

PERFORMANCE SYSTEMS
DEVELOPMENT

We Speak  Building

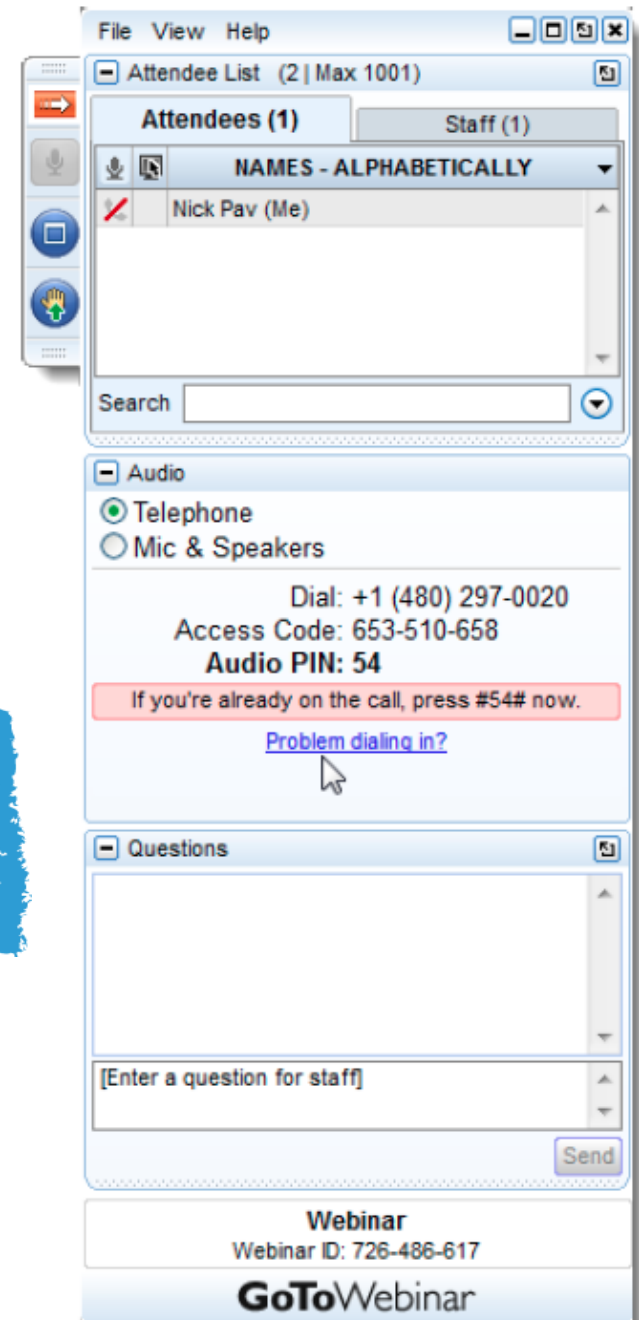


Fundamentals of Measurement & Verification Training

FREE Webinar: Sneak Peek



- If you have questions during the webinar please enter them using the questions pane.
- Unanswered questions will be answered offline and you will be sent a link to view them.





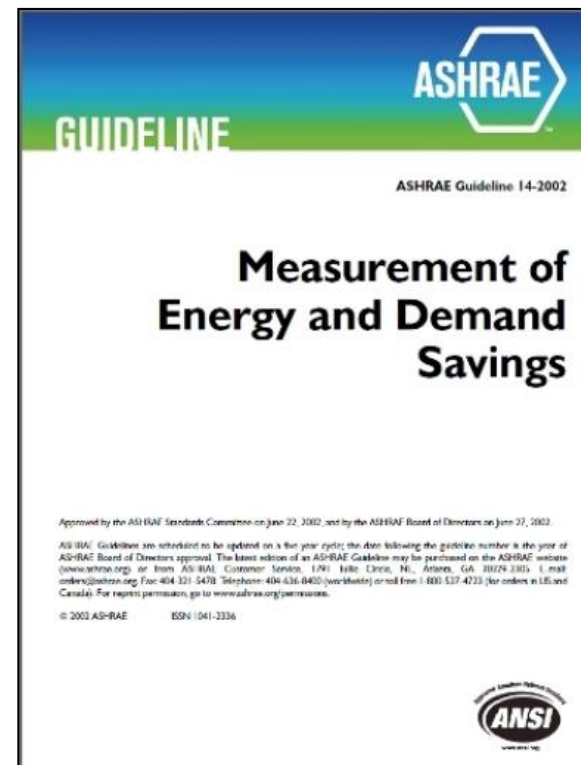
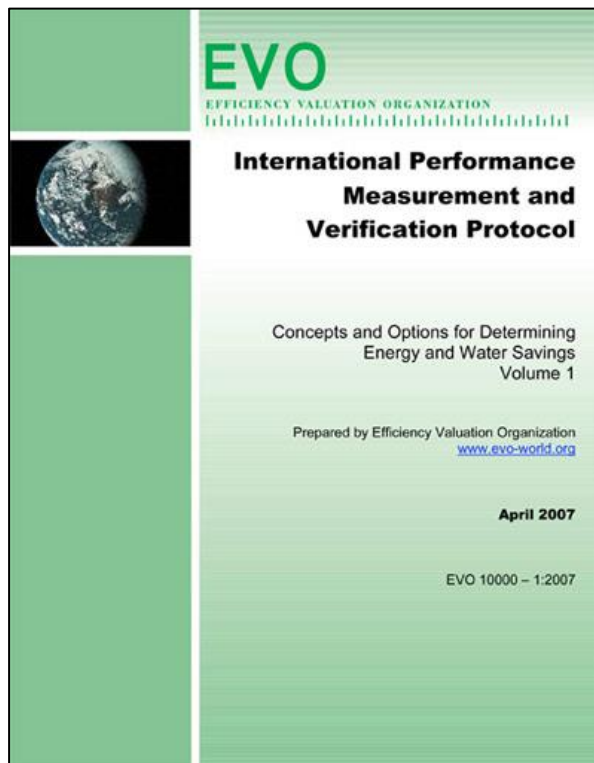
- To raise the professional standards of those engaged in measurement and verification.
- To improve the practice of measurement and verification by encouraging professionals to partake in a continuing education program of professional development for measurement and verification professionals
- To identify persons with acceptable knowledge of the principles and practices of measurement and verification through completing the certification and fulfilling prescribed standards of performance and conduct
- To award special recognition to those professionals who have demonstrated a high level of competence and ethical fitness in measurement and verification

Purpose : Build capacity of trained, recognizable M&V professionals

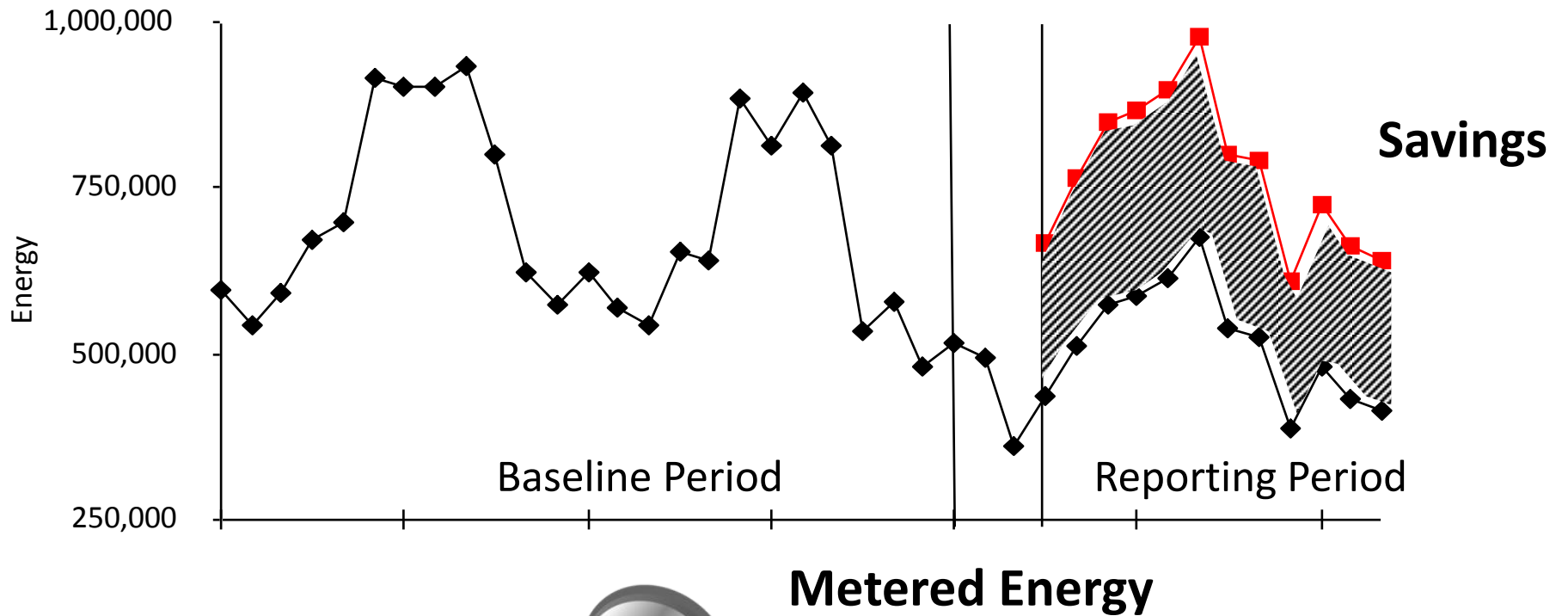
- Audits provide prediction of potential of performance.
- Commissioning provides proof of installed potential to perform.
- M&V provides reliable Measured “Proof of Performance”.



- Volume 1 (2012) - **Concepts and Options for Determining Energy and Water Savings**
- ASHRAE Guideline 14 (2002) – **Measurement of Energy and Demand Savings**



Baseline + Adjustments



Principles of IPMVP Adherent M&V

- Accuracy
- Completeness
- Conservativeness
- Consistent
- Relevant
- Transparency



IPMVP is not a standard

M&V = Improved Risk Management

- www.eepperformance.org



LARGE COMMERCIAL

Baselining Core Req.

- ASTM BEPA
- ASHRAE Guideline 14-2002
- Whole building baseline development
- Baseline operational / performance data for all systems

Savings Projections

- ASHRAE Standard 140
- Whole building energy simulation model (DOE-2, Trace, etc)
- Calibration to utility bills

Design, Construction, Verification

- Operational performance verification
- Development of a systems manual

Operations, Maintenance, Monitoring

- One of the following: BMS review, fault detection and diagnostics, whole-building monitoring, periodic RCx
- Training

Measurement and Verification

- ASTM BEPA
- IPMVP Option C
- ASHRAE Guideline 14-2002
- Credentials: AEE CMVP or 5+ years experience

- Reduce Transaction Costs and source high quality deals
- Provide bankable underwriting with actuarial standards
- Unlock reliable & measurable demand side resources
- Increase transparency and roadmap to private capital



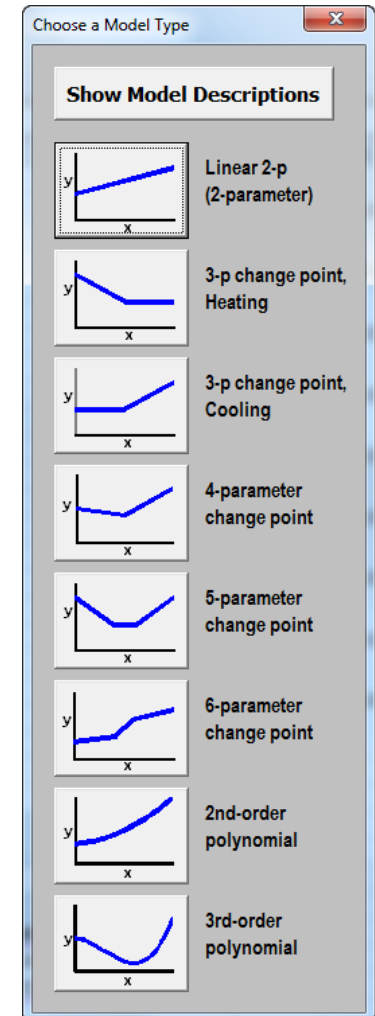
Uncertainty of Savings - The 2nd dimension

- ALL measured data has elements of error (uncertainty)
- Exposing uncertainty adds a 2nd dimension to savings
- Understanding uncertainty of savings → risk mgmt.



- Measurement
- Sampling
- Baseline Models

	A	B
1	Column1	
2		
3	Mean	995
4	Standard Error	35.69122632
5	Median	990
6	Mode	#N/A
7	Standard Deviation	123.6380347
8	Sample Variance	15286.36364
9	Kurtosis	-0.140616815
10	Skewness	-0.159828873
11	Range	445
12	Minimum	760
13	Maximum	1205
14	Sum	11940
15	Count	12



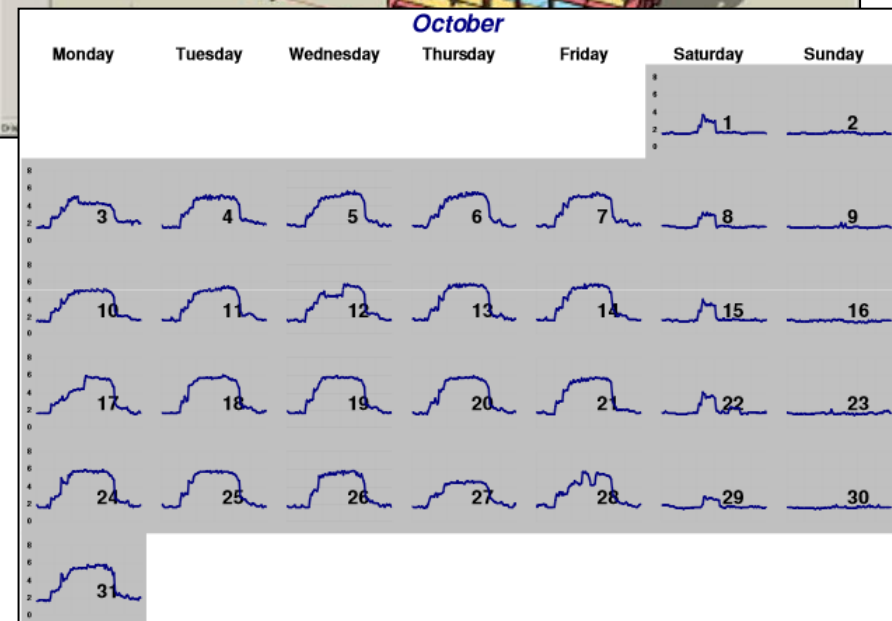
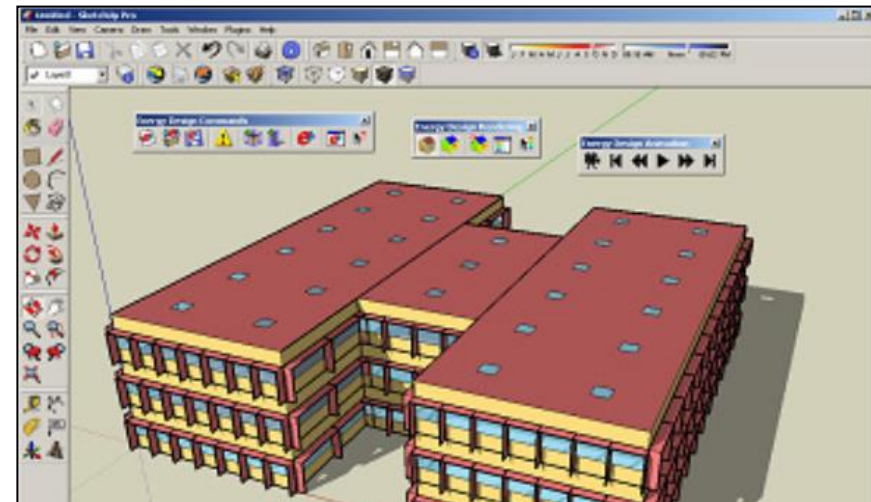
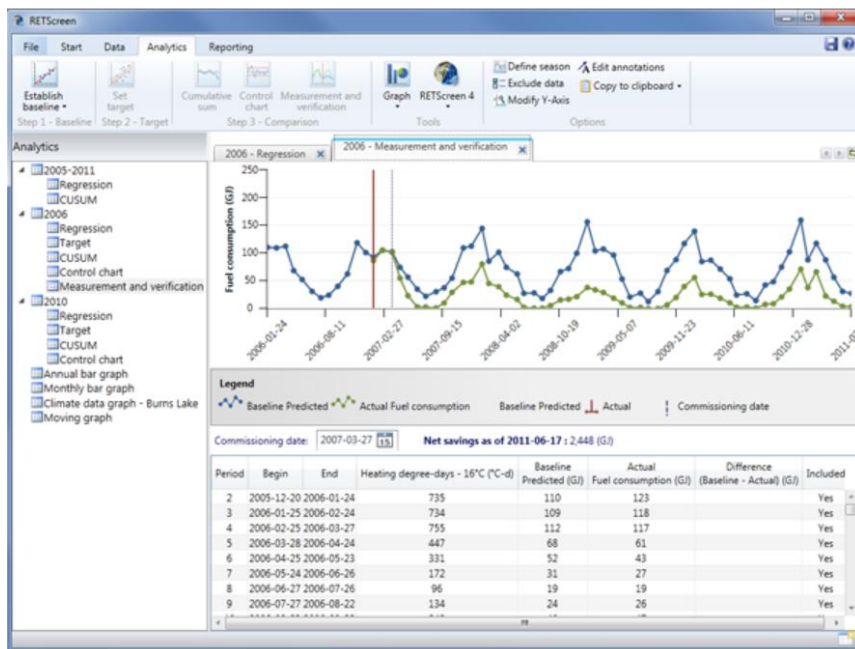
Propagation of Error (uncertainty)

$$SE_{(savings)} = \sqrt{SE(U_1)^2 + SE(U_2)^2 + SE(U_3)^2 \dots}$$

M&V Public Domain Tools

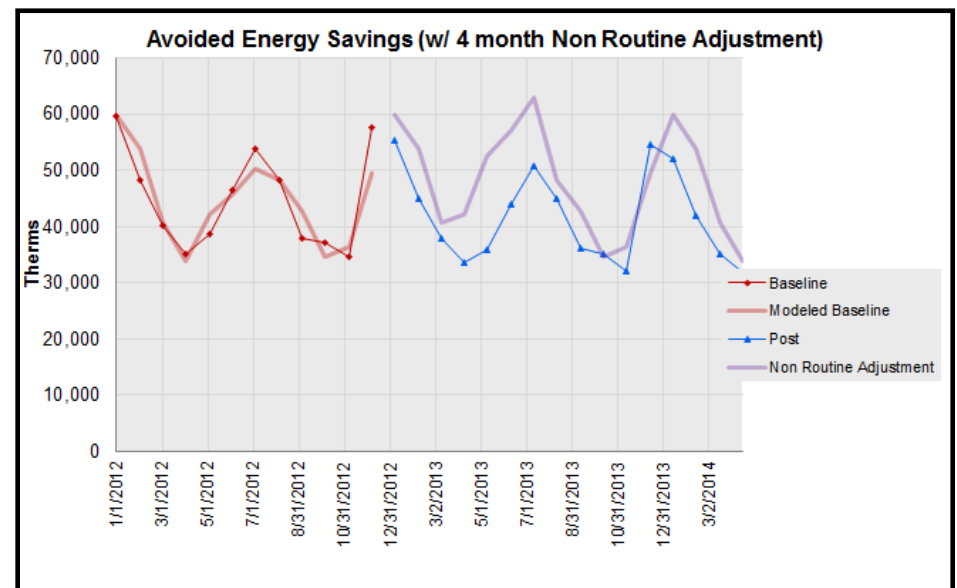
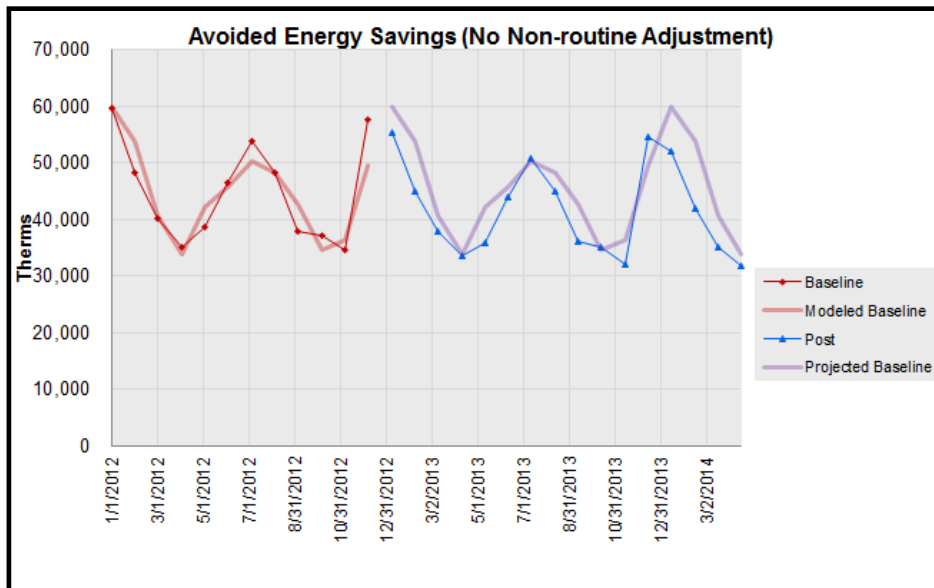
PERFORMANCE SYSTEMS DEVELOPMENT

- ECAM+ (Energy Charting and Metrics Tool)
- Universal Translator
- RETScreen Plus
- OpenStudio



CMVP Training: Hands-on examples

- Perform both *routine* and *non-routine* adjustments
- Generate savings estimates with both *precision* and *confidence*



726,767	Projected Baseline Energy
666,977	Measured Energy
59,790	Energy Savings
31,805	Projected Baseline ±Uncertainty @ 80% Confidence Level
59,790 ±31,805	Energy Savings and Uncertainty @ 80% Confidence Level
4.4%	Projected Baseline ±Uncertainty @ 80% Confidence Level
8.2% ±4.4%	Energy Savings and Uncertainty @ 80% Confidence Level

769,805	Projected Baseline Energy (with non-routine adjustment)
666,977	Measured Energy
102,827	Energy Savings
31,805	Projected Baseline ±Uncertainty @ 80% Confidence Level
102,827 ±31,805	Energy Savings and Uncertainty @ 80% Confidence Level
4.1%	Projected Baseline ±Uncertainty @ 80% Confidence Level
13.4% ±4.1%	Energy Savings and Uncertainty @ 80% Confidence Level

Upcoming NYS CMVP Courses / Events

JUL
14
Mon
2014

Fundamentals of Measurements and Verification
@ Green Light NY, Suite 609
Jul 14 @ 9:00 am – Jul 16 @ 5:00 pm



NOV
12
Wed
2014

Fundamentals of Measurements and Verification
@ Green Light NY, Suite 609
Nov 12 @ 9:00 am – Nov 14 @ 5:00 pm



Do you live or work
in NY State? You may
be eligible for 50% off
this training!



50% OFF

**NY State
Trainings**

Click to read
eligibility details

<http://www.psdconsulting.com>

CMVP courses are also offered by AEE (North America) and by EVO (internationally).



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DEVELOPMENT

Thank You for Participating!

For more information:

<http://psdconsulting.com/calendar>

or

<http://psdconsulting.com/training/ny-state-trainings/>

NYSERDA 50% Discounted Trainings

Agenda ▾ Categories ▾ Tags ▾

JUNE – NOVEMBER 2014 Collapse All Expand All

JUN 17 Tue 2014	Fundamentals of Measurements and Verification @ Albany, NY Jun 17 @ 9:00 am – Jun 19 @ 5:00 pm
JUN 20 Fri 2014	Free Webinar: Sneak Peek – Fundamentals of Measurement & Verification @ Free Webinar Jun 20 @ 12:30 pm – 1:00 pm
JUL 3 Thu 2014	Free Webinar: Sneak Peek – RESNET Combustion Safety and Work Scope Training @ Free Webinar Jul 3 @ 12:30 pm – 1:00 pm
JUL 14 Mon 2014	Fundamentals of Measurements and Verification @ Green Light NY, Suite 609 Jul 14 @ 9:00 am – Jul 16 @ 5:00 pm
JUL 15 Tue 2014	Small Building Re-Tuning @ New Buffalo Impact Jul 15 @ 9:00 am – Jul 16 @ 5:00 pm
JUL 17 Thu 2014	Free Webinar: Sneak Peek – TREAT Software @ Free Webinar Jul 17 @ 12:30 pm – 1:00 pm
AUG 1 Fri 2014	Free Webinar: Sneak Peek – HERS Rater @ Free Webinar Aug 1 @ 12:30 pm – 1:00 pm