% @ Current/Time criteria
79.94% @ Class kWh Energy criteria
\$14,085 @ At Risk Dollars criteria

0.15 class: 5.87% @ Current/Time criteria
81.44% @ Class kWh Energy criteria
\$13,031 @ At Risk Dollars criteria

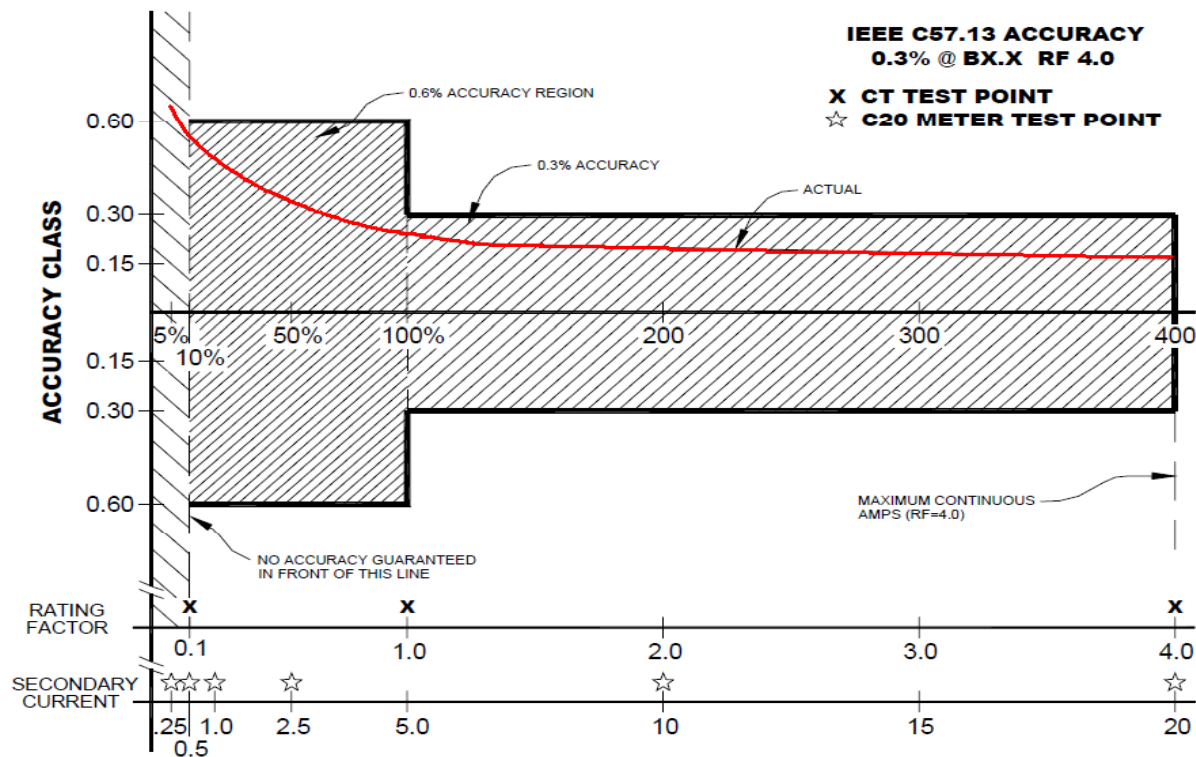
0.15S class: 98.58% @ Current/Time criteria
99.68% @ Class kWh Energy criteria
\$222 @ At Risk Dollars criteria

- ❑ In the non-conformance scenario, the Market Participant will submit its conformance plan
 - MP conformance plan must consider impact to the market (time duration and At Risk Dollars)
 - MP may propose to implement measures such as making CT ratio change; applying a CT error correction factor; providing a projection for return back to normal business activity levels; etc.
 - IESO to assess the MP conformance plan
- ❑ IESO will document and log case assessment decisions and outcomes for RMSC

Note: 24/800 meter points audited in 2005-2010 failed the 80/20 time based threshold. A large percentage of these 24 points are expected to pass the 80/20 kwh energy based assessment.

- ❑ Market Manual Part 3.4: Measurement Error Correction provides for applying CT error correction
 - Sec 1.2 Scope - Measurement Error Correction (MEC) is required for: 'Current transformers normally operating at less than 10% of the rated primary current'

Burden Class 0.3



- ❑ Review and finalize with Revenue Metering Standing Committee meeting of October 28, 2010
- ❑ Immediate implementation of new kWh energy assessment in the determination of metering installations meeting the passing 80/20 threshold
- ❑ Present to Metering Service Provider Group meeting of November 25, 2010 as an information item
- ❑ Baseline update to the Wholesale Revenue Metering Standard - Hardware