

Regional Technical Forum Meeting Notes

August 30, 2007

DRAFT

1. *Greetings and Introductions.*

Tom Eckman welcomed everyone to today's meeting, held August 30 at the Council's Portland offices. 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.

The minutes from the July RTF meeting were approved with a few minor edits.

2. *Review of Vending Machine Market Characterization Research.*

Charlie Grist said that this study is now completed. The that reviewed the report believes that there is cost-effective savings potential in new vending machines. The subcommittee also believes that this market should be approached on a regional basis, because there are only a few vending machine market actors. We could probably tackle this issue with a consistent region-wide approach, Grist said.

We sent out an RFP for a study to characterize the vending machine market, he continued; a company called Quantec was awarded the contract. Their study produced some very interesting findings – so interesting that I am very glad we decided to do the study, Grist said. He introduced Doug Brooks from Quantec, who led this presentation.

Brooks touched on the following major topics:

- Research questions: who are the major actors, how big is the market, how old are the machines, what are the latest market trends, how often are machines replaced/refurbished, what energy opportunities exist?
- Study methodology: interviews, literature reviews, information synthesis
- Interview results – manufacturers, vendors, bottlers

- The Pacific Northwest vending market: 120,000 machines, the majority between 7-11 years old, consuming a total of 400 million kWh/year, average field life 10-15 years but can last much longer. Between 5 and 10 percent of these machines – a total of 6,000-12,000 – are replaced with new machines each year.
- All new machines coming into the market are at least Energy Star Tier I.
- Coke and Pepsi dominate the market with 90 percent of refrigerated machines.
- Vendors closely track machines
- Glass fronts are becoming more popular
- Number of machines by state and vintage
- Energy efficiency options, by machine vintage
- Energy Star refurbishment
- Early replacement – feasibility, potential free ridership problems

Brooks offered the following programmatic recommendations:

- Delamping for pre-1996 models
- Thermostat controls for 1996-'99 models
- Fan motors for more recent models
- Software controls – low cost and significant savings, but need to overcome vendor reluctance
- Rebates and incentives for new equipment, possibly tiered depending on machine age

Brooks then touched on the following remaining questions/issues:

- Any rebate program to encourage the installation of higher-efficiency components during retrofit will depend on a steady and sufficient supply of the necessary components
- If bottlers can get their hands on those components, do they have the know-how to install them?
- Encouraging a regular refurbishment cycle would provide more opportunities for energy efficiency improvements
- Interest and awareness are major issues for bottlers, the key market actor for any sort of energy efficiency improvement program.
- What incentive level/program is appropriate?

The energy bills for vending machines are being paid by the hosts, so aren't they really the key actor when it comes to demanding energy efficiency improvements? Jeff Harris asked. The bottlers aren't paying the energy bills, but unless you're a large host site, such as a university, you don't have a lot of influence, because the bottlers just show up with their machines, Brooks replied – it's only at the contract points that the hosts could exert significant influence. Bottlers have little motivation to implement energy efficiency improvements, one

participant agreed. Bottlers do see energy efficiency as potential market leverage for use against their competitors, however, Brooks noted.

Is it possible for the equipment manufacturers to pre-set the controls on their machines to make them more energy efficient? One participant asked. They aren't pre-setting them right now, but there is some emerging technology – I believe it's called a "Night Light" mode – a smart setting that dims lights and anticipates lighting turn-off through usage patterns, another participant replied. There is some reluctance to pre-set controls currently because the machines are typically sent to regional centers, then shipped out to the bottlers who need them. The place to do that might be at the distribution center level, he added.

In response to a question, Brooks said the control settings are essentially timers that power down the machines when they are not in use. That capability is there, built in to the new machines, but those capabilities are not typically being used, he added. And the majority of post-1996 machines have this capability? David Baylon asked. We don't see a lot of software capabilities in pre-1999 machines, was the reply.

Brooks observed that this exercise was designed strictly as a market characterization study – clearly more exploration is needed before you could design another program. With that in mind, said Grist, we have scheduled another meeting of the vending machine subcommittee in a couple of weeks to take this study, and the issues that have been raised, and discuss what steps need to be taken in crafting a program.

One issue is that you have older machines, you have an average existing life of, say, nine years; you also have a measure life of three years, said Bruce Cody. That leaves three years. It will take at least a year to design a program, and another year to get it operational – that means there isn't a lot of time left in this measure life. That's going to make it very difficult to design a program, Cody said. Actually, the useful field life for these machines is more like 12-15 years in top-tier locations, said Brooks; after that they're typically moved to second-tier locations such as warehouses or gas stations. The point is that we need to look at all the cohort vintages individually, said Grist, and the question is, do we need to design something specifically for this cohort that's going to live on? If so, what is it, and will the bottlers be amenable to implement it? Grist also reminded the group that the RTF does not design programs, although it is willing to work with the utilities on program design if they believe such a program to be desirable.

The group discussed Tier II refurbishment opportunities; one participant noted that there simply aren't a lot of Tier II retrofit kits available. Once you estimate what the energy savings would be if you retrofit a Tier I machine to make it Tier II, the cost-effectiveness doesn't look very favorable, he said, adding that the kits that are currently available include the VM2-IQ from USA Technologies, which bottlers are generally reluctant to install. In other words, it may make sense to

encourage component-by-component upgrades, rather than trying to incent the use of the kits. You can get most of the savings with a thermostatic control that costs \$50-\$150, he noted; it is also easily field-installable. In response to another question, he said that the cost of replacing newer machines is probably prohibitively high, but that bottlers would likely be open to incentives for the early retirement of pre-1999 machines.

It was noted that the Energy Star program considers vending machine software to be an add-on bonus of 20-30 percent – the Energy Star savings calculations are based on the mechanical components in the Tier II package. So the combination of the software and the mechanical upgrade could push the savings above 2,000 kWh/year per machine? Baylon asked. Yes – that’s possible, was the reply, although thermostatic controls are already built into the machines built in the last two years. Grist asked that any additional thoughts the RTF may have on this issue be provided to him prior to next Friday’s vending machine meeting.

3. *Presentation and Discussion of Treatment of Productivity and Other Non-Energy Benefits on Total Resource Cost-Effectiveness Determinations.*

Grist noted that Reid Hart of EWEB had asked the RTF to consider this issue, because of his utility’s belief that there may be enough value in productivity and other non-energy benefits to justify their inclusion in Total Resource Cost calculations. Grist said he had agreed that the RTF could discuss this issue, hence this agenda item.

Hart then provided a presentation, touching on the following major topics:

- The problem: the cost-effectiveness barrier
- The challenges involved in calculating the energy portion of a new building project – for example, some equipment may have purposes other than energy efficiency
- The analysis of “other” benefits should be appropriate for a hurdle rate – it’s not the same as a kWh savings calculation
- Pilot project example – Ecolight fixtures
- Potential productivity measures with other benefits: daylighting, view access, other green features: better ventilation and maintenance, commissioning improved controls, sustainable practices that improve occupant attitude toward the building.
- Where other benefits exist to potential energy savings measures, EWEB believes the TRC calculation should allow project eligibility, either by providing for O&M savings, or allowing a cost split between the energy portion and another benefit.
- Method of calculation needs to be kept as simple as possible
- Verification should not be required.

Hart introduced Dave Hewitt, who briefed the RTF on the following topics:

- List of items in the built environment related to energy-using systems that also influence comfort, health and productivity, including the presence of daylighting as an architectural feature, the quality of electric lighting design, adequacy of fresh air etc.
- Carnegie-Mellon University's Building Investment Decision Support tool (demonstration and results)
- Links between lighting and strategic business outcomes
- The importance of "green" features to successfully marketing new office buildings
- Common features of the top "green" buildings in the country: daylighting, advanced control systems, natural ventilation

Hewitt offered the following conclusions:

- Productivity improvements associated with improvements to energy systems are real and well-documented
- The business community is acting on these messages of improved productivity associated with better, more sustainable buildings
- Finally, while it may be difficult to assign a financial value to productivity, it is substantially more than zero.

Did the Carnegie-Mellon work compare good practice to typical practice, or did they just compare good to bad? Fred Gordon asked. They are picking out studies that they believe have value in understanding what's happening in the market, so you can't really make a generalization about the type of studies they have, Hewitt replied. There are case studies in their data, such as a building that did a retrofit of its lighting design. In other words, the Carnegie-Mellon work isn't a monolithic block – it's just a series of studies, each of which has something to recommend it, Hewitt said.

One conundrum I see associated with this issue is, is it possible to tie the energy measure to the characteristic that buys you the productivity gain? Grist said. With respect to personal temperature control, for example, there are probably some physical things that you could tie to both increased productivity and energy savings, but when you're talking about, say, better lighting design to reduce glare, you could achieve that without energy efficiency gains. How do we tie the characteristics that are buying productivity to energy efficiency, with any certainty? Grist asked.

My suggestion is, if you're not able to invest in energy-related systems that lead to greater productivity, you're not going to have any control, Hewitt replied. If you want to get the energy efficiency and the other things in, then you might want to be in a position to get it past the TRC test, he added.

Next, Didi Chapelle discussed the office real estate market, and current trends within the industry. She described:

- Her background
- How do you assess and value the attributes of energy efficiency and sustainability within the real estate industry. Answer: there is a lot of interest in finding a way to evaluate the costs and benefits of energy efficiency and sustainability, but at this time, there is no formula for doing so.
- Savings such as lower O&M costs, tenant improvements and reduced capital reserves flow directly to net operating income, which can be reflected in value
- Productivity increases and tenant satisfaction are difficult to quantify, but survey data show that these can have a direct impact on property value. One way to measure this is lower “churn,” or tenant turnover, and higher occupancy.
- One question: what do you do with qualitative values? Risk assessment isn't all about numbers
- What the market values, from an investment perspective, is market value.
- Examples from recent real estate transactions, including the Leed-certified Henry condominiums in Portland, which sold out months before completion at a premium price point and has enjoyed higher-than-market-average resale values, and the Louisa, which has among the highest occupancy rates and lease prices in the Pearl District. Tenants in the latter building say they value quality of life above all other attributes.
- Indications of the importance of energy efficiency outside the Pacific Northwest
- One of the most important issues in commercial real estate investment is risk mitigation. Investors want to know what's likely to go wrong as much as they want to know what's going to go right. Buildings that do not incorporate energy efficiency and sustainability face increased risk, including earlier functional obsolescence, regulatory risk and diminished capital investment.

This is a compelling case for incorporating energy efficiency into building design, but what happens when you take it to a developer? Baylon asked. There is no definitive answer – costs and benefits are evaluated on a project-by-project basis, Chapelle replied. The development community needs to be educated on these issues, she added.

In closing, Hart said EWEB needs to get projects into shopping carts. The first question, he said, is, does this even fit within the TRC? If the answer is no, then we'll go home. If it's yes, then I would propose that a methodology be developed to come up with a number for an individual building – something we could apply

as an interim measure, today, Hart said. Finally, looking to the future, is there a simpler method we can arrive at?

So the first question is, does this belong in the TRC? Hart said. Is there a method we can apply today to the project I have been waiting for approval on for three and a half months? We have stuff in the pipeline, and if we don't capture some of these measures, it will be a lost opportunity, said Hart.

Hart again asked whether the RTF feels it would be reasonable to include productivity or cost split into the TRC calculations. If so, can we develop a methodology that we can implement fairly quickly? He asked. Jim Lazar described a potential methodology he and Eckman had developed to address non-energy benefits in 1992. Ultimately, Eckman asked whether there is enough RTF interest in this issue to justify the formation of a subcommittee to consider Hart's requests to incorporate productivity and/or other non-energy benefits into the TRC calculation, despite the difficulty in quantifying the benefits of such measures. There are always going to be marginal measures that consumers are willing to pay for independent of their energy value, Eckman said – we may as well address this as a global problem. Eric Brateng, Mark Johnson, Adam Hadley, Jim Lazar, Jeff Cole agreed to serve on this subcommittee. ETO staff (Daniel Gidding) assist in coordinating the subcommittee.

Eckman noted that there are two issues raised by Reid's presentation. The first is Bonneville's current policy of not including non-energy benefits in the TRC calculation. Eckman indicated that in his view the RTF does consider non-energy benefits, such as productivity as a legitimate addition to the benefits of some industrial projects. The RTF affirmed its position that this is indeed the case and indicated to Reid that he should communicate this to his Bonneville contact. The second issue raised by Reid's presentation is how to address the quantification, monetization and documentation of non-energy benefits in day-to-day program operation. This, Eckman said, is the primary problem to be addressed by the subcommittee.

4. *Discussion of Cost-Effectiveness Methodology and Presentation, Discussion and Decision on Protocol for Establishing Incremental Cost for High Efficiency Heat Pumps and Central Air Conditioners.*

We use TRC to consider all costs and benefits no matter who receives them or pays for them, Eckman said – that's the boundary condition. Under the Power Act, we (the Council) is directed to account for all of the expenditures for conservation, not just what the utilities pay, he said. In fact, when the Act was passed in 1980 utilities were adamant that we include all conservation's costs when comparing conservation to new generation. This policy kept us from doing some really silly things, such as buying woodstoves for everyone back in 1980.

We use TRC to avoid double-counting of benefits or costs, Eckman continued. When we deal with the question of how much of the non-energy benefits we should count, we need to make sure that we exclude the energy benefits from that part of the equation, to avoid double counting.

Eckman then led a presentation titled “Cost-Effectiveness Screening – Issue for RTF.” He touched on the following major topics:

- Why the RTF uses TRC (avoids promoting measures that may impose non-energy costs on others, Act directs the Council to give second priority to the use of renewable resources; analysis in the 1st Plan concluded that the cost of using wood stoves to offset the use of electric heat was below the cost of electricity from new generating facilities, but the 1st Plan excluded use of wood heat due to “non-energy cost” (pollution) to the region).
- Why the RTF uses TRC (con’t): expands the list of conservation options by considering quantifiable “non-energy” benefits
- Application of TRC to projects and programs – “What’s the incremental cost?” It is not always practical and/or possible to quantify the incremental cost of non-energy improvements
- Joint product problem: incremental cost of energy efficiency improvements (e.g. dishwashers) (graph)
- Joint product solution: base incremental cost on “minimum cost to achieve efficiency (e.g. dishwashers) (graph)
- Joint product problem: incremental cost of clothes washer energy efficiency improvements (graph)
- Joint product solution: “minimum cost to achieve efficiency” doesn’t always work, e.g. clothes washers (graph) Sometimes higher efficiency costs less: average retail price of Energy Star clothes washers (table)

Eckman then turned to the discussion of whether the RTF’s current estimate of the incremental costs of air-source heat pumps reflects their actual incremental costs in the region. BPA has received comments that high efficiency heat pumps are costing considerably more than RTF estimates. Eckman said it appears that there is significant difference between incremental “cost” and incremental “retail price.” The question for the RTF is which value should we use in determining the cost effectiveness of high-efficiency heat pumps and central AC? Eckman then presented slides showing heat pump cost estimates from various sources:

- Cost to consumers of HSPF7.7/SEER 13 – three ton heat pump (current RTF estimate vs. STAC vs. online estimates) (graph)
- Cost to consumers of HSPF 8.5/SEER 14 – three ton heat pump (graph)

- Cost to consumers of HSPF 9.0/SEER 15 – three ton heat pump (graph)
- Incremental “cost” to consumers of HSPF 8.5/SEER 14 three-ton heat pump (graph)
- Incremental “cost” to consumers of HSPF 9.0/SEER 15 three-ton heat pump (graph)
- Incremental “cost” to consumers of PTCS system commissioning (graph)
- So what’s your call: the incremental cost of high efficiency heat pumps (and central AC) should be based on: current retail market prices (STAC), incremental equipment cost from online data sources adjusted for contractor markups, engineering estimates of incremental cost (DOE), or other?

The group devoted a few minutes of discussion to this topic, offering a few clarifying questions and comments. Did your estimates take brand into consideration? Bruce Manclark asked. Performance only, Eckman replied – if it had an ARI-rated performance, that’s all I looked at. The issue before us today is the difference between cost and price.

In response to a question from Manclark, Eckman said that roughly 80 percent of the benefit the region is getting out of upgraded equipment, with commissioning, is from duct sealing, system conditioning and controls. The other 20 percent is from equipment efficiency improvements, Eckman said. However, we do better in Zone 2 than we do in Zone 1 because the auxiliary heat control has more effect, added another participant.

The issue may be a little different than what you’ve posed here, said Harris. From AC Direct, you have real prices for just the box cost, and you have an incremental number there that’s relatively low. If the market was truly competitive, it would drive prices down to this lower level. Part of the problem is that heat pumps account for only 10 percent of the heating systems in new construction – it isn’t a very competitive market. The industry is still trying to recoup its losses from going to 7.7 and SEER 13, he said, and the market simply isn’t very competitive. The online market is competitive; the rest of it is what you might call profit-taking. From the Council’s perspective, looking long-term at whether something ought to be included in the supply curves, you need to take an incremental cost somebody could get it for, as the threshold test. That’s what we’re doing now, if you look at the DOE numbers, Eckman said. Hales pointed out that approximately 25% of the contractors who responded to the STAC survey indicated that their cost for heat pump upgrades were very similar to those currently used by the RTF and comparable to those Eckman had obtained from the online sites. In his judgment, these costs are probably more representative of the competitive market conditions that Harris described.

Manclark noted that while heat pumps may account for only 10 percent of the new-home heating systems, they are becoming increasingly popular in retrofits because there is growing recognition that heat pumps are the cheapest way to heat your home. Sometimes the contractor has to decide whether to bid a job as PTCS or non-PTCS. I think if we were to separate the standard, and choosing whatever the incremental cost standard ought to be in going from an 8.0 to an 8.5, that could allow someone who couldn't necessarily afford an 8.5 machine to still enjoy the benefits of PTCS, which is where most of the savings are coming from, Manclark said. But right now, we're pricing a whole segment of the marketplace out because they can't afford the high efficiency equipment. Eckman noted that there is a measure for duct sealing and system conditioning for retrofits. What we haven't signed off on is new construction with that measure, Eckman said.

The group devoted a few minutes of discussion to this issue; among the topics debated were price, incremental cost, real-world market anecdotes, the difficulties inherent in collecting accurate price data, the difference between "price" and "cost," and how labor costs break out from equipment costs in these installations.

Ultimately, it was agreed that the RTF would continue to use its current incremental cost estimates for high efficiency heat pumps and central air conditioners. In addition, Eckman was directed to create a set of deemed measures for PTCS duct sealing, system commissioning and control savings in new residential construction. Since this involves simply separating the current deemed savings estimates from high efficiency heat pump upgrades into its component parts, the RTF agreed that it did not need to review these prior to their being added to its online Planning, Tracking and Reporting system.

5. Presentation and Discussion of 2008 RTF Work Plan and Budget.

Eckman said this is the first opportunity to discuss items the RTF would like to work on in 2008. We have a clean slate at the moment, he said, and are open to suggestions about where we should focus our attention and money. We will spend most, but not all, of our 2007 budget, so there will be some carryover funds available, Eckman said.

The group offered a series of suggestions:

- What does conservation do on needle peak? Load shape and the contribution of various conservation measures to summer and winter coincident and non-coincident peaks. What we don't have is good information on system margin losses on-peak, Lazar said.
- Another phase of coordinated work on economizers
- Ductless mini-splits in existing homes – coordinated market research is very high on some RTF members' lists

- The 15% deemed issue for new small construction – a more ambitious look
- Hotel room energy management (power door interlock switches)
- A reconsideration of the issue of default CO2 values, based on the recent findings from the EU and California markets
- Commercial kitchen equipment – combination ovens, convection steamers, ware washers, ventilation hoods etc.: savings and cost effectiveness estimates, for starters
- Below-grade and ground contact heat loss calculations for SEEM and general modeling
- Savings from programmable residential thermostats
- Sociological field testing of home energy monitors as an efficiency device
- Coordinated incentive testing among utilities
- Tankless water heaters (electric and gas) – should we be offering incentives?
- The end-use split measurement question – commercial end-use load studies haven't been re-done for about 20 years. Where does energy go in commercial end uses? The same issue could be raised in residential.
- DOE is interested in getting back into energy efficiency; they would like to better understand how new high-performance buildings are actually performing.
- How do we bundle field-test next-generation residences and commercial buildings – especially net-zero projects?
- More than 1,000 Super Good Cents homes were triple-metered in the 1980s, and those meters are still turning – it might be interesting to see what those meters are saying today, because they haven't been studied since 1989.

Eckman said the RTF will take this issue up again at its October meeting; he asked the RTF to send him or Grist any additional ideas they may have. He said he intends to release the draft RTF work plan for public comment prior to final adoption by the group.

6. *Presentation and Discussion of Proposed Prescriptive Specifications and Evaluation Plan for New Small Office Program.*

The purpose of this agenda item is to discuss potential deemed savings for a subset of the commercial new office market, Grist said. These are simple buildings, most spec-built, and developers are looking for a list of things to do that would be better than standard construction.

Grist's presentation touched on the following major topics:

- Energy Smart office prescriptive package of measures which exceed code (table): cooling system minimum efficiency level, effective window u-value, window SHGC, enhanced economizer, integrated design of HVAC system, whole-building lighting budget, lighting controls
- Next steps: obtain additional feedback from architects, engineers, commissioning agents, building owners, developers and property managers. A program theory, goals, success metrics and outreach program are being developed. An evaluation plan will be developed by the end of the year. Additional materials and resources will be developed.
- Sample Energy Smart office prescription letter
- Program incentives
- Incremental costs of the package

Grist then offered his small office savings analysis:

- Summary: tested a dozen measures, tested sensitivity to climate, building size, HVAC system type, baseline assumptions. Findings: HVAC system type and baseline assumptions impact savings estimates; climate and building size are not big factors; package savings show modest range due to compensating effects of package.
- Electric site savings all measures (graph)
- Electric savings by measure (graph)
- Mean gas savings by measure
- Interactive electric savings from LPD – by system type for Boise and Seattle (graph)
- Interactive electric savings from HVAC equipment (graph)
- Windows: savings are sensitive to baseline assumptions for U and SHGC, measure U value and SHGC interact, system type, window area, window/wall ratio, climate, other measures in package
- Window baseline assumptions (graph)
- Interactive electric and gas savings from windows (graphs)
- Electric savings from economizer commissioning (graph)
- Measure cost estimates (graph)
- Measure cost per unit
- Measure TRC cost effectiveness – Seattle (graph)
- Measure TRC cost effectiveness – Boise (graph)
- Package TRC cost effectiveness (graph)
- Electric bus bar savings all measures (graph)
- Weighted savings and B/C (table)

One possible approach would be to create a look-up table that users could run specific buildings through, Grist said. In terms of a final number, we are proposing 1.9 at the site and 2.0 at the bus bar. The goal is to get something out on the street so that we can run M&V and find out if it's 2.0, or 1.0, or some other number, Eckman said.

The group devoted a few minutes of discussion to this topic, offering a few clarifying questions and comments. Baylon observed that the HVAC design element is the key to the success of this measure. Ultimately, it was moved that Grist and Eckman take this measure and run with it as proposed; this motion was seconded and unanimously approved.

7. Energy Star Clothes Washers – Residential and Commercial Tiers.

Eckman noted that some of the Seattle-area utilities have requested that they be allowed to offer three tiers, rather than two tiers, for residential clothes washers. The third tier would be 2.2 and above. He provided a table showing the various tiers and bins for this measure. All of the cost effectiveness ratios look really good, Eckman said.

On the commercial side, I forgot that, after April 1, we were supposed to truncate the tiers from two to one, Eckman said. Again, the B/C ratios look very good for this measure. Lazar moved that both requests be approved. One participant noted that his organization is running a commercial washer program for the California utilities. Who is accumulating the data for commercial washers up here? He asked. I have the data on commercial washer equipment, but it basically uses the California CEC database in terms of product availability, Eckman said. After a brief discussion, Lazar's motion was seconded and unanimously approved.

8. Updates.

Tim Steele asked that the grocery store M&V be reconvened to consider recent developments, including a plan to pay for gaskets and door closers, and the recent BPA report on strip curtains.

Greg Styles updated the group on bathroom LED motion sensor nightlights; we are doing pre- and post-monitoring at five rooms in the Lloyd Center Doubletree Hotel. We're wrapping up the 10 days of pre-install monitoring; the units will be installed next week, after which we will do 10 days of post-installation monitoring, Styles said. The rooms will be 100% occupied during these periods, he added. We're looking forward to getting the results and comparing them to the results from the similar study that was done in Sacramento. We will update the group further at the RTF's October meeting, he added.

9. Next RTF Meeting Date.

The next meeting of the Regional Technical Forum was set for Tuesday, October 9. Meeting summary prepared by Jeff Kuechle, NWPPCC contractor.