Regional Technical Forum Meeting Notes

April 5, 2005
Northwest Power & Conservation Council Offices
Portland, OR

DRAFT

1. Greetings and Introductions.

RTF Chair Tom Eckman welcomed everyone to today's meeting, and led a round of introductions and a review of today's agenda. The notes from the February and March RTF meetings were approved with a few minor changes. The following is a summary (not a verbatim transcript) of the topics discussed and decisions made at this meeting. Anyone with questions or comments about these notes should contact Eckman at 503/222-5161.

2. Update on Proposed Deemed Savings Values for Energy Star Lighting in New Energy Star Single-Family Construction.

David Baylon said the only change he has made to these values has to do with what is used as the base case; he put up a table showing what the group saw last month. The proposal was for 1.6 w/sf., he said; the next question was to what degree portable table and stand lamps and other fixtures that aren't hard-wired – and therefore not a part of the 1.6 w/sf calculation – should be taken into account. The approach we decided to take was to decrement the savings in the full Energy Star lighting package by about 15%, he said. Baylon put up a table titled "Revised Deemed Savings Calculation for Northwest Energy Star New Homes" and went briefly through the numbers it contains for three options: NW BOP, advanced package and full Energy Star. The wattages per square foot for these packages were calculated at 1.60 for the base case, 1.0 for NW BOP, 0.80 for the advanced package and 0.60 for full Energy Star.

The group devoted a few minutes of discussion to the methodology Baylon used to generate the numbers in this table. As a point of process, I need to point out that the only two approved methods right now are 50% of sockets or the technical compliance option, observed Jeff Harris – it has to go through the Energy Star Northwest technical compliance process before it is approved. And that was the main purpose for this exercise, said Baylon – we wanted a deemed savings value that was at least quasi-reasonable for most Energy Star homes.

Eckman then put up a spreadsheet showing how the revised deemed savings calculation for lighting savings translates into C&RD credits; he noted that the offsets by system type are built into these calculations. The total credit runs from $135 to $470, depending on which package is chosen. In response to a question, Eckman said it is possible to normalize the total credit to square footage. How many sockets do you assume for the first case? Mark Johnson asked. Fifteen, Eckman replied; it might be 20-25 for new construction. One thing we'll need to talk about at tomorrow's Technical Advisory Group meeting is how this will play out, in terms of in-the-field compliance and keeping people from gaming the system, said Jeff Harris. My only concern is that we not create a perverse incentive for people to install 12-lamp bath bars in order to increase the number of sockets in their houses, observed Jim Lazar; if we're not careful, people will be able to add 24 sockets to a house for $100 at Home Depot, and qualify for $1,000 in rebates. Would we need to modify the whole-house Energy Star calculation if this is implemented? asked Mark Johnson. Correct, Eckman replied.

After a few minutes of additional discussion, Charlie Stephens moved that the RTF send the revised deemed savings calculator to Bonneville for technical review and implementation. Jay Himlie seconded this motion; it was unanimously approved.

3. Update on Regional Heat Pump Evaluation.

Baylon, Dave Robison and Shelly Strand led this presentation, titled "Heat Pump Research Project." Strand said there were three main pieces to this research: billing analysis, lab tests and after-market interviews. Strand and Robison went through a series of overheads (available via hotlink from today's agenda on the RTF website), touching on the following major topics:

- The CheckMe! billing analysis – project goal: evaluate the impact of refrigerant charge separately from CheckMe! tuneup.
- Sample distribution and attrition (table) – raw data received, complete data and analysis set for participants and non-participants
- Analysis methodology – weather-normalized pre- vs. post-consumption methodology; same difficulties using PRISM as in C&RD analysis; used a simplified engineering model, EZSim; etc.
- Fit of model to bills example (graph)
- Analysis results: savings estimates (graph)
- Analysis results: NAC difference (kWh/hr) – table
- Distribution profile (graph)
- Control group consumption (tables)
- Conclusions: EWEB's CheckMe! program provides an effective average savings of 360 annual kWh. These savings are small but statistically significant. There are no additional savings associated with refrigerant adjustment. The savings appear to result from improvements made by the technician in the course of testing and examining the unit.

- C&RD/ConAug billing analysis – project goal (evaluate realization of anticipated savings from C&RD and ConAug heat pump programs in various climates)
- Sample distribution and attrition (table)
- Reasons for high attrition – billing procedural change at utility, data collection change (Energy Trust), partial vacancy, occupant turnover, incomplete data
- Billing analysis methodology – PRISM regression (proved impractical), multivariable regression (successful)
- Heating-only temperature regression example (graph)
- Heating/cooling temperature regression example (graph)
- Billing analysis results: statistically significant (with 90% CI), normalized annual data robust, space heat, cooling and base load disaggregation less robust, little difference between C&RD and non-C&RD groups, Tri-Cities represents the only cooling zone
- Normalized annual consumption (NAC) – graphs
- Savings estimates by region (table)
- Savings estimates by equipment type (graph)
- Disaggregation (graphs)
- Normalizing variables (tables)
- Control group consumption (table and graph)
- Realization rates by program year base (table)
- Realization rates by region (graph)

Robison then offered the following conclusions for this part of the study:

- The study population was smaller than expected due to inability to obtain all the requested data. However, the study group of 1,022 cases is large enough for a relative precise estimate of mean savings. Breakdown of estimates into subsets of the study population suffers from missing information and small sample size for sub-categories
- Best estimate of net savings is 4,149 kWh per year and is highly significant. Best estimate for only the C&RD participants is 4,240 kWh/year.
- Savings are approximately 60% of the predicted amount. There is ambiguity because specific *ex ante* savings estimates are not available.
- There is little difference in overall savings between climate zones. However, Cooling Zone 3 exhibits more cooling consumption and savings, as would be expected
- There are significant differences between the type of equipment that was replaced. These differences do not show higher savings for furnace over zonal, as would be expected. The equipment codes also appear to be highly unreliable. thus, no conclusions are suggested based on equipment type.
- Realization rates for C&RD calculator (the new slide) – graph comparing C&RD vs. adjusted and unadjusted billing analysis for Zones 1 and 2 in 2003 and 2005.

The presentation then moved on to the Purdue University lab tests. The presenters touched on the following topics:

- Project goal: establish the charge in heat pump performance resulting from sub-optimum refrigerant charge and air handler flow
- TXV and FEO comparison – biggest impact in higher temperature bins, much smaller impact in lower temperature bins; at some temperature point, performance is actually degraded by TXV and lower charge variation
- TXV vs. FEO system at 47 degrees F (graph)
- TXV vs. FEO system at 35 degrees F (graph)
- TXV vs. FEO system at 17 degrees F (graph)
- Impact of different charges and temperatures on COP (graph)
- Impact of frost formation on heating capacity (graph)
- Impact of frost formation on COP (graph)
- Lab tests: preliminary results – degradation of COP for TXV and FEO will be less than that seen at 47 degrees; impact of defrost is potentially significant, although low charge seems to improve performance; C-sub-d tests more inclusive, but results seem to suggest higher values than those used in tables.

The RTF devoted an extensive discussion to the heat pump study results and conclusions, offering a variety of clarifying questions and comments. Many of these questions and comments focused on the reasons for the high study attrition rate, the base case assumptions used to generate the savings estimates, and the influence of coding errors. With respect to the new table of realization rates for the C&RD calculator, Baylon said Zone 2 should actually have been designated Zone 3.

Eckman noted that today's presentation is a status report only; more information will be forthcoming in the next few months. There are some issues we need to address, he said; number one is the issue of ambiguity. This adjustment assumes that what is in the billing records matches up with this analysis. It would be good if the participating utilities could provide some additional data on the houses you submitted, said Eckman; the realization rates could go up or down once we backfill some of the data from the utilities.

What if we make it simple – we've just shown that it doesn't matter what zone we're in or what equipment we have, and have an estimate of about 4,000 kWh savings, said one participant. It seems to me that we could simplify this. The upgrade-vs.-conversion question matters to cost-effectiveness, Eckman replied.

Something isn't connecting up for me, in terms of conversions vs. upgrades, said Eugene Rosolie. You seem to be saying that there are more savings associated with upgrading a heat pump than there are from converting from an older forced-air furnace to a heat pump. We're saying that we don't trust the coding, replied Strand. And you were mistrustful of the coding only after you saw these data? Bruce Cody asked. Oh, no – we were extremely suspicious of the coding before we saw these results, Baylon replied. One reason for that is that we have two sets of coding, one of which doesn't include heat-pump upgrades.

We don't have an explanation for the difference between forced-air and zonal, added Robison – that's another reason to distrust the coding. There could be any number of explanations as to why these codes were entered incorrectly, said Strand; the bottom line is that, based on the fact that we know there is some coding problem, we know there was some sort of clerical error. Because of the relationship between Bonneville and the utilities, we were specifically prohibited from making some of the cross-walks that would have made this data more meaningful, she said – if you want better data, you should consider removing some of those prohibitions.

In response to another question, Eckman clarified this issue further by explaining that part of the problem was that the baseline data received from the utilities was a mix of conversions and upgrades – in some cases, houses were included in the baseline data that already had heat pumps, rather than forced-air furnace systems. How can we resolve this? another participant asked. The first step is, again, to ask the utilities to provide additional data that will tell us more about what kinds of equipment each of the subject homes started out with, Eckman replied.

4. Presentation, Discussion and Decision on Petition for PTCS Service Provider Equivalency – Idaho Water Resources, Energy Division.

Ken Eklund led this presentation. He noted that the Idaho Energy Division (IED) began working with duct efficiency in manufactured homes in 1989 with the Super Good Cents Manufactured Home Program, and pioneered (with the Montana Department of Environmental Quality, Oregon Department of Energy and WSEO) specifications for making crossover connections structurally sound and sealed. They have conducted research and trouble-shooting on over 100,000 energy-efficient homes since 1989, resulting in better duct performance.

We are concerned because we currently rely on Climate Crafters to certify contractors, Eklund said; it's not a big deal because most performance testing work is covered by the version of this proposal that has already been approved by the RTF – we use our own home performance specialists. They own the Duct Blasters, and provide the equipment and testing on all of the Energy Star homes. Right now, our contractors are trained by David Hales; we have set up a number of dates for him to perform training in the future. We plan to continue that; right now, everyone who is trained by Climate Crafters is certified by Climate Crafters. We would simply like to be as authorized as our sister states, Oregon and Washington, to certify contractors, should the need arise. What we propose in this amendment is to be able to train them, to maintain our own database, and to decertify them if necessary, and to provide quality assurance if necessary.

We propose to offer two types of training and certification for contractors, said Eklund. The first type is one-day training, during which we would teach them what the standard is, the testing method is demonstrated, they are taught to seal ducts, and they

are taught to commission the air conditioning systems, which is a requirement of the Idaho Power service area. This certification does not include performance testing.

There is also two-day testing and certification, Eklund continued; those people would be certified in the performance testing component of this process. We would then be able to certify contractors who just seal, but understand the whole standard, as well as contractors who also do the performance testing.

What you have before you is the existing, approved document, with those additions in it, said Eklund. The group devoted a few minutes to a review of this document, offering a few clarifying questions and comments. Ultimately, Lazar moved that the RTF approve this petition; this motion was seconded by Bob Lorenzen and unanimously approved.

5. Presentation, Discussion and Decision on Proposed Revised Deemed Savings Calculator and Deemed Savings Values for Energy Star Commercial Clothes Washers.

Eckman noted that there is a spreadsheet on this issue appended to today's agenda on the RTF homepage. He noted that this item pertains to commercial clothes washers, so that the cycles per year are substantially different than would be the case in residential laundries. The machines in question are more durable and more expensive; the cost generally runs $1,000 to $1,200. What this spreadsheet does is to form two bases for savings, said Eckman; one is to take a look at a single tier, which is what we discussed on the residential side; the other is a two-tiered offering with Energy Star being the minimum, at 1.42 MEF up to 1.79. Everything at 1.8 MEF or better would be in the second tier.

In the residential laundry section, we're using two tiers with a fixed amount of credit per tier, said Eckman; I therefore built this parallel, but you can choose to offer it as a single-tier option if you so desire. He then demonstrated the deemed savings calculator, responding to a few clarifying questions and comments. Eckman noted that he did not show this as a weighted average, because it is important to show whether or not a given system is gas or electric. In response to a question from Adam Hadley, Eckman said 1.36 is the plan baseline; 1.53 is Tier 1; 2.04 is Tier 2, and 1.88 is the single-tier option – the weighted average of all commercial models presently qualified as Energy Star.

After a few minutes of further discussion, Eckman said he had heard a base case starting at MEF 1.32, and a second tier starting at 1.8, with nothing before that. I would agree with that, said Lazar. I will re-work the numbers, said Eckman, and will send them on their way. The calculator right now assumes 1.04, but I will re-calculate. We can re-base the calculators at whatever point you want to begin counting.

Ultimately, it was agreed that anything that isn't above MEF 1.36 will receive a

negative credit. Do I have a motion to re-base everything (deemed savings and deemed calculator) at 1.36, with a single tier, starting at 1.8? Eckman asked. Stephens so moved; the motion was seconded, and carried unanimously.

6. Presentation, Discussion and Decision on Proposed Revised Deemed Savings Calculator for Heat Pump and Central Air Conditioner HSPF and SEER Tradeoff Calculator.

There is some question as to whether or not this issue is ready for prime time, said Eckman. There are several calculators currently in use that are affected by the change in the federal standard for air source heat pumps starting in January 2006 – the Earth Advantage calculator, the Energy Star New Homes calculator, the Heat Pump Tradeoff calculator, the Weatherization calculator and the Mobile Home/New Home calculator. The current base case assumes a 7 HSPF and 11 SEER. The new federal standard is 7.7 and 13. Modification of all of these calculators to reflect this change will alter the savings, and will alter the requirements for making tradeoffs. Ultimately, it will be up to Bonneville to decide what they want to do in terms of payments and credits, said Eckman. If the group so decides, I can fix this calculator so that it shows what the old credit would have been, as well as what the new credit is, although that will take a fair amount of work, he added.

The group devoted a few minutes of discussion to this topic. Mark Johnson noted that BPA has placed a moratorium on changes to the heat pump credits for the remainder of this rate period, any revisions will not become effective until FY 2007. Subsequently, the group recommended that the staff wait until the RTF has had the chance to discuss the results of the heat pump evaluation prior to modifying the calculators.

7. Presentation, Discussion and Decision on Proposed Revised Deemed Savings Calculator for Energy Star New Homes.

Based on the fact that these revisions are directly related to the performance of heat pumps the group recommended that the staff wait until the RTF has had the chance to discuss the results of the heat pump evaluation prior to modifying this calculator.

8. Presentation, Discussion and Decision on Proposed Revised Deemed Savings Calculator for Earth Advantage Homes.

Based on the fact that these revisions are directly related to the performance of heat pumps the group recommended that the staff wait until the RTF has had the chance to discuss the results of the heat pump evaluation prior to modifying this calculator.

9. Presentation, Discussion and Decision on Proposed Revised Deemed Savings

Calculator for Residential Weatherization.

Based on the fact that these revisions are directly related to the performance of heat pumps the group recommended that the staff wait until the RTF has had the chance to discuss the results of the heat pump evaluation prior to modifying this calculator.

10. Presentation on Irrigation Scheduling Practices in the Northwest - Phase II: Measurement of Water and Electricity Impacts - Hossein Haeri and Kerstin Rock, Quantec, LLC.

Hossein Haeri began his presentation with an overview of the study (a copy of this presentation is available on the RTF's website). He indicated that the study was undertaken with the support of Bonneville, the Northwest Energy Efficiency Alliance and PNGC. The first phase of the study included a survey of irrigation water management and scheduling practices across the region. This phase defined scientific irrigation scheduling (SIS) and developed a baseline for its practice in the PNW. The first objective of the second phase of the study was to develop an estimate of the water and energy savings from SIS using a set of "matched-paired" fields. A second objective of this phase of the study was to develop a simplified methodology for calculating energy savings from SIS.

Mr. Haeri then summarized the major findings of Phase I of the study as follows:

General Characteristics:

- Alfalfa is the prominent crop (31% of irrigated acres), followed by wheat (17%), vegetables (10%), corn (15%), and potatoes (7%).
- 94% of farms use pressurized pump systems.
- Local utilities are the main source of power; 4% report using on-site generation.
- On-line services, primarily AgriMet, are the most commonly used sources for ET and account for 45 percent of cases.
- Sprinklers are the common irrigation system (82%); gravity systems (15%); micro-irrigation, sub-surface irrigation (3%).
- Irrigation districts (44%), groundwater (29%), surface water (24%) are the main sources of irrigation water recaptured tail water, wastewater, and other sources account for the remaining 5%.

Irrigation Scheduling Practices:

- Nearly 80 percent of farms do not use irrigation water management and only 11% use irrigation practices that meet this study's definition of SIS.

Following a brief discussion of the Phase I results, Haeri continued with his presentation. He described the Phase II study. A set of roughly 20 "matched-pair" fields were established where water and electricity consumption was measured. Water savings from SIS were derived by comparing the difference between *Actual Water Use*

(AW), based on field measurements, and irrigation requirements, *Ideal Water Use* (IW), across the two groups, that is:

$$Water\ Savings = (AW_{Treatment} - IW_{Treatment}) - (AW_{Control} - IW_{Control})$$

Ideal water requirements were calculated as follows:

$$\sum_S ET_C - R_{Eff} - \Delta SM_S - \sum_S Gross\ IR \times E_{appl} = 0$$

Where:
•Σ Gross IR_S is the gross seasonal water requirement
•Σ ET_c is the cumulative seasonal crop consumptive use of water
•R_{Eff} is the effective rainfall during that period
•ΔSM_S is the change in soil water storage during the season (the storage at end of season less the antecedent moisture)
•E_{appl} is the application efficiency, the proportion of water delivered to the field that is effectively stored in the root zone for use by the crop

Once ideal water use requirements are know they can be compared to actual water use to determine the water savings from SIS. Energy savings are then computed as follows:

$$ElectricitySavings = water\ savings \times \frac{TDH}{PPE} \times PCF$$

Where:
•TDH = total dynamic head (pumping lift, pressure and head loss)
•PPE = pumping plant efficiency
•PCF = a factor to convert energy use from units of force x distance to kWh

Kerstin Rock then demonstrated a spreadsheet calculator (available for download on the RTF website) that can be used to compute annual water and electricity savings from use of SIS. This calculator allows the user to enter in crop and soil type for a given local as well as information about the irrigation system (design capacity, suction lift, discharge lift,etc.) to compute annual energy and water savings. Rock said that this calculator is in draft form and that Quantec and Bonneville would like feedback on its functionality.

Lazar asked if the value of the water for energy production that is not withdrawn from the river was included in the calculator. Rock indicated that it was not. Lazar noted that the RTF had analyzed this value when it submitted its original recommendations to Bonneville and that he felt the calculator should included these savings. Eckman indicated that he would pass the RTF's analysis along to Quantec.

11. Next RTF Meeting Date.

The next meeting of the Regional Technical Forum was set for May 17. It will be held in the Pacific Northwest Generating Cooperative's (PNGC) Conference Room. PNGC is located at 711 NE Halsey St. Portland, Oregon. Meeting summary prepared by Jeff Kuechle.

Regional Technical Forum Meeting Participant List
April 5, 2005

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