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To: Residential Insulation Stakeholders
From: Andre Desjarlais
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We are planning to update the insulation level recommendations found in the DOE Insulation Fact Sheet[i] (and referenced by other DOE web sites and programs) during FY 2007. Our analysts last revised the recommended insulation levels for new and existing homes in 1997.[ii] (The insulation and fuel cost data bases accessed by the Web version of the algorithm used to calculate the recommended insulation levels, called the ZipCode, were updated in 2002 but the tables listing recommended R-values were not.[iii,iv]) In general, we plan to follow the same approach used in the previous work. However, in order to make the most effective use of our limited resources, we are inviting your comments and suggestions before we begin this project. In particular, we invite your comments in three subject areas: (1) cost data, (2) algorithms, and (3) presentation.

Cost data

Fuel:

All fuel and electricity cost data will be taken from values published by the Energy Information Administration (EIA). The latest 12-month average for each state will be used for residential electric power. For heating oil, propane, and natural gas, the average price during the most recent heating season for each state will be used. (Suggestions regarding appropriate data sources for - and treatment of - recent electricity rate increases are welcome.)

Because the insulation level recommendations are based upon a life-cycle economic analysis, projected fuel prices are required. These price projections are taken from DOE life cycle cost guidelines.[v]

Insulation:

A detailed survey of contractors was made to establish typical installed insulation prices for residential customers in 1996.[ii] Published cost data was not used at that time because it was based on union labor and tended to overestimate the prices charged by contractors in the residential market. This survey was time-consuming, difficult, and costly, and will not be repeated. In 2002, we escalated the insulation cost data based upon the change in installed insulation prices between the Means CostWorks 2002 and the R. S. Means prices published in 1996.[vi,vii] At that time, the state-wide insulation cost multiplier values were replaced by a cost multiplier for each zip-code area. We plan to use the same methodology to escalate the insulation prices to from 2002 to 2006. Additionally, a limited phone review has been made to determine retail insulation prices in most states for several common insulation products. The results of this review will be used as a reality check on the escalated prices.

Algorithms

We plan to use the same calculational methodology that was used in 1997 and is named the ZipCode.[ii] The economic calculations in this method are exhaustive. Every possible insulation level is considered for each location and the level that produces the lowest life-cycle cost is recommended.

The heat transfer calculations used by the ZipCode are much less sophisticated than the current state-of-the art in building modeling. These calculations (all equations are shown in [ii]) are simple one-dimensional models that multiply the change in effective U-value by the cooling degree hours or heating degree days and divide by the cooling or heating system efficiency. Some simple adjustments are made for seasonal heating and cooling effects and for differences between one-dimensional results and whole-house behavior. Some thought has been given to upgrading to the better modeling tools available today. However, there are a number of tradeoffs that have led us to the conclusion to stick with the same tool used to generate the previous versions of the DOE recommended levels:

- Interactive effects become more important, so the assumptions for one part of the house influence the recommended levels for another.

- These results are used generally for any house, so more closely matching any given house becomes not only a case of diminishing returns, but may lead us to less appropriate recommendations for other houses.
- More calculational effort (and therefore more costly)

Presentation

The insulation levels have traditionally been calculated for regions identified by the first three digits of the postal Zip Code. We plan to continue that method, which allows us to reflect climatic and insulation cost variations within a state. The results have been presented with separate recommendations for new and existing homes and for the different heating system types.

In the past, a cluster analysis was used to organize these results into regional sets of recommendations for insulation measures appropriate for new and existing house types. We also provided the results within web-accessed look-up tables as a function of zip code, home type, and heating system type.

We seek your suggestions in this area. If you prefer a graphic presentation (such as a map or set of maps), please provide your ideas regarding the number of maps or other ways to reflect differences within a geographical region due to house type or heating fuel.

Summary

An update of the DOE Insulation Fact Sheet is planned for early FY07. Comments concerning the update are invited. Please post your input on this web site, or send your input to Therese Stovall at stovalltk@ornl.gov, by 31 November 2006. Thanks for your participation in this update process.

References:

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[i] ORNL Insulation Fact Sheet home page

[ii] T. K. Stovall, Supporting Documentation for the 1997 Revision to the DOE Insulation Fact Sheet, ORNL-6907, Oak Ridge National Laboratory, Oak Ridge, TN, August 22, 1997

[iii] Zip Code Computer Tool

[iv] T. K. Stovall, Addendum to ORNL-6907, Oak Ridge National Laboratory, Oak Ridge, TN, August 2002,

[v] A. S. Rushing and S. K. Fuller, Energy Price Indices and Discount Factors for Life-Cycle Cost Analysis April 2006, NISTIR 85-3273-21 (Revised 4/06), Annual Supplement to NIST Handbook 135 and NBS Special Publication 709, National Institute of Standards and Technology, Washington, DC, April 2006

[vi] R. S. Means Company, Means CostWorks 2002, R. S. Means Company, Inc., Kingston, MA, Version 6.0

[vii] P. R. Waier, Senior Editor, Means Facilities Construction Cost Data, 11th Annual Edition, R. S. Means, Inc., Kingston, MA, 1996