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*Comment Received From: Russell King, ME*

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## **Russell King, ME, Response to RFI for Whole House HERS Program**

*Additional submitted attachment is included below.*



Coded Energy, Inc.  
Developers of Kwik Model 3D Software  
Building Science Consulting and Training



January 10, 2024

To: Cheng Moua, California Energy Commission (Docket 23-HERS-02)  
From: Russell King, ME, Coded Energy, Inc.  
RE: Response to RFI on Home Energy Rating and Labeling

Dear Cheng:

I have been deeply involved with the California HERS program since Day 1. I was the Project Manager for the 1992 CEC contract to develop the very first Home Energy Rating System in California. More recently, I was the primary author of the only CEC-approved Whole House Home Energy Rating System in California (aka, HERS II).

I am a huge proponent of a whole house home energy rating system for existing homes in California. I think it can be instrumental in helping CA accomplish its decarbonization and energy efficiency goals. My comments are directly focused on a HERS program for existing homes. Personally, I feel that a new labeling program for newly constructed homes is far less important.

**For existing homes, however, a HERS program is long overdue.** We tried back around 2010 or so with the HERS II program, but it collapsed under its own weight due to its complexity and desire for unnecessary accuracy and precision. Unfortunately, that program left a bad taste in many peoples' mouths. It will be important to learn from those mistakes and directly address those bad experiences. Focus groups will be important. You need to involve all stakeholders, especially the installers and contractors doing the work. They were the ones most left out of the development of the original program.

One of the biggest challenges with the original HERS II program was the difficulty of collecting data in the field and inputting that into the modeling software and the complexity of the software. I was lead trainer for the original HERS II program and trained numerous raters how to go out to a house and sketch a home's floor plan, take off all the necessary geometry from this sketch and enter it into the software. It took hours to do this, even on a basic home. Recent technology and software have greatly

improved the process. Decreasing the time by at least 75%. My company has been developing software and partnering with a technology company to create tools specifically to do this. You can now simply scan a home with a phone app and open it in our software, which automatically creates a 3D room-by-room model of the home. Our award-winning software currently can input building information directly into CBECC-res, EnergyGauge USA, and EnergyGauge loads (for HVAC design). EnergyGauge USA is a national HERS software developed by the Florida Solar Energy Center (FSEC).

I look forward to collaborating with you and other stakeholders to get a new, effective, and successful Home Energy Rating and Labeling program up and running as soon as possible. I have attempted to answer as many of your questions in your RFI document as completely as possible. Please see attached pages. I have a lot of experience and advice to give on this topic. I am happy to answer any more questions you may have.

Best Regards,



Russell King, M.E.  
CEO/Founder

Responses to questions asked by CEC Staff in the RFI on Home Energy Rating and Labeling

- 1) What home energy rating and labeling services and programs currently exist? **Home Energy Score (HES), RESNET, the remnants of the original HERS II program (e.g. the CalRate version of CBECC). HES in CA is mostly existing homes and RESNET is mostly new construction.**
  - a. Which existing programs are the most developed or have completed the largest number of ratings? **Not sure. Probably RESNET. Home Energy Score has been used in the BayREN program for a while. You should contact BayREN about it.**
  - b. Which existing programs successfully promote consumer awareness and education on the monetary and or environmental benefits of energy efficiency? **Probably RESNET**
  - c. Which existing programs promote energy-efficient construction practices? **Both**
  - d. Which existing programs increase compliance with building standards? **In other states, probably RESNET for new construction. In CA, maybe RESNET in that it puts a little bit more verification in the process. The CA RESNET program is based on the energy code and that verification process, which is severely lacking building department support and enforcement of the QA process.**
  - e. Which existing programs are recognized by appraising and lending communities and may result in higher real estate values? **Probably RESNET**
- 2) What asset rating tools and software can be used to generate home energy ratings and labels? **HES has their own software. RESNET has three software programs certified for use outside of CA: EnergyGauge, REMRate, Ekotrope. In addition new technology and software has recently become available that makes it very easy to scan an existing home and convert that into a 3D model of a house, which can then be input into any modeling software.**
  - a. What dwelling types can these tools assess – single family, low-rise multifamily, high-rise multifamily, mixed-use buildings? **Mostly single family.**
  - b. Are these tools capable of assessing performance, assets (independent of performance), or both?
  - c. What inputs are required to generate home energy ratings? **Building geometry, weather data, energy features, utility cost data. Building geometry has historically been the most time consuming.**
  - d. What assumptions and/or boundaries are assumed by these tools?
  - e. What calculations or algorithms are used to generate the ratings?
- 3) What are the most important elements to creating a successful home energy rating and labeling program? **Simplicity, ease of use by all stakeholders, ease of collecting data, and the results have to be logical and intuitive.**
- 4) How specific and accurate do home energy ratings need to be? **The biggest variable is occupant behavior, which is impossible to predict. Knowing this, the ratings do not need to be super accurate. Don't waste time splitting hairs when we need to be shaving heads.**
- 5) What metrics/units are most important to include on home energy ratings (e.g. energy bill costs (\$), energy (kWh, Therm, BTU), energy use intensity (KBTU/ft<sup>2</sup>-year), greenhouse gas emissions (CO<sub>2</sub>e)? Should these units be normalized by floor area? **These all require**

similar data to be collected. Once the necessary data has been collected, all of these are possible as outputs. Predicting actual energy bills is the most challenging and controversial part. Even automobile ratings don't try to do that. It is important in terms of determining the cost-effectiveness of features, but it probably should be kept behind the scenes.

- 6) What are known or possible barriers to providing reasonable estimates of potential utility bill savings, and reliable recommendations on cost-effective measures to improve the energy efficiency of homes? Are there examples of existing programs that have overcome these barriers? **Occupant behavior, then data collection in the field for existing homes and inputting that data into the software has historically been one of the most challenging and time-consuming parts. Brand new technology and software has helped improve this greatly. HES has improved this by making their program super simple, but probably too simple. The field data collection challenges is one of the reasons that RESNET mainly focuses on new construction and one of the reasons the old HERS II program failed.**
- 7) There are many different rating scale systems that could be used (e.g., 1 through 10, 1 through 100, grades A, B, C, etc.). Should a scaling system be considered? If so, what scale and labeling system should California's home energy rating and labeling services learn from and why? **A combination of a simple main score and more complex detailed scores seems to be the best. A first glance score (e.g., stars) is useful when looking at larger groups of homes and detailed scores are helpful when evaluating a single home or comparing a few homes. Comparing a house to a reference house seems to make the most sense, but a lower is better score is not intuitive for the general public.**
- 8) How can California's home energy rating and labeling services rate both newly constructed dwellings as well as additions and alterations to existing dwellings on the same rating scale? **A house is a house, regardless of age. Try not to overcomplicate it. I think they can all use the same scale. What varies is how the data is collected and input into the software. For new construction it is much easier because a lot of the data is available as part of the construction process, but there is much less opportunity for affecting the construction of the home (new homes are already super-efficient). For existing homes data collection is (was) a big challenge, but the opportunity for energy savings is much, much larger.**
- 9) How can the CEC encourage adoption and use of a voluntary home energy rating and labeling services? **Make it an important part of incentive and rebate programs. Encourage entrepreneurship and promote success of businesses wanting to provide training, implementation, technology, innovation, new products and services, etc.**
- 10) How can the CEC ensure the benefits of home energy rating and labeling services are equitably distributed to California's low-income and disadvantaged communities? **Involve community partners in the implementation and encourage members of disadvantaged communities through subsidies to get trained in a profession that is integral to the program (HERS raters, home performance contractors). See Sierra Service Project's Sacramento Sustainability Academy as a good example.**
- 11) Should California's home energy rating and labeling services provide a process for accepting other third-party rating systems to be recognized by the CEC? How could this be

technically achieved considering programmatic differences? **Not sure what you mean by “third-party”. I think it is important that all rating tools (software) have consistent results. Unfortunately, the only easy way to ensure this is for them to all use the same modeling algorithm.**

- 12) What role(s) should field professionals or assessors have to support California's home energy rating and labeling services? **They are the front line to a program like this. They can be divided into specialties: field data collection, software modeling, and installer/contractor. With distinct levels of certification and quality assurance (QA).**
- a. Is there a need to certify these individuals or entities? If so, what knowledge and skills do these professionals need to possess? **Yes. Absolutely. Ongoing QA is critical also.**
  - b. Who should certify these individuals and entities? **HERS Providers should certify (test) them and provide QA, but many other entities should be allowed to train and recruit them.** Should these individuals and entities be regulated? **HERS providers, yes. The exam composition and how they are administered should be carefully monitored. (See CABEC CEA program as a good example)** Training organizations, not as much. If the testing is rigorous and effective, it will filter out poorly trained individuals. Candidates should be allowed to challenge the certification exams (take the test without any documented training). Detailed exam content should be made available to any and all training organizations. **There should be hands-on exams as well as book exams.**
  - c. How can the CEC ensure there is an adequate and well-qualified workforce to provide statewide coverage of home energy rating and labeling services? **Provide mentoring programs and facilitate an ecosystem that allows them to be independent contractors that work collaboratively. Encourage independent, third-party assessors (who do not do any installation work), but do not require it. Let the homeowner decide if they trust the advice of the installer.**
- 13) What level of quality assurance is warranted for voluntary home energy rating and labeling services in California? **Substantial, but not burdensome. Emphasize “desk-audits” over field audits. Provide a channel for complain resolution. Make performance evaluation more of a reward program than a punitive program (except for gross violations). Make it competitive and interactive. Social media and reviews (e.g., Yelp) can play a big role.**
- 14) What is an acceptable cost for completing home energy rating and labeling services in California? **It depends on the data collection requirements. New construction should be very cheap. Existing homes require much more data collection. I think a target of \$200-\$300 per existing home is reasonable.**
- 15) What other valuable information should be included as part of California's home energy rating and labeling services? **Heating and cooling load calculations! This is extremely important and has been a gross oversight of ALL other programs. The data needed to create an energy score is almost exactly the same as that needed to calculate heating and cooling loads. Proper equipment sizing, especially for heat pumps, is critical to an accurate energy model, true energy savings and true comfort. It is widely known that most AC's and furnaces are drastically oversized, but when you throw heat pumps into the equation (and we all know that electrification will be a huge component of any**

**rating program) the equation changes dramatically. The only way to size equipment correctly is with an accurate load calculation.**

16) What organizations or stakeholder groups should be made aware and invited to participate in the home energy rating and labeling proceeding?

- **HERS providers**
- **Community colleges, trade schools, and other workforce development programs**
- **Utilities**
- **Software developers/vendors**
- **HVAC trade associations (IHACI, ACCA, etc.)**
- **Real Estate inspectors (CREIA, ASHI, etc.,)**
- **Home performance contractors**
- **Insulation/weatherization contractors**
- **Product manufacturers**