DOE Technical Assistance Program

U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy

The Parker Ranch installation in Hawaii

Quality Assurance for Residential Retrofit Programs

October 26, 2010

Jim Grevatt

Vermont Energy Investment Corporation

DOE Technical Assistance Program

Team 4 – Program & Project Development & Implementation

Webinar Overview

- Technical Assistance Project (TAP) Overview
- Part 1: Why is QA important?
- Part 2: Define realistic goals for QA
- Part 3: Key elements of a QA program
- Resources
- Q&A

What is TAP?

DOE's Technical Assistance Program (TAP) supports the Energy Efficiency and Conservation Block Grant Program (EECBG), the State Energy Program (SEP) and the Better Buildings grantees by providing state, local, and tribal officials the tools and resources needed to implement successful and sustainable clean energy programs.

How Can TAP Help You?

U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy

TAP offers:

- One-on-one assistance
- Extensive online resource library, including:
  - Webinars
  - Events calendar
  - TAP Blog
  - Best practices and project resources
- Facilitation of peer exchange

On topics including:

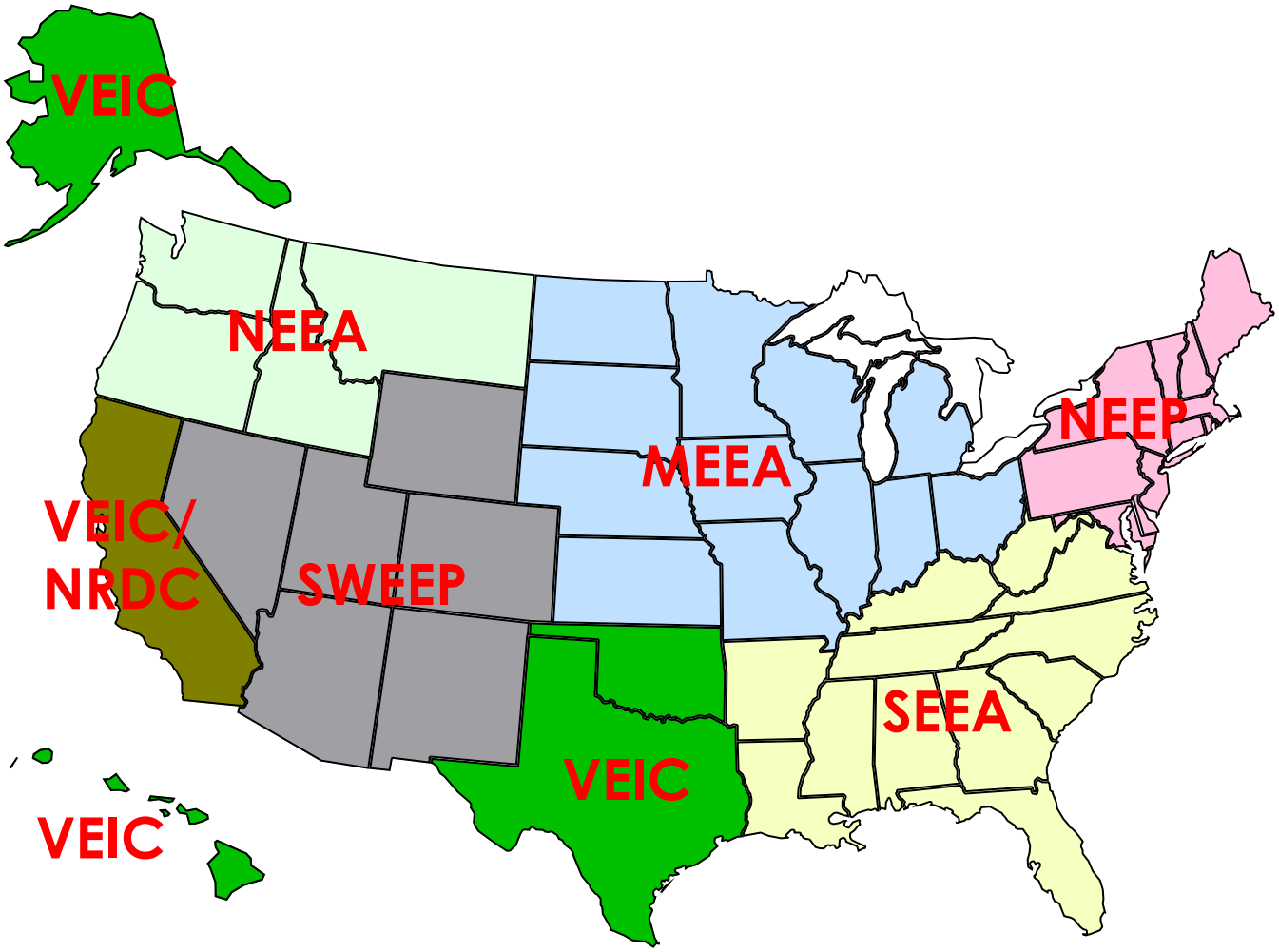
- State and local capacity building
- Energy efficiency and renewable energy technologies
- Program design and implementation
- Financing
- Performance contracting

Provider Network Resources

U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy

State and Local Capacity Building	• Trainings • Workshops • Peer-to-peer matching
Technical	• Renewable energy siting and development • Review of technical specs for RFPs • Strategic planning, energy management, and conservation strategies • Green building technologies • Building codes
Program Design and Implementation	• Policy and program development • Coordinating rate-payer funded dollars with ARRA projects and programs • Sustainable community and building design • State and regional EE and RE assessments and planning • EE and RE portfolio program design elements
Financial	Program design support and guidance on financing mechanisms such as: • Revolving loan funds (RLFs) • Property-assessed clean energy (PACE) • Loan loss reserves and enhanced credit mechanisms
Performance Contracting	• Designing and implementing a performance contract • Leveraging private investment • Reducing institutional barriers • Tracking and comparing programs

Who We Are: Team 4



VERMONT ENERGY INVESTMENT CORPORATION

ENERGY FUTURES GROUP

MEEA Midwest Energy Efficiency Alliance

nep

SWEEP

NORTHWEST ENERGY EFFICIENCY ALLIANCE

seea

NRDC THE EARTH'S BEST DEFENSE

ACEEE American Council for an Energy-Efficient Economy

ACEEE, NRDC: National Support

Why do we need Quality Assurance?

Assure that your investment is achieving desired result:

Saving energy!!

And make sure that customers get what they pay for

- Durable
- Safe
- Effective

Without unintended negative consequences….

FALSE ADVERTISING ON INTERNET:

Energy Efficient Windows Could Save You 50% off Your Heating and Cooling Costs

One of the best ways to lower your home heating and cooling costs is to replace your home's windows. It's a terrific home improvement project, and it will also help you increase the value of your home. Energy efficient windows could be a deciding factor if you are looking to sell your home as well.


1. 3. 2007


THE AMERICAN CAT ADDRESS BOOK

Set Reasonable Expectations

- Will every job be perfect?

- More likely
  - *Our QA program will provide a reasonable assurance that contractors are installing and reliably reporting appropriate measures that will save energy as represented and not cause harm to the buildings or their occupants*

Preparation before QA

- Clear goals for Program lead to clear QA objectives
- Contractor Qualifications (certification, accreditation)
- Participation Agreement with clear expectations
- Training
- Recognition of current market conditions- One size doesn't fit all! Different approaches needed at different stages
- Clear remediation process for complaints and deficiencies

Define QA Objectives first:

U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy

- Evaluate the comprehensiveness and appropriateness of recommendations made by Participating Contractors
- Confirm that customers receive the services for which they paid
- Verify that contractors work in accordance to BPI or other specific criteria/requirements to ensure quality and safety
- To the extent possible, ensure that customers are satisfied with work done on their homes
- Work cooperatively with Participating Contractors to address technical challenges
- When possible, proactively resolve disputes between contractors and customers
- Monitor and put procedures in place to ensure the accuracy of reported data

Certification and Accreditation

- Can provide huge benefits to program
- Certification
  - Requirement assures that individual doing work understands requirements
- Accreditation
  - Requirement assures that company adheres to prescribed practices
  - Can shift some “responsibility” for QA to accrediting organization

Participation Agreement

U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy

- Define work product standards
  - Meets BPI standards
  - Meets Standard Work Specifications
- Direct Install protocols
  - Lighting, water conservation
- Incentives
  - Eligible measures
- Professional conduct
- Codes
- Health & Safety

MUST DO TRAINING AND Q & A ON AGREEMENT!

Participation Agreement

- The 2010 Home Performance with ENERGY STAR program puts significant trust in Participating Contractors to conduct accurate home energy assessments and recommend comprehensive work scopes. It is expected that the Contractors maintain professional program participation at all times.

Participation Agreement

The *Participating Contractor* is responsible for ensuring that work performed through the Home Performance with ENERGY STAR service complies with all applicable laws, codes, regulations, rules, standards, and manufacturer's instructions. Energy conservation measures for which incentives are paid must comply with Building Performance Institute (BPI) standards as outlined in the BPI Technical Standards and in the Home Performance with ENERGY STAR Contractor Participation Agreement. Specifically:

- Program will not offer incentives for any work that disturbs vermiculite insulation;
- Beginning in April 2010, renovations to any home built before 1978 must be performed by a contractor certified in lead safe practices as required pursuant to U.S. Environmental Protection Agency regulations at 40 C.F.R. 745.80, Subpart E; and
- Any exposed foam plastic interior wall coverings must be installed in compliance with the 2006 International Building Code Sections 2603.4 and 2603.3.
- Failure to adhere to these known health and safety issues will result in probation or termination from the Home Performance with ENERGY STAR program.

- Reporting process that requires participating contractors to report jobs….
- Job report review process that ensures program compliance and provides for follow-up with the contractor when necessary.
- Customer feedback mechanism which allows customers to provide feedback directly to the Program Sponsor.
- On-site inspection protocols including a sampling rate set at a minimum of 5% (1 in every 20 jobs) for all participating contractors.
- Conflict resolution mechanism for responding to and resolving customer complaints.
- Record keeping and tracking of results from on-site inspections, customer surveys, and corrective actions.

Reporting Process

- You can’t monitor work that you don’t know is happening
- Contractors provide details including:
  - Building address, owner name, utility meter #
  - Existing conditions
  - Improved conditions
  - Installed costs
  - Estimated energy savings
  - Health and Safety conditions corrected

Job Report Review

- Program needs to monitor reports to ensure that contractors are meeting program guidelines for
  - Comprehensiveness
  - Addressing Health and Safety
  - Estimating energy savings
  - Material specifications
  - Any other requirements

Customer Feedback Mechanism

- Surveys
  - Satisfaction with contractor (cost, attitude, quality)
  - Perceived performance of improvements
  - Overall satisfaction with program and installation
  - Suggestions for program improvement
- Formal or informal “interview” during field verification
  - Engage customer in conversation to learn things that they might not put in writing

On-Site Inspection Protocols

- Protocols vary with program maturity
- Young program:
  - Focus on training and technical assistance to build capacity
  - Address customer complaints
- Mature program
  - Continued focus on training, with
  - Increased performance requirements with clear expectations for results
- Ongoing feedback and communications always!

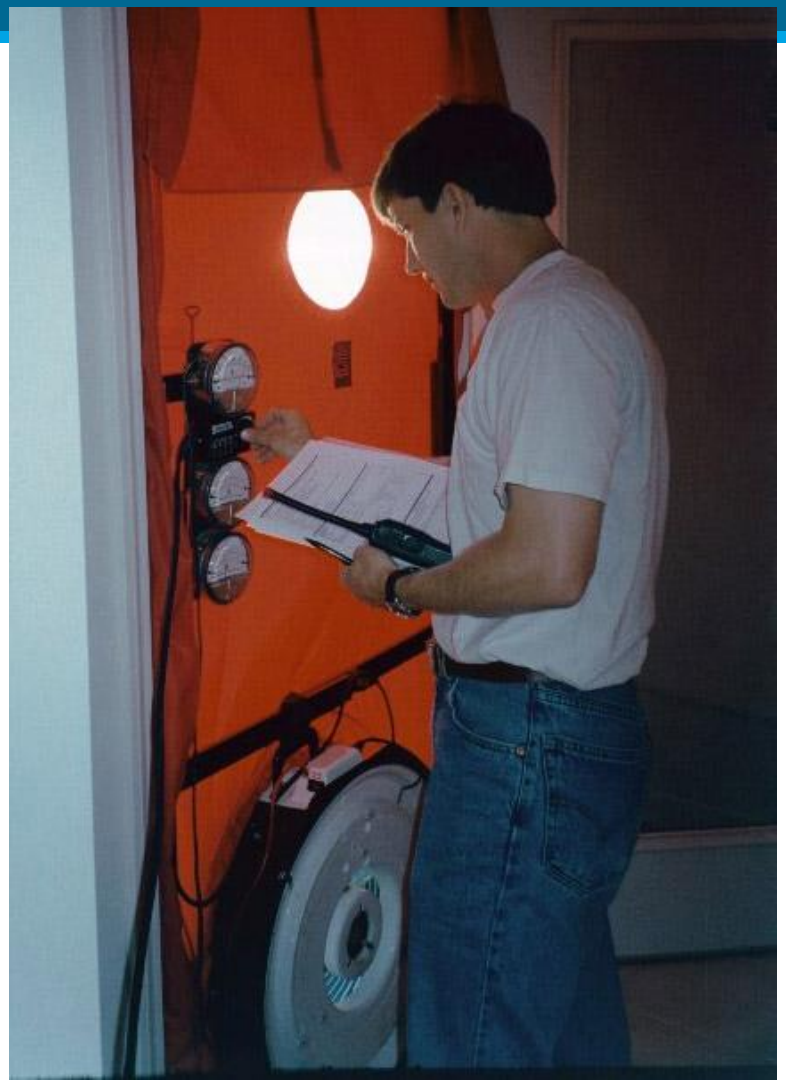
On-Site Inspection Protocols

- Protocols vary with contractor experience & size
- Contractor new to program:
  - Mandatory site visit for first 5-10 jobs
  - Site visits when work is in progress with crew on-site
- Contractor experienced with program:
  - Sampling protocol for site visits
  - Minimal inspections as long as they pass
  - Increased sampling if deficiencies are found
- Large contractor with sophisticated business systems
- Two person company where owner does the books

On-Site Inspection Protocols

- Qualifications of Field verifiers
  - Must have at minimum the same competencies as installers
  - Must be tactful in communicating with customers to:
    - Maintain working relationships with contractors
    - Protect confidence in the program brand
  - Must provide accurate documentation of any issues requiring follow-up, as well as their resolution
    - Ensures issues are properly addressed
    - Necessary for effective contractor remediation process

On-Site Inspection Protocols



On-Site Inspection Protocols

- Consider QA at different stages of work
  - Assessment / Pre-work QA
    - How well are contractors meeting audit expectations?
  - Work-in-progress QA
    - Great opportunity for on the spot training
  - Post-work QA
    - Does the completed job match the proposal?

Pre-work QA

- Observe procedure for blower door test and duct blaster test if needed.
- Ensure the correct procedures for combustion safety testing.
- Check the accuracy of the BPI ventilation requirement calculation.
- Ensure Contractor checks for and identifies all applicable hazards
- Observe the Contractor's communication skills with the customer
- Review the comprehensiveness and accuracy of the proposed measures
- Ensure that the Contractor checks for Direct Install and other electrical opportunities. Check that they know which appliances and fixtures are eligible for incentives.

Work-in-Progress

- If the homeowner is present, interview them about the job in process
- Ensure that all safe work practices are being followed
- Discuss the likelihood of in-progress combustion safety issues
- Observe that the work crew is respectful of the client and the property.
- Ensure that the correct tools and techniques are being applied to find and seal air leaks.
- Verify that all other measures (insulation, duct sealing, heating system improvements) are being installed properly.
- Verify that the recommended measures listed in the reporting tool match those being completed on-site.
- Try to observe both the Participating Contractor and any subcontractors involved with the project

Post-work QA

- Interview the homeowner about the job (incentive received as expected, home improvement expectations met, satisfaction with Contractor, received desired improvement in home comfort, were DI and appliance improvements discussed).
- Verify the final CFM50 value reported in the reporting tool within 10%.
- Verify the combustion safety testing results reported in the reporting tool within 10%.
- Verify other measurements captured in the reporting tool within 10% (duct blaster test, area and volume calculations, R-value improvements).
- Verify that the measures listed in the reporting tool match those completed on-site, and that all measures were completed with high quality and to BPI standards.
- Identify any measures not completed that are needed for comprehensiveness. Was it due to an audit miss or homeowner refusal to do the measure?
- Check that DI and major electrical opportunities were addressed.

Conflict Resolution Protocols

- Installation issues vs. Professionalism issues
- Define acceptable accuracy of results
  - Blower door within 10% of reported?
- Define major defect vs. minor defect
  - Installed 13” of cellulose instead of 14”
  - Failed to insulate attic
- Working cooperatively with contractor is preferred, but when that fails?
  - Probation
  - Suspension

Record-Keeping and Tracking

Efficiency Vermont

Home Performance with ENERGY STAR®
QUALITY ASSURANCE SITE INSPECTION FORM

Date of Inspection: 3-25-10 QA Inspector: Jeff Manney MAS90 #: 6036-A345

Company: Hand Energy Services Customer Name: Susan Hunnewell

Customer Address: 9 Court Square, Rutland, VT

Type of Quality Assurance:
□ During Audit □ During Work X During Test-out □ Post-Completion

Mechanical System Information:

Primary Heating System
Fuel: X oil □ natural gas □ LP gas □ electric □ wood □ other: _____
Vent: X natural □ induced □ direct-vent □ other: _____
Dist: □ forced hot air X forced hot water □ other: _____
Fuel Switch Eligible □ yes X no
SSE 77 % Temp 690 °F CO_2 in flue ___ % O_2 in flue ___ % Smoke ___ CO 41 ppm Draft -20 pa

Secondary Heating System
Fuel: □ oil □ natural gas □ LP gas □ electric □ wood □ other: _____
Vent: □ natural □ induced □ direct-vent □ other: _____
Dist: □ forced hot air □ forced hot water □ other: _____
Fuel Switch Eligible □ yes □ no
SSE ____ % Temp ____ °F CO_2 in flue ____ % O_2 in flue ____ % Smoke ____ CO ____ ppm Draft ____ pa

DHW System
Type: □ direct X indirect (side-arm) □ on-demand □ tankless coil □ Other _____
Fuel: X oil □ natural gas □ LP gas □ electric □ kerosene □ other: _____
Vent: □ natural □ induced X direct-vent □ other: _____
Fuel Switch Eligible □ yes X no

If observing, were the proper BPI procedures followed? □ yes X no
Notes there were some mistakes made during CAZ testing

Combustion Safety Test:

Combustion Appliance Zone (CAZ) Depressurization Test
Conduct a complete combustion safety test under worst case conditions according to BPI standards.

Zone 1
Location: basement
Base Pressure: -1.7 Pa
Worst case door open X or closed ____ NA ____
Worst-case depressurization: -2.3 Pa
List all appliances in this zone: oil boiler w/ indirect

If observing, were the proper BPI procedures followed? X yes X no
Notes some mistakes made during CAZ testing - flue draft test

Combustion Safety Test Continued:

Worst-Case Spillage Test
Heating System 1: (P) / F ____ If FAILED at worst case, normal conditions: P / F ____
Heating System 2: P / F ____ If FAILED at worst case, normal conditions: P / F ____
DHW System: P / F ____ If FAILED at worst case, normal conditions: P / F ____
Other Appliance 1: P / F ____ Type: _____
Other Appliance 2: P / F ____ Type: _____

Worst-Case Draft Test
Heating System 1: (P) / F -20 Pa If FAILED at worst case, normal conditions: P / F ____
Heating System 2: P / F ____ If FAILED at worst case, normal conditions: P / F ____
DHW System: P / F ____ If FAILED at worst case, normal conditions: P / F ____
Other Appliance 1: P / F ____ Type: _____
Other Appliance 2: P / F ____ Type: _____

Carbon Monoxide Measurements high
Heating System 1: 41 ppm (P) / F ____ If FAILED at worst case, CO ppm normal ____
Heating System 2: ____ ppm P / F ____ If FAILED at worst case, CO ppm normal ____
Test location: Ports ____ Breech ____ Stack ____ Other ____
DHW System: ____ ppm P / F ____ If FAILED at worst case, CO ppm normal ____
Oven: ____ ppm P / F ____
Other Appliance 1: ____ ppm P / F ____ Type: _____
Other Appliance 2: ____ ppm P / F ____ Type: _____

Gas Leak Testing Results: N/A NA ____

If observing, were the proper BPI procedures followed? □ yes □ no
Notes _____

Building Airflow Characteristics:

Conduct a single point blower door test with house under normal winter conditions. Verify building area/volume/BAS only if contractor's reported numbers are in question.

Building Volume: 18000
Number of Occupants: 3
Building Floor Area: 2130 sq.ft.
Building Airflow Standard: 1619 cfm50
CFM50: 3370
Existing exhaust capacity: 0 cfm
Mechanical ventilation required? □ Yes X No If Yes, was it installed by contractor? □ Yes □ No
If observing, were the proper BPI procedures followed? yes

Duct Sealing Information:

Complete duct leakage test if required. Otherwise, record conditions based on visual inspection.

Location of Ductwork: ____ % inside thermal boundary ____ % outside thermal boundary
R-value of duct insulation outside thermal boundary ____
Total Leakage: ____ cfm25 Leakage to outside: ____ cfm25

Zonal Pressure Diagnostics:

Zone ____ Pressure ____ WRT ____
Zone ____ Pressure ____ WRT ____
Zone ____ Pressure ____ WRT ____

Record-Keeping and Tracking

- QA provides necessary information for contractor improvement and if necessary for contractor probation/suspension
- QA provides critical information for designing program improvements
  - Customer issues with process
  - Trends that merit further contractor training and better processes

Summary

- Define Realistic Goals for QA based on program goals
- Clearly communicate and train contractors in program requirements
- Make sure that Field Verifiers have needed skills
- Tailor QA to where you are in ramp-up
  - Early: focus on training and process
  - Mature: focus on results
- Different approaches may be needed depending on characteristics of contractor base:
  - Large businesses with internal processes?
  - Small remodeling/building contractors?
- Track and document QA results

Resources

- Home Performance with ENERGY STAR® Sponsor Guide (http://www.energystar.gov/ia/home_improvement/HPwES_Sponsor_Guide.pdf)
- Standard Work Specifications http://www1.eere.energy.gov/wip/retrofit_guidelines.html
- Building Performance Institute- Certifications relevant to field verifiers and certification/accreditation relevant to contractors- www.bpi.org
- RESNET-Certifications relevant to field verifiers www.resnet.us
- Consortium for Energy Efficiency- Existing homes Program Guide (Rebecca Foster- rfoster@cee1.org)

The TAP Blog

U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy

Access the TAP Blog!
http://www.eereblogs.energy.gov/tap/

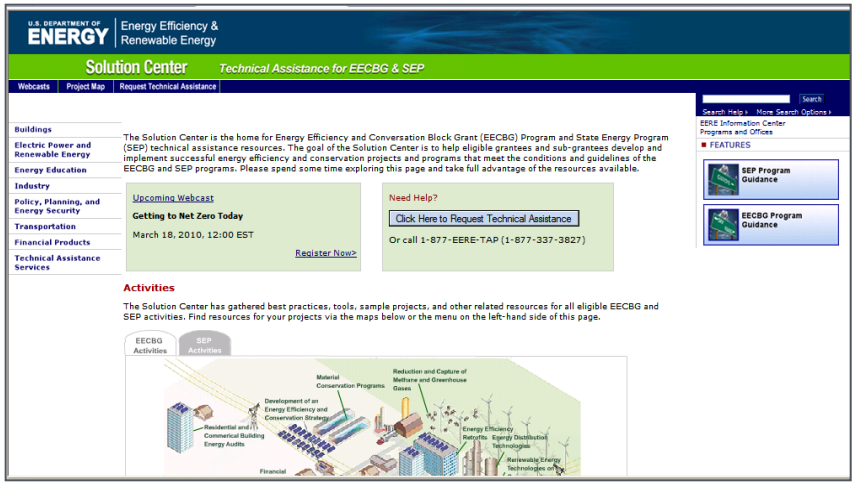
Provides a platform for state, local, and tribal government officials and DOE's network of technical and programmatic experts to connect and share best practices on a variety of topics.

Accessing TAP Resources

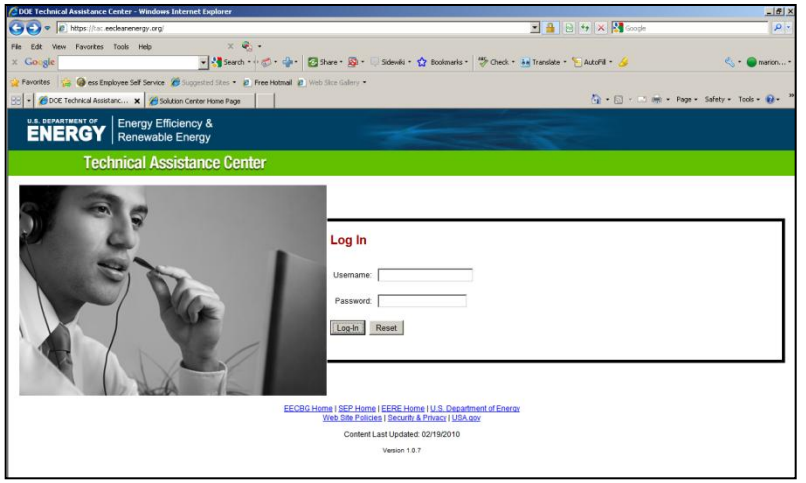
U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy

We encourage you to:

1) Explore our online resources via the Solution Center



2) Submit a request via the Technical Assistance Center



3) Ask questions via our call center at 1-877-337-3827 or email us at solutioncenter@ee.doe.gov

Upcoming Webinars

U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy

Please join us again:

Title: **Quality Assurance for Residential Retrofit Programs**
Host: Jim Grevatt, VEIC
Date: October 26, 2010
Time: 2:00-3:00 EDT

Title: **RETScreen Training 101**
Host: Sarah Busche and Jimmy Jones, NREL
Date: October 27, 2010
Time: 3:00-4:15 EDT

Title: **Benchmarking Your Building's Energy Using EPA's ENERGY STAR Portfolio Manager**
Host: Peter Flippen, ICF International
Date: October 28, 2010
Time: 12:00-1:00 EDT

Title: **Designing Effective Incentives to Drive Residential Retrofit Program Participation**
Host: Richard Faesy, Energy Futures Group and Jim Grevatt, VEIC
Date: October 29, 2010
Time: 2:00-3:00 EDT

Title: **How to Design a Community Energy Alliance**
Host: Ben Taube, SEEA
Date: November 1, 2010
Time: 2:00-3:15 EDT

Title: **Preparing for the Arrival of Electric Vehicles**
Host: George Little, Mike Salisbury, and Bob Yuhnke, VEIC/SWEEP
Date: November 3, 2010
Time: 2:00-3:00 EDT

Title: **Effective O&M Policy in Public Buildings**
Host: Susy Jones, NEEP
Date: November 4, 2010
Time: 2:00-3:00 EDT

Title**: Local Power Empowers: CHP and District Energy**
Host: Jay Wrobel, MEEA
Date: November 8, 2010
Time: 2:00-3:00 EDT

Title: **Driving Demand: Lessons from the Field #2**
Host: Merrian Fuller, LBNL
Date: November 9, 2010
Time: 2:00-3:15 EDT

For the most up-to-date information and registration links, please visit the Solution Center webcast page at www.wip.energy.gov/solutioncenter/webcasts

Questions & Comments

Jim Grevatt
Managing Consultant
Vermont Energy Investment Corporation
802-658-6060 x1156
jgrevatt@veic.org
www.veic.org

Questions?

U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy

CONTACTS

VEIC: Dan Quinlan, dquinlan@veic.org, 802-488-7677 (**Team 4 Lead**)

MEEA: Wendy Jaehn, wjaehn@mwalliance.org, 312-784-7272

NEEP: Ed Londergan, elondergan@neep.org, 781-860-9177

NEEA: Dave Kresta, dkresta@nwalliance.org, 503-827-8416

SWEEP: Curtis Framel, cframel@swenergy.org, 303-447-0078

SEEA: Jolyn Newton, jolyn@seealliance.org, 615-612-9592

ACEEE: Eric Mackres, emackres@aceee.org, 202-507-4038

NRDC: Lara Ettenson, lettenson@nrdc.org, 415-875-6100

EFG: Richard Faesy, rfaesy@energyfuturesgroup.com, 802-482-5001