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Investigator: Mary Mee **Phone:** <<< REDACTED >>> **Opinion Date:** 3/28/2018

Opinion Number: 2018 - 149017 **Priority: Respond within 5 business days**

Opinion Codes: Rate Case Items - In Favor **Closed Date:**

First Name: Bob **Last Name: Dunn** **Account Name:** Bob Dunn

Address: <<< REDACTED >>>

City: Sun City **State:** AZ **Zip Code:** 85351

Home: <<< REDACTED >>>

Company: Arizona Public Service Company **Division:** Electric

Nature Of Opinion

Docket Number: E-01345A-18-0002 **Docket Position:** For

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The six new APS rate plans with a nominal 4.6% rate increase can yield measurably different results between HERS rated newly constructed and existing residential homes.

Arizona Corporation Commission: APS 18-0002

Mary Mee mmee@azcc.gov

3/28/2018

Here are just a few comments about the six new rate APS rate plans along with some references as to why the APS rate plan increases can be much higher that expected. The point of the new APS plans is

to make a choice from the six optional plans considering usage and conservation to achieve economy. That decision also requires reliance on the predictive nature; a sort of picture of a home's energy usage.

The US Department of Energy, to this end, developed a new energy efficiency rating system graph called Home Energy Residential Score (HERS) which I have included as a JPEG file. It is currently a

national standard for measuring home efficiency. There are now two million homes since 2013 with HERS index scores. This was done for the purpose of and perspective of a consumer considering energy usage/efficiencies for a new or existing home purchase. It compared a reference home build to the International Conservation Code (ICC) of 2006 and newly constructed HERS rated energy efficient homes along with existing homes prior to the 2006 code which carried no ratings. A higher HERS number for an average existing home at 135% means it is 35% less efficient than that of the reference percentage to the 2006 energy conservation code reference of 100. A newly constructed energy typically rated home is 35% more efficient by percentage than the 2006 reference home. These are huge differences to make or set rates by and expect the same energy conservation results for two divergent models on the same HERS scale. The issue is that the HERS ratings pose enough of a significant difference in the efficiencies of the two models under the nationally recognized system that the three-time-of-day APS rate plans function poorly for energy use planning. The same argument applies to the three APS convenience plans. The EPA rated LEED new homes USGBC energy star are another 20-30% greater in efficiency. It is impossible to plan with at 100% plus/minus difference as the rate plans function for the most efficient, the new homes under HERS and/or LEEDs energy star ratings.

The fairness issue as demonstrated by the two HERS scores could look at fair measures of central tendency to determine the fit of the two models to the six rate plans. In terms of statistical bell curves, standard

deviation comparison of the two model examples under HERS, existing and newly constructed shows a nearly 1x (100%) potential minimum difference exists in data points between the HERS-rated average existing home at 135% and the newly constructed home with a HERS rating of 65%. There is a lack of statistical fit, or goodness-of-fit, in trying to apply the two HERS models different data points to the same similar six rate plans and expecting the plans to produce reliable predictive results in terms of energy conservation when there exists this significant difference between the HERS scores for the two models.

Statistical components are critical measures of rate modeling and selection. If we look at the data for both sets of ranges of values for existing and newly constructed homes for the two examples under HERS it is clear that one bell curve, the one for existing homes will appear flatter as the values spread further out, statistically disperse with greater numbers of results displayed for the majority of older homes that were built decades before the HERS standards. This illustrates that the bell curve for existing homes has a higher "statistical variance," meaning that the values located farther away from the average are more likely to occur. Our KwHs are already 100% greater under the HERS scores for the existing and the new models. However, there is the likely-hood also that under the bell curve for existing inefficient homes the mean, skewness and variance, and consequently those higher KwH usage values that are graphed under the bell curve will also likely represent higher usages for the greater numbers of existent homes that they represent in the total population group being considered. This is because the standard deviations are out further, (a flat bell curve), meaning that there are a high number of disparate results for existing homes, vis-a-vis the smaller number of newly constructed homes and tighter, or statistically less disperse results around the measures of central tendency. As well, the Bell curve under the existing home model is likely skewed statistically, or right shifted positively i.e., there are greater numbers of older homes, after considering the fact that the significant number of older existing homes are a majority of the homes in the HERS reference standard that exist today. The right- shifted curve includes the higher populated, older homes along with the measures of central tendency demonstrating again that larger bunches of existing, older inefficient homes are misfits when it comes to the six APS rate
plans.

Also, there are no total figures in analytical format for the APS customer base of existing homes, i.e., cumulative data charts, cost of KwH by month, time of day, season, and year. There are no cost share programs for HERS-based index corrective actions except for equipment replacement and the income program which is not current with the poverty and misery index. Significantly, there are no programs incentivized and coordinated with the tax authorities to provide cost share or minimize costs for identified correction of HERS scale deficiencies. The APS low income program and a high energy HERS-rated value for an existent home should be and are mutually exclusive. APS policy apparently comingles both of these separate issues with the mistaken notion that APS takes care of it with the low income program. The problem needs recognition, disclosure, and an examination of applicable, corrective actions including new rate plans. Otherwise we are ignoring the problem for the largest demographic, that being the retired generations who are rate payers, and some of the most vulnerable among us.

All taxpayers funded these EPA and US Department of Energy ratings and codes as a way to compare the energy usage of new and existing homes. The six APS rate plans primarily benefit new, efficient

HERS homes that can use the rate features for their benefit as demonstrated by the HERS index to an overwhelming percentage advantage using split hour timings and minimal on /off peak use periods.

It is interesting to note, part of the reason for the higher-than-stated percentage APS nominal rate increase is Newton's Law of Cooling. Newton's formula shows that the heat flow is proportional to the difference in temperature between a system and its surroundings. The greater the difference in temperature, a gradient factor, between the system and the surroundings, the more quickly the body temperature of the object (home) changes. This concerns conductive heat, walls, and window parts and, to a lesser degree, convective heat, roofs and ceilings. In other words, Newton's formula makes it tough to predict energy usage in times of higher temperature differences. Since this law describes heat transfer in this case, as a large part of the home building envelope, it is a key part of the answer to the puzzle of much higher percentage

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consumer energy cost increases, as the rate of the rate of the gradient accelerates under the equation. Failure to recognize the impact of Newton's formula as it applies to the six APS rate plans allows for an understatement of the APS rate plan increases and costs to a related significant degree for HERS typically rated existing homes, and newly constructed HERS rated homes to a lesser degree.

Also, HVAC tonnage and BTUs are proportional to the expression of one ton of energy equivalence is 12,000 BTUs. However wattage is not directly proportional and increases at higher rates. According to government studies many existing homes have low SEER ratings (8, 9, and 10) with higher tonnage designed to compensate for lower efficiency homes. Many of these existing homes are also

uncorrectable for economic or structural reasons, therefore placing the financial burden on the older population generations subject to an inflation adjusted income. This represents a significant percentage rate base for APS and the country's homeowner base.

Recently the International Energy Conservation Code (IECC) adopted the use of the building energy rating index (ERI) a type of HERS rating in the US as a code compliance option within the 2015 building code. Existing homes could involve HERS inspection and calculation for purposes of rate plan determination selection, thus allowing for the consideration of energy performance of existing homes and plan rate selection or plan modification as a disclosure and fairness issue.

Sincerely,

Robert V. Dunn Jr. Sun City, Arizona

1) US Department of Energy, 2006 International Energy conservation code

2) HERS scale www.resnet.us/energy-rating, HERS index home energy rating score index

3) EPA LEED homes, US Green Building code and energy star homes

4) ANSI, American National Standard Institute. Residential Network (ResNet) Residential Energy

Services Network

5) Newton's Law of Cooling

6) Heat transfer through different materials; ratings. Home heat transfer; conductive and

convective

		Investigation	
Date:	**Analyst:**	**Submitted By:**	**Type:**
3/28/2018	Mary Mee	Telephone	Investigation

Comments noted for the record and docketed. CLOSED.

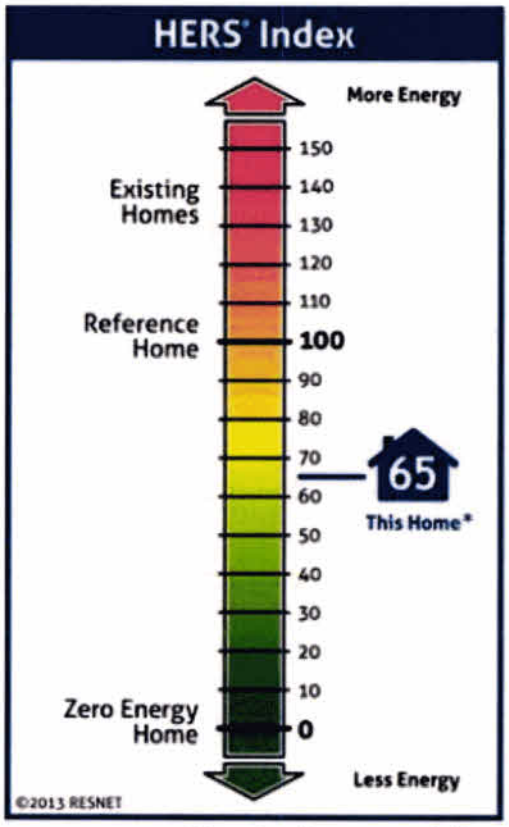
How Does the HERS Index Work?

To calculate a home's HERS Index Score, a certified RESNET Home Energy Rater will do a home energy rating and compare the data against a 'reference home' - a design modeled home of the same size and shape as the actual home, so the HERS Index Score is always relative to the size, shape and type of house you live in. The lower the number, the more energy efficient the home.

A typical resale home represents 130 on the HERS Index while reference home (a standard new home built in 2006) is rated at 100.

- A home with a HERS Index Score of 70 is 30% more energy efficient than a standard new home.
- A home with a HERS Index Score of 130 is 30% less energy efficient than a standard new home.

Developed by the Residential Energy Services Network and introduced in 2006, the HERS Index is the industry standard by which a home's energy efficiency is measured. Government agencies such as the Department of Energy (DOE), Department of Housing and Urban Development (HUD) and the Environmental Protection Agency (EPA) recognize the HERS Index as an official verification of energy performance.



*Sample rating representation.

The HERS Index in Less Than 3 Minutes

A quick and fun way to learn about the HERS Index and why it's important to you.