Lessons from Successful Quality Assurance and Quality Control Programs

A report using ICF's ENERGY STAR® Homes Program's Quality Assurance and Quality Control Process as a Case Study

Brian Preston Smith, Principal, ICF International

INTRODUCTION

Implementing a well designed Quality Assurance and Quality Control (QAQC) process can provide many benefits to the sponsors of energy efficiency program. QAQC can improve the overall quality of the program by quickly identifying and correcting problems, decreasing the uncertainty associated with program impact estimates, and increasing the likelihood of the program standing up to regulatory scrutiny from third-party auditors.

ICF International (ICF) has been implementing a successful QAQC process for the Oncor Electric Delivery ENERGY STAR® Homes Program since 2004 and began implementing a process for Rocky Mountain Power in Utah in 2006 (ESH program). The main goals of the QAQC process are to verify RESNET standards are followed by HERS Raters, confirm the data used by the utilities to calculate program impacts, and help strengthen the HERS rating process.

This paper reviews the QAQC process designed by ICF for the ESH program. The QAQC process can be applied to energy efficiency program to measure and verify energy savings while achieving continuous improvements in program implementation strategies and cost-effectiveness. This paper provides a framework of how to design a systems-based QAQC process, establish feedback loops to obtain and evaluate results, and implement strategies to achieve continuous improvements in energy efficiency program. Examples from the QAQC process for the ESH program are provided to illustrate types of data collected, the findings, the improvements achieved, and lessons learned. This approach can be applied to any energy efficiency, demand side management, or market transformation program.

QUALITY ASSURANCE AND QUALITY CONTROL (QAQC) Process

The QAQC process for the ESH program is modeled after the Deming Model of Plan, Do, Check, Act. This model provides a systems approach to analyze and control, while operating with greater efficiency and organization.

This system structure introduces a formal set of procedures that helps program sponsors adopt a written policy, set priorities, goals and targets for continuous improvements, assign clear responsibilities, and evaluate and refine the QAQC process over time. The use of the Plan, Do, Check, Act model requires program sponsors to:

- Review M&V requirements established by the Public Utility Commission;
- Establish goals;
- Establish targets and objectives to verify energy savings;

- Design program to meet the target and objectives;
- Monitor and measure progress in achieving targets and objectives;
- Ensure project sponsors' awareness and competence; and
- Evaluate progress of M&V and continuous improvements.

When implemented correctly, the use of the Plan, Do, Check, Act model has the potential to bring a program towards a dynamic, continual process of improvement in performance. Any program sponsor who adopts a QAQC process will likely discover new opportunities to capture additional energy savings while improving program effectiveness and benefit-cost ratios.

ESTABLISHING A SYSTEM BASED M&V PROGRAM

The benefits of establishing a QAQC process can far outweigh the costs. Some of the benefits the program sponsors of the ESH program gained, and are likely to be gained by any sponsor that correctly uses this model, are:

- Demonstrated commitment to measurable goals;
- Reduced liabilities;
- Increased efficiency;
- Improved communication;
- Shared solutions;
- Improved public / community relations; and
- Positive external relations and public image.

The procedure to establish a QAQC process includes the following four steps, as the model's name implies: Plan, Do, Check, Act. The model's main strategies and elements, as related to the ESH program, are described below.

Plan – Plan M&V Protocol

Establish goals.

The first step in the planning phase is to establish the goals. Some of the goals for the ESH program were obvious, while others required more thought. The program sponsors considered the requirements of the Public Utility Commission, its own company's goals and the goals of the ESH program' market allies when developing their goals. The QAQC process was introduced in Texas for the Oncor ENERGY STAR Homes Program in 2004 with the goals to:

- Validate the accuracy of the information reported to the ESH program by the participating HERS rating providers;
- Help strengthen the integrity of the ENERGY STAR label and the HERS rating process by identifying inconsistencies and contributing to the establishment of industry standards and best practices; and
- Confirm the data used by the program sponsors to calculate predicted kW and kWh savings reported to the Public Utility Commission.

It is important to note that during the entire planning phase, the program sponsors and the program implementer worked very closely with the HERS Raters and the Texas Home Energy Rating Organization Texas (Texas HERO). The Texas HERO is a trade organization of home energy raters established by Oncor and rating companies in Texas. The QAQC process was designed in conjunction with Texas HERO to ensure that raters and rating providers knew what would be tested, agreed on testing methodology, increased their commitment to the plan and ownership of the process.

Establish objectives, targets, and criteria.

The second step within the planning phase is to establish objectives, targets, and criteria. These help the program sponsors "translate purpose into action." In Texas, an ENERGY STAR qualified home had to achieve a HERS score of 86 or greater and be at least 15% more efficient than a home built to the state residential building code (2001 International Energy Conservation Code) when the QAQC process was being developed. To confirm that these ENERGY STAR specifications are met, the QAQC process generated HERS scores based on actual building plan specifications collected from rating providers and onsite diagnostic tests conducted by an independent energy rating specialist. Rating providers' confirmed and reported final HERS scores were then compared to the QAQC results. Failures were identified, and further analysis was conducted to identify potential discrepancies with RESNET approved standards. The following performance factors were reviewed to verify that homes achieved ENERGY STAR specifications:

A. HERS score;
B. Percent savings above IECC score;
C. SEER; and
D. Designated climate zone.

RESNET has not approved acceptable target variances for these performance factors being reviewed by the QAQC process. Since there are no industry targets, there was a need to establish some in order to evaluate the final results. During the planning phase, the program sponsor and implementer worked closely with Texas HERO and other rating providers to define a target variance level for the performance factors being reviewed. Target variances agreed upon were:

A. HERS score variance = +/- .5 points;
B. Percent savings above IECC score variance =, +/- 3%; and
C. SEER level variance = +/- 1 SEER level.

These target variance levels were used to evaluate the results and provide recommendations moving forward.

Along with determining the objectives and targets, the ESH program established criteria for selecting a sample. The sample used to verify that homes met ENERGY STAR performance specifications consisted of approximately 300 homes each year, which represents about 2.0% of the ESH program's annual participation. All homes selected for the QAQC process were tested and batched homes (i.e., homes that were physically tested by the rating provider and also certified using batch sampling).

All rating providers participating in the ESH program were included in the QAQC review process. Rating providers that joined the ESH program mid-year were not included in the sample set. The priority when determining the sample was to ensure that the number of homes selected per rating provider was proportional to the percent of homes they delivered to the ESH program each year.

The second priority when determining the sample was to verify the performance of the homes constructed by most participating homebuilders. The sample was determined by homebuilder participation in the ESH program each year according to the following methodology:

1. Homebuilders with more than 500 participating homes had an automatic selection of 10 homes per homebuilder. This resulted in an approximate sample size of 120 homes for 12 homebuilders;
2. Homebuilders with 250 to 499 participating homes had an automatic selection of 5 homes per homebuilder. This resulted in an approximate sample size of 60 homes for 12 homebuilders; and
3. Homebuilders with fewer than 250 participating homes had homes randomly selected from a pool, giving priority to homes rated by rating providers who, up to this point, had little or no homes selected from the first two methods described above. This resulted in an approximate sample size of 120 homes for 80 homebuilders.

Design implementation processes.

The final stage of the planning phase is to design the implementation processes to accomplish the goals. The design must outline the data collection process, data analysis process, the corrective action's goals and intent, and establish roles and responsibilities. These steps are discussed below as they related to the QAQC process.

Design Data Collection Process

Determining the data collection process posed a great challenge for the ESH program because timing was critical. The onsite inspections and performance tests needed to be conducted after the home was completed, after the rating providers completed their testing, and before the homeowner moved in. The following steps were followed to gain access to each home during this "window of opportunity" and to perform onsite inspections:

1) Rating providers submitted daily or weekly testing schedules (depending on each rating provider's preference) listing homes ready for onsite verification;
2) Homes were selected from these lists based on sampling targets for each rating provider and homebuilder;
3) Coordination with the rating providers and homebuilders was conducted on an ongoing basis to ensure access to selected homes; and
4) Onsite inspection occurred at least 72 hours after the rating providers reported their final inspection date (via their testing schedules). This delay was implemented so that the homebuilder and rating provider could complete any minor follow-up work that may be required, prior to the QAQC inspection. Texas HERO agreed that a 72 hour delay would be more than enough time to complete last minute improvements because follow-up work is typically completed within 48 hours in Texas.

Once there was access to each home, onsite data collection and verification was performed by a third-party home energy rating specialist. Onsite performance tests included a blower door test for air

leakage and a duct leakage test. Visual inspections of the homes were also conducted to gather additional data necessary to generate the final HERS score and percent above code through the *REM/Rate* software. Following is the data collected in the field by the third-party rating specialist:

- Home location
- Number of stories
- Foundation type
- Home orientation
- Predominant exterior wall color
- Total duct leakage
- Duct leakage to the outside
- Whole house infiltration value from blower door test
- Blower door metric used
- Presence of radiant barrier
- Presence of p-stat
- Predominant window frame type and number of panes in windows
- HVAC coil and condenser brand, model, and serial number
- Qualitative assessment of attic insulation installation and HVAC installation quality
- Photograph of front orientation

In addition to the data collected from the onsite inspections, the following were collected from rating providers for each home in order to complete the analyses:

A. Building Plans: building plans contain the architectural information (e.g., conditioned floor area, perimeter, window area and distribution, elevations, etc.);

B. Construction Specification Sheets: construction specification sheets identify the energy-efficient features incorporated into the home. Such features might include: insulation values, window u-value and solar heat gain coefficients, HVAC SEER and AFUE ratings, and infiltration and duct leakage specifications. This information, along with the building plans, is typically provided to the rating provider so that the rating provider can populate a *REM/Rate* file (see below) and produce a projected HERS score. The sheets also serve as a checklist during the subsequent onsite inspection to ensure that the home is built to the standards specified by the homebuilder; and

C. *REM/Rate* Files: confirmed *REM/Rate* files, developed by the rating provider, contain the rating provider's final inputs concerning all energy related characteristics of the home. They encompass both architectural information from the building plans and energy-efficient features from the construction specification sheets. The *REM/Rate* files collected by ICF were originally used by the rating provider to generate their projected HERS and percent savings above IECC scores using the *REM/Rate* software.

In addition, data was collected to perform a climate zone and a SEER analysis. For the SEER analysis, each home's coil and condenser data was collected during the onsite verification process. This data was then used to lookup the ARI SEER value and compare it with the SEER reported by the raters. For the climate zone analysis, each home's correct climate zone was compared with the climate zone used by raters to test the home.

Design Data Analysis Process

The next step is determining how the data that is collected will be analyzed. This includes determining which guidelines to use, whether they be regional, state, or national, and planning how to review and use the collected data. The ESH program analyzed each home's HERS score,percent

savings above IECC score, SEER, and climate zone usage. For the data analysis, the ESH program generated a HERS and percent savings above IECC score for each home in the sample. These scores were generated by using actual field diagnostic test results and observations made during the onsite verification process. These scores were then compared to the scores listed in the providers' confirmed *REM/Rate* files and the scores reported by the rating providers to the ESH program's online system. These four analyses allowed the ESH program to determine the accuracy of the scores generated by the rating providers, identify possible trends or potential issues regarding the way the homes were modeled in the *REM/Rate* software, and identify inconsistencies in the way data was reported to the ESH program's online system.

Design Corrective Action Process

An effective QAQC process will improve the management of energy efficiency program and program design by making it easier to identify opportunities and deficiencies. It will also help evaluate performance, analyze root causes of problems, identify areas where corrective action is needed, and improve performance and efficiency. Program sponsors can establish procedures to monitor key characteristics of processes that can have a significant impact, track performance, and evaluate compliance. When establishing a QAQC process it's important that the utility "focus on things that it can do something about."

The goal of the ESH program's corrective action plan was to achieve continuous improvements and advance the development and acceptance of industry standards and best practices by Texas HERO. The results generated from the QAQC process were continuously reported to Texas HERO and individual rating providers to accomplish program sponsor's goals. Below are the corrective action steps taken:

1. Identify rating providers with the greatest inconsistencies based on the QAQC results;
2. Meet with rating providers as a group (with Texas HERO) and individually (one on one) to review results, discuss causes of inconsistencies, and identify potential solutions;
3. Work with rating providers to obtain assurances that any inconsistencies will be remedied;
4. Monitor rating providers' progress concerning specific inconsistencies by paying particular attention to future plan analyses and onsite inspections;
5. Present final results and recommendations to TX HERO and encourage the adoption of best practices; and
6. Discontinue accepting certificates from rating providers who continuously deliver inconsistent results, even after intervention.

Establish Roles and Responsibilities

Once the QAQC process has been designed, the final step in the planning phase is to establish roles and responsibilities. Every person/group involved should have clear, written knowledge of what his/her task is. It should be very clear what the function of that task should be, as well as how it fits within the entire program and timeline.

When establishing the roles for the QAQC process, the ESH program created a flow chart that not only detailed each person/group's role, but that detailed step-by-step the order in which the process should flow. This way, everybody knew exactly what to do and when to do it.

Do – Implement Processes

Once all the planning is finished, the design is complete, and the action plan in place, a program sponsor is ready to begin the implementation phase. The implementation stage in Texas included:

- Providing necessary training – Training is a very important aspect of an effective QAQC process. Not only does it increase awareness and improve competency in the program, it also empowers participants to conceive good ideas that can have a positive impact on the program. HERS raters are required to take and pass RESNET accredited HERS training classes, as well as an HVAC installation, and system design of facilities trainings.
- Conducting the data collection as designed.
- Conducting the analysis as designed – this allowed the ESH program to compare its independently generated scores and values with those used and reported by the participating raters. With this analysis, the ESH program is able to determine if any homes are certified as ENERGY STAR qualified homes when they in fact did not meet the standards.

Check – Evaluate and Take Corrective Action

Monitor and measure.

In order to evaluate the performance of HERS raters and take proper corrective action, results obtained from the data analysis first need to be evaluated. Trends and inconsistencies should be identified during this phase.

For example, the QAQC process has been able to identify several trends and inconsistencies during the past few years:

1. In 2004, 14 homes that were verified failed to meet ENERGY STAR standards because at the time the home was verified, they lacked attic insulation;

2. In 2004, 33 homes were rated with a questionable climate zone; and

3. In 2005 and 2006, about one third of the homes did not have their HVAC performance verified. For these homes, SEERs did not have an ARI match when pairing up coil and condenser data collected during onsite verification.

4. In 2006, about 35% of homes reported different floor areas than calculated by ICF. 5.8% of the homes had a discrepancy of 100ft^2 or greater.

   See Appendix A for comparison of results by program year.

Once trends and inconsistencies are identified, the next step is to examine further to determine the root cause of inconsistency. Identifying and addressing the root cause is the only way to correct the actual problem, not the symptom.

For example, once the ESH program process was able to identify issues and inconsistencies, it dug deeper in an effort to find the root of these problems. For each inconsistency mentioned above, the root cause was found:

1. The 14 homes that failed our analysis due to their lack of attic insulation, uncovered a problem with the program's timing and raters' inaccurate schedule reporting. With these particular homes, raters incorrectly listed them on the testing schedule as being completed and ready for final QAQC inspection. The third-party, onsite inspector therefore tested the home before the home was complete, which is why the home did not have attic insulation in place. It is known that the homes later had the insulation installed because they passed city inspection and were issued a certificate of occupancy. This made it clear that had the raters provided an accurate testing schedule, the onsite inspection would have taken place at the appropriate time and the home would have passed.

2. Upon discovering that 33 homes used a questionable climate zone, an analysis was performed to identify the part of the region that had the most inconsistencies. After researching national and industry guidelines, it was found that the national and industry guidelines did not have a clear definition of what climate zone was correct for that part of the region. It was therefore discovered that the raters of these 33 homes were not testing outside the standards. Instead, it was clear that since national and industry guidelines did not address this issue, the program sponsor, ICF, and the rating industry collaborated to adopt 'best practices' to avoid inconsistent methods of determining a home's climate zone in the future.

3. After looking deeper into why so many homes did not have their coil and condensers match in the ARI database, it was discovered that, much like the situation above, national and industry guidelines for HVAC performance verification do no clearly state that in order to verify a home's SEER, an ARI match has to be made. The language used in these guidelines is somewhat vague and subject to interpretation. In light of this, the program sponsor was able to shift its focus to making this a best practice for 2005 and a requirement for 2006.

4. The discrepancies identified in the calculated floor areas were shared with Texas HERO. This revealed that the national HERS standards to calculate floor area was vague and allowed for different interpretations. As a result, all of the raters were using different methodologies to calculate floor areas. The program sponsor, ICF, and Texas HERO worked to establish an acceptable variance for floor area, brought issue to RESNET's attention, and encouraged appropriate modifications to nationals HERS rating guidelines.

Take corrective & preventative action.

Once the issues and the root cause of those issues are identified, the next step is to take corrective and preventative action.

As previously mentioned, the ESH program designed the corrective action plan to include six steps. Below are those steps once again, along with specific action taken by the QAQC process.

1. **Identify rating providers with the greatest inconsistencies based on the QAQC results.** Analysis showed that there were a couple of raters that showed a significantly higher percentage

of failures and inconsistencies than the other raters in the program. Most issues were failing HERS and % Savings above IECC scores, lack of attic insulation, usage of a questionable climate zone, homes not having a SEER ARI match, and miscalculation of floor area.

2. **Meet with rating providers as a group (with Texas HERO) and individually (one on one) to review results, discuss causes of inconsistencies, and identify potential solutions.** The ESH program met with Texas HERO to give general program results and introduce general issues that had been identified throughout the year. Also, one-on-one meetings with raters and homebuilders were conducted to review results, discuss causes of inconsistencies, and identify potential solutions.
3. **Work with rating providers to obtain assurances that any inconsistencies will be remedied.** The ESH program worked collaboratively with raters to gain their commitment to correcting the problem. Because raters were involved in the program and corrective action plan design from the start, obtaining these assurances was easily facilitated.
4. **Monitor rating providers' progress concerning specific inconsistencies by paying particular attention to future plan analyses and onsite inspections.** As the year progressed, the ESH program paid close attention to the progress made by raters to be sure that they were addressing and correcting the issue that had been brought to their attention.
5. **Present final results and recommendations to Texas HERO and encourage the adoption of best practices.** Results were presented to Texas HERO periodically throughout the year. At the year's end, when all the data had been collected and analyzed, the ESH program presented a detailed overview of the QAQC process and the results to Texas HERO. During this time, issues that had come up throughout the year were focused on and the adoption of best practices was encouraged.
6. **Discontinue accepting certificates from rating providers who continuously deliver inconsistent results, even after intervention. TXU ED has not been in a situation where it needed to act on this step.** After each issue was presented to the raters, visible and measurable improvement was observed, which up to this point, has eliminated the need to discontinue accepting any raters' certificates.

See Appendix B for the results of the corrective action during the past three years.

Act – Perform Management Review

Management reviews are required to keep the QAQC process efficient and cost effective and also plays a vital role in continually improving the system while ensuring organizational needs are met over time. The major question that management reviews try to answer is, "Is the system working as we intended?" Some questions to consider during the management review process are:

- Did we achieve our objectives and targets? (if not, why?) Should we modify our objectives?
- Are roles and responsibilities clear and do they make sense?
- Are we applying resources appropriately?
- Are the procedures clear and adequate? Do we need others? Should we eliminate some?
- Are we monitoring our QAQC (e.g., via system audits)? What do the results of those audits tell us?

- What effects have changes in materials, products, or services had on our QAQC process and its effectiveness?
- Do changes in laws or regulations require us to change some of our approaches?
- What stakeholder concerns have been raised since our last review?
- Is there a better way? What else can we do to improve?

CONCLUSIONS AND LESSONS LEARNED

The QAQC process described above demonstrates how sponsors of energy efficiency program can successfully monitor program progress, confirm energy savings, and continuously improve program design. These capabilities will become more important as program sponsors are forced to achieve more agressive energy efficiency goals over time – requiring more accurate savings reporting, increased program activity, and greater scrutiny over use of public benefit funds.

For ICF, and the sponsors of the QAQC process in Texas, a QAQC process has been effective in:

- Validating the information reported by rating industry to the program;
- Confirming data reported by the program sponsor to the PUCT;
- Strengthening the integrity of the HERS rating industry by identifying and correcting inconsistencies;
- Contributing to the establishment of industry standards and best practices through TX HERO;
- Continuously evolving and improving the process to provide value to TXU ED, the HERS rating industry, and homebuilders; and
- Improving the quality of energy efficiency measure installations by maximizing potential energy demand and savings per measure.

With three years of successfully implementing its QAQC process for the ESH program in Texas, ICF recommends program sponsors consider the following when designing a QAQC process:

- *Work closely with stakeholders during the design of the program.* By having the raters *(stakeholders)* involved in the plan and design phase of the QAQC process, raters "bought-in" to the process, and this in turn significantly reduced potential for resistance. In order to ensure rater commitment, ICF fully informed them of what the QAQC process will be evaluating and the methods and procedures it will take. From the beginning, it was ICF's goal to have everyone involved, especially the raters, embrace and take ownership of the QAQC process.

- *Establish continuous feedback loop and monitor progress closely.* No process is designed perfectly; there will always be room for improvement and progress. Incorporating a feedback loop in the QAQC process was key and allowed the program to identify unforeseen challenges early and make needed modifications staying on track and on time. Incorporating tracking mechanisms / reports was essential to monitoring progress and make necessary changes. The key is to execute the changes necessary to realize improvements.

- *Timing of on-site data collection can be critical to success*. As mentioned earlier, the ESH program uncovered a problem with the timing of on-site inspections due to raters' inaccurate schedule reporting. As a result of this discovery, the method to collect testing schedules from raters was

modified so that the onsite verification would be performed during the correct 'window of opportunity'. In 2004, 14 homes were found to not have attic insulation at the time of onsite verification. In 2005, that number significantly dropped to one.

- *Method of selecting sample should be independent of the entity being evaluated.* Although the testing schedule was improved as just mentioned, there is still room for improvement so that potential testing sites come from a more independent source. To improve the integrity of the QAQC results, the sample of potential testing sites should come from more independent source if possible not from the rater. This will increase the independence of the sample design and in turn increase the validity of the results.

- *Corrective Action Plan is successful at achieving continuous improvements in design and quality of energy efficiency measures.* When HERS and Percent Savings Above IECC scores failed or were off by a significant margin for some homes, it was brought to the raters' attention. Once the issue was discussed and methods to eliminate the inconsistency were agreed upon, failures and large discrepancies significantly dropped.

  Also, when it was discovered that one third of all the homes in the QAQC sample did not have their HVAC performance verified, again, it was brought to raters' attention. Although it is not a national, industry or program requirement to have an ARI match for every HVAC unit, action was taken by a rater and builder to verify their equipment's SEER, retest and certify their homes. In addition, TX HERO has acknowledged the importance of verifying HVAC performance with ARI lookups, and even suggested that the 2006 QAQC process require an ARI lookup for every home.

- *Raters are committed to strengthening the rating industry.* From minor procedural changes to changes in national and program guidelines, raters have demonstrated that they are genuinely interested in generating good results and improving their industry's standards and reputation.

Appendix A: Comparison of QAQC Results by Year

HERS Score Analysis

	Discrepancies	Failures	Passing Rate
2004	18	16	94.50%
2005	3	1	99.70%
2006	16	4	98.70%

IECC Analysis

	Discrepancies	Failures	Passing Rate
2004	31	22	92.40%
2005	7	2	99.30%
2006	9	2	99.40%

Homes Passing Rate

	Number of homes that did not meet ENERGY STAR qualifications	Passing Rate
2004	22	92.40%
2005	2	99.30%
2006	4	98.70%

SEER Verification Analysis

	Non ARI Matches	Average ARI SEER	Average Rater Reported SEER	Average Difference
2004	n/a	11.76	11.79	-0.03
2005	36	12.23	12.02	0.21
2006	78	12.7	12.3	0.4

Attic Insulation Analysis

	Homes with no Attic Insulation	Percent Flag Rate
2004	14	4.84%
2005	2	0.68%
2006	1	0.30%

Appendix B: The Corrective Action Plan at Work

2004	**8% of homes failed to meet ENERGY STAR qualifications (HERS Index of 86 and 15% above IECC)**	
Issue	Action Taken	Result
14 homes lacked attic insulation at time of inspection	• Discussed findings with TX HERO • Improved home verification scheduling (72 hour window)	• The issue has virtually disappeared
Roughly one third of the homes used inconsistent climate zone for analysis	• Discussed findings with RESNET, TX HERO • Increased the awareness of climate zone usage and the selection of correct weather files to use in plan analysis and software modeling • Track rating providers' climate zone usage	• Standard practices were established by TX HERO and RESNET clarified language in specifications • No longer an issue

2005	**1% of homes failed to meet ENERGY STAR qualifications**	
Issue	Action Taken	Result
Many raters did not enter valid coil and condenser data for HVAC systems	• Discussed findings with TX HERO • Discussed with raters and providers with greatest failure rates	▪ Issue has somewhat improved ▪ However, still a minor issue
There was a discrepancy between HERS scores reported online and final REM/Rate files	• Discussed findings with TX HERO • Discussed with raters and providers with greatest failure rates	▪ Issue has somewhat improved ▪ However, still a minor issue

2006	**2% of homes failed to meet ENERGY STAR qualifications**	
Issue	Action Taken	Result
Many homes did not have a valid ARI SEER match	• Discussed findings with TX HERO • Redesigned online system to require ARI reference number upon submission of home	TBD
A large percentage of homes had a different floor area reported in the REM file, online system and the QAQC calculated floor area	• Discussed findings with TX HERO • Working with TX HERO to establish acceptable variance for floor area • New RESNET standards should address	TBD
Result of Corrective Action		• **Passing rate increased from 92% in 2004 to 99% in 2006**