

Regional Technical Forum Meeting Notes

October 19, 2004
Northwest Power & Conservation Council Offices
Portland, OR

DRAFT

1. Greetings and Introductions.

The October 19 Regional Technical Forum meeting, held at the Northwest Power and Conservation Council's Portland offices, was chaired by Tom Eckman. The following is a summary (not a verbatim transcript) of the items discussed and decisions made at this meeting. Anyone with questions or comments on these notes should contact Eckman at 503/222-5161.

2. Presentation and Discussion of Proposed Irrigation Water Management Program and Deemed Savings Circulation Protocol.

Paul Stoker, executive director of the Columbia Basin Groundwater Management Area, led this presentation, titled "Irrigation Water Management (IWM): Opportunities and Results." He touched on the following major topics:

- The Columbia Basin groundwater management area – covers Grant, Lincoln, Adams and Franklin Counties in east-central Washington (map)
- Irrigated acreage by crop in the Columbia Basin (table)
- IWM – acres requested vs. acres assisted, 2000-2004 (graph)
- Sources of Columbia Basin IWM funding, 2000-2008
- IWM saves water and power resources by encouraging irrigators to implement irrigation water management technologies, and to conserve water and electricity
- Example of Evapo-Transpiration based on irrigation scheduling – kw/h per acre, inches of water per acre, potato yield tons/acre for participants and non-participants (table)
- IWM soil moisture graph
- Nitrate movement in soil – native soil, continuous high leaching, maximum management potential (graphs)
- IWM 10-point plan criteria – measure and document the PCC value for each irrigation system, determine the amount of water delivered to an area (known application rate,

- determine when irrigation water should be applied etc.
- Why the 10-point plan is successful – contract signed pre-season, with payment only upon completion; site-specific to each field, program implementation oversight, credibility with agricultural community, required documentation forces grower to actively participate, 50% cost share by growers buys grower involvement, etc.
- Columbia Basin IWM benefits – monetary incentives can provide significant conservation investment returns, variable rate cost-share program specifies savings by crop and location, incentive payments are based on potential savings, IWM saves water and power at the field, water not diverted from lake Roosevelt for irrigation has high value
- Conservation benefits spreadsheet – spreadsheet calculates the potential water and power savings by using IWM in the Columbia Basin, four main variables can be entered to customize the spreadsheet to a given scenario, spreadsheet creates a variable cost share value based on different crops and locations, summary on the spreadsheet can demonstrate total conservation benefits.

The bottom line, then, is that you're saying that this program could result in \$15 million in annual energy savings, from a program that costs just under a million dollars a year? asked Jim Lazar. That's correct, Stoker replied. That sounds relatively cost-effective to me, Lazar observed. Stoker noted that there are a number of reasons the program has been so successful: that it is a local program, operated by local people who understand the agricultural practices in the area; that because they have local credibility, they have been successful in motivating local farmers to participate in the IWM program; that they have been diligent in documenting the program, and that the 10-point plan has been very successful.

If you had twice as much money, could you get twice as much acreage participating in the program? one participant asked. That's an interesting concept, Stoker replied – yes, basically, I think that is correct. We can make a program in which you would get so much per kw/h saved work, he said.

Is it primarily an up-front capital cost issue for the farmers, in terms of deciding whether to participate in IWM? asked another participant. I would say that 95% of the program is on an annual basis, Stoker replied. The other factor is that you have to have a core of sophisticated service people to keep these systems up and running. So there are substantial annual costs? another participant asked. Correct, Stoker replied – for a real-time monitoring system, it costs about \$16 per acre, of which the farmer has to pay \$8. It works pretty well for high-value crops, but not quite as well for low-value crops, in terms of asking the farmers to pay their share. However, if we had the money – about \$8 per acre – we could sign up 400,000 acres next year. In response to another question, Stoker said the use of flood irrigation is diminishing in the groundwater water management area; it is very difficult to use IWM in fields that are flood-irrigated.

Eckman noted that the task, for the RTF, is to identify the baseline farming practice for a particular acreage, in order to establish the incremental improvement in water management, and therefore kw/h. We need to be able to say, OK, here's the average practice today, and here's how we're incrementally improving that with a given suite of incentives. That's going to be difficult

to do, Stoker replied – how do you find a baseline amidst progress in management concept changes over a 3-5-year period? We have struggled with finding a way to compare a baseline to an improvement, Stoker said; we had to find a farmer who had never heard of IWM, but had a similar crop, soil, location and system, and compare him to someone with a similar crop and system who was using IWM effectively. Those kinds of comparisons are hard to come up with.

Eckman noted that one of the things that separates this proposal from other irrigation water management proposals is the 10-point agreement, which will provide verification that something was actually accomplished. What we still don't have, however, is an understanding of what their practices were before we started talking to them. We need to resolve that baseline problem. The problem is not only how to arrive at a baseline, but defining what SIS was, and what we mean by water management observed Hossein Haeri. What we need to do is to make an executive decision; in my study, we define SIS and IWM the same way that GWMA does. Having that definition in place will make it a lot easier to define a baseline. True, and that's what's attractive about the 10-point program, Eckman agreed. My vision of how this would lay out is to say, here's the 10-point program and its associated contract; if you want to qualify, then you have to follow that. With some additional measurements that they have to achieve, noted Haeri.

Couldn't we track historic releases from Banks Lake, which Reclamation keeps tabs on, to establish a baseline? asked another participant. Yes, but acreage and crop types change, Lazar observed. I'm satisfied that, with some more discussion, we can arrive at a satisfactory definition of the baseline, said Eckman. I would note, however, that if we cease our incentives, the IWM acreage will deteriorate rapidly, said Stoker. In particular, we have to continue to incent the potato growers, because they're at the top of the heap, in terms of the social structure among our local farmers.

We're talking about a \$30-\$40 million return on a \$1.5 million investment, noted one participant – how large does the return have to be before we can endorse this program? I agree, said Lazar. I think we have enough information to move forward, said Eckman; obviously this is a highly-leveraged investment, and there is a high level of interest in securing it. I will continue to work with today's presenters to figure out how we can bring this back to the RTF as a specific proposal, he said.

3. Presentation, Discussion and Decision on Proposed City of Ellensburg Solar PV Research and Demonstration Project.

Eckman distributed various documents regarding the proposed Ellensburg solar PV project, including a letter from City of Ellensburg resource manager Gary Nystedt to BPA's Mark Johnson describing the project, a project description paper titled "Ellensburg's Solar Electric Project," another paper laying out the criteria for the evaluation of proposed renewable resource research development and demonstration activities, and spreadsheets detailing the project's costs (\$280,000) and timeline (groundbreaking on Earth Day – April 22, 2005, with completion by July 2005). Nystedt provided an overview of the City's aggressive approach to conservation and renewables, then described the proposed project, a community-based, highly-

visible, grid-connected, centralized solar electric project that will give local Ellensburg customers the opportunity to invest in locally-produced clean electricity. The initial phase of the project will be 80 solar panels generating 24 kW, expandable to 165 kW within 5-10 years if successful.

Nystedt noted that the financing for this project is quite innovative; he drew the group's attention to the project cost spreadsheet. The costs will be shared between Ellensburg customers, who will be the primary source of funds for the solar modules, and the City of Ellensburg, which will pick up most of the remaining costs. The City is also seeking grants, private donations and volunteer help for this project.

Mark Johnson noted that, under the CRD guidelines, there are two ways to claim PV systems – there is a deemed savings, and there is a \$20,000 exemption for renewables RD&D. Obviously Ellensburg would like to spend more than \$20,000 on this project; he is therefore asking this group for a recommendation that he be allowed to do that. Because this has an educational component, and because of its high visibility, in my opinion, it is worthwhile for the RTF to consider, Johnson said.

Nystedt noted that one of the things that hurts Ellensburg is that it is small; because of that, our C&RD discount funds amount to \$97,000 a year for five years. Even with your approval, we're limited to 20% of that going toward this project. As I was looking through the criteria, there is a section labeled "key fetures;" one of those key features is local control over funds spent, said Nystedt. We are somewhat unique because of the high degree of emphasis we've put on conservation in the past, and would like to see whether there is a possibility, given the limited funding available to us, of going beyond the 20% criteria in putting our C&RD funds toward this project.

After a few minutes of discussion, Lazar moved that the RTF recommend to Bonneville that the Ellensburg solar project be treated as renewable RD&D. This motion was seconded and unanimously approved. Thank you, said Nystedt, and we'll kepp you informed as to how it's going. He asked any RTF participants who might know of avenues to additional funding to contact him directly.

4. Presentation and Discussion of Regional Heat Pump Evaluation Project.

David Baylon reminded the group that, about a year ago, the RTF developed a scope of work and a set of goals and protocols for assessing heat pump performance. The purpose of this research was to compare the assumptions used by the RTF to calculate the savings with field measurement data and billing history analysis using actual heat pump conversions. In the late summer of 2004, Ecotope was awarded a contract through a competitive bid process to pursue that general scope of work. The project is being managed by the Alliance with funding from the RTF, the Alliance, Bonneville and the Energy Trust of Oregon. The project goal was to try to assess the accuracy of the engineering calculations and to used field survey and measurements to confirm or revise the various components of that calculation. Baylon stated, that in the RTF's deemed savings calculation procedures there are numerous assumptions; we hope this project

will determine whether the calculation formulation we've been developing over the past five years actually delivers something resembling an assessment of heat pump performance.

One other significant detail is that what the C&RD spreadsheets tell us is that, in the absence of certain installation practices, we will lose somewhere between one-half and two-thirds of the savings the heat pump was supposed to generate, said Baylon. You can go to places in the region – Idaho and Montana, for example – where they see that savings is nowhere near as large as what we project because the RTF installation specifications are not “current practice.”.

This research project is using three different performance assessments, Baylon said. The first is to measure heat pump performance at the laboratory level. At previous meetings, the RTF has discussed on the lack of data on the impact of air flow across the inside coil and incorrect refrigerant charge on actual heating performance. In this phase of the project, Purdue University's Engineering Laboratory will measure the heating and cooling performance in a climate controlled lab over a range of air flows and refrigerant charges to determine the impact of these variables on part load efficiency, defrost cycle use and system capacity and system efficiency. This research will provide data that will improve the ability of the RTF to improve system sizing and air flow and refrigerant charge specifications for systems that are primarily used for heating, he said.

The second component of the research is to develop a better understanding of current heat pump sizing and installation practices. Baylon noted that the RTF has had to make some very heroic assumptions about current installation practices across the region. This phase of the research is focused on gathering systematic information on what practices around the region are and determining whether they are consistent with current RTF assumptions.

The goal of the third phase of this research is to attempt to ascertain what the savings from air source heat pump conversion under the C&RD program? This is part of the due diligence that the RTF and Bonneville exercise to ensure that savings assumptions used in C&RD are reasonably accurate.

Moving on through his presentation, Baylon touched on the following major topics:

- Where (in what areas of the Northwest) do heat pumps work?
- Where are there enough heat pumps to conduct a valid billing analysis?
- What really happens in the field? – thermostat behavior, thermostat performance, thermostat impact on heat pump performance, reset capability, fan flow specs, refrigerant charge
- What constitutes optimum charge for the heating side, and what constitutes optimum charge for the cooling side? How “optimum” is “optimum,” in terms of charging for cooling rather than for heating?
- The airflow problem
- Lab testing will begin by the end of the month; it is a four-month testing regimen. Lab testing will include design simulation.

The base case for your lab testing will be R-22? asked Lori Sanders. Yes, Baylon replied – it's a base-case heat pump, 7.2 HSPF. And that's to allow you to determine what heat pumps have achieved in the past? Sanders asked. The biggest problem with 410-A is that it is not dominating the market by a long shot, Baylon replied. The original intent was to do both, but we didn't have the budget to do both – given the limited budget, we chose to establish the base case.

Our current strategy is to try to build a before-and-after billing analysis for the C&RD utilities, said Baylon; we are talking to every C&RD utility in the five regions, and are making reasonable progress, although we're far from being finished. We expect to do this as a pre- and post-analysis; we are recruiting a control group, mostly from IOU utilities that are in corresponding areas – Bend, the Tri-Cities, Cle Elum and Portland/Clark County. The final group is EWEB. The EWEB sample is somewhat unique because we're trying to isolate the savings impact of a program that is aimed at correcting the refrigerant charge and/or airflow. We will be using Prism supplemented by EZSim determine the savings.

We're experiencing the usual problems with the billing data, said Baylon; billing analysis is very easy to do, as most of you know, in comparison to actually collecting the data. We're at about the 20% level at this point. As of now, we have 1,900 completed surveys; eventually, we will likely wind up with about 1,500. We are not doing the coastal area. All of the field work is being recruited from the control group; the goal is 40 for each of the four areas. We've done a dozen installer interviews, mostly in Tri-Cities/Yakima. We ask 35-40 questions, everything from general questions about their shop to the split between new installs and retrofit, how they size their systems, what product lines they rep and install, consumer demand for different parts of their product line, their awareness of incentive and tax credit programs. We also added some questions about TXVs, and how they may affect problematic charge levels. We also asked about backup heat usage through, for example, a thermostat with an outdoor temperature sensing capability, because that is the most important factor in how fast the meter spins over the course of the season. That question, and how installers deal with it, is crucially important, and there are wildly ranging opinions and approaches. Another question is low-ambient cutout.

With respect to fieldwork, said Bob Davis, in Kitsap, Central Oregon and Yakima, we're in the 25-30% range; we're in the process of identifying the specific sites in Clark County. Because of the way this work is staged, we're not able, in most cases, to have the heat pump and house/duct work parts done at the same time. There is also the question of the time of year. We've been lucky because, in most cases, we've been able to do both heating and cooling checks on charge. The house and duct work will be substantially complete by the end of November.

With respect to preliminary results, said Davis, based on 12 heat pump installations studied to date, three had very serious problems; based on anecdotal evidence, at least two more may also not be working; about a third of the cases show failed compressors or reversing valves not fully reversing; there is a significant fraction with low air flow; only three of the 12 systems had a correct charge. Most homeowners had at least one question about their thermostats; we found a whole range of problems with thermostat settings.

The group devoted a few minutes of discussion to this presentation; most of the questions

and concerns had to do with data collection on where heat pump controls are being set for outdoor lockout, how many outdoor thermostats are being installed (virtually none). Ultimately, Eckman said that Davis et al will come to a future RTF meeting to discuss building analysis and the remainder of the manufacturer/contractor surveys with respect to the revealed preferences of the RTF's assumptions.

5. Presentation and Discussion of a Review of Recent Commercial Roof Top HVAC Unit Field Studies in the Pacific Northwest and California.

Alan Cowan provided a presentation titled "Review of Recent Commercial Roof Top HVAC Unit Field Studies in the PNW and California." Among the highlights:

- Purpose of Project – Collect, review and synthesize recent work in the west on commercial rooftop HVAC units, focus on economies; develop findings; make recommendations for future direction, research, program
- Field studies key characteristics – source, number of sites, number of rooftop units, tons of cooling, location, timeframe
- Problem areas common among studies – refrigerant charge, economizer, airflow, thermostats, sensors (table)
- Frequency of problems by problem area – refrigerant circuit, economizer, airflow, thermostat, sensors (economizer most prevalent) (graph)
- High and low range of estimated cooling savings by problem area – refrigerant circuit, economizer, airflow, thermostat, sensors (economizer, thermostat and sensors the most prevalent) (graph)
- Multiple problems per unit (graph)
- Insights: three approaches to fixes: System specifications – new or replacement system upgrades; component specifications – economizer replacement; service protocols – system and economizer service and repair

Cowan then offered the following recommendations:

- Address problems at three levels – manufacturer, design/installation, repair/service
- Priority intervention point is during new and change out specifications – low cost, high leverage
- Cost and market barriers make repair/service and retro conditioning problematic

For new and replacement units:

- Develop specs for a Northwest premium RTU
- Review elements of EWEB western premium optimizer, CEC PIER FDD program
- Identify best combination of features responsive to Northwest conditions
- Develop regional procedure for acceptance testing

For service, repair and retro-commissioning:

- Simpler service protocols needed
- Need better understanding of components and operations
- Research and field monitoring needed to improve and simplify service protocols, identify savings from protocols
- Monitor performance of PSE Premium Service program
- Reconvene regional experts to scope research and monitoring agenda and funding options

One participant observed that there is a strong tendency, among utilities, to use billing analysis as the default standard for evaluation; he said his belief is that this is where PSE will go with this. This may be a bad idea, he said, but it is unlikely that they will go in another direction.

Grist observed that this particular effort is one that is big enough and expensive enough that it should be done under a regional umbrella – it is big enough, and extensive enough, that no single utility can handle it. It’s one area where regional cooperation will result in lower costs to everyone, he said; it should at least be a part of this study.

Grist also observed that one of recommendations from the New Buildings Institute was that the RTF convene a group to sketch out next steps, with respect to research and monitoring, to identify what research done to inform program development and the calculations of all aspects of this program. There was a general consensus that developing a specific research agenda based on our current understanding of the problems with rooftop HVAC units seems like the logical next step. Grist indicated that, once the Power Plan is completed he would attempt to convene a group of interested parties to develop such an agenda. He asked that those who are interested in participating in this process to let him know so he could make sure they are notified of the meeting.

6. Presentation and Discussion of the Use of Regional Commercial Energy Codes, ASHRAE Standard 90.1, New Buildings Institute’s Advanced Building Guidelines As the Basis for Estimating Savings from New Commercial Construction Efficiency Programs.

Baylon led this presentation, titled “Non-Residential Energy Code Comparison.” Among the highlights:

- Compared commercial codes: Oregon 2004, Washington 2003, Washington proposed 2004, Seattle 2002, IECC 2003, ASHRAE 90.2001 & addenda, E-Benchmark Guidelines (NBI)
- Approach: comparison of State energy codes in the PNW
- Provisions compared (lighting power, lighting controls, mechanical systems, building envelope, window performance requirements); identify potential for a PNW model code; identify potential for utility program involvement
- Lighting power
- LPDs for key occupancies (graph)
- Lighting controls
- Details: lighting controls (graph)

- Program opportunities (lighting)
- Mechanical systems – equipment efficiency, economizer
- Mechanical systems – distribution – air distribution systems (aspects are totally unregulated); except IECC all codes require HRV for greater than 70% make-up air
- Program opportunities (distribution):
- Mechanical systems (control)
- Program opportunities (controls)
- Program opportunities (commissioning)
- Program opportunities Design)
- Envelope
- Program opportunities (Envelope)
- Windows
- Program opportunities (windows)

Baylon summarized his presentation by stating that one cannot assert which of the individual codes/standards/guidelines reviewed was required the most efficient construction. Specific requirements or recommendations of each code or standard may be more stringent than that requirement in other codes, while other provisions may be less stringent. Grist stated that the results of this work will be used as input to the RTF as it attempts to establish savings estimates for new commercial construction programs across the region. He also indicated that Council intends to use this information to help identify the provisions of existing state energy codes that could be improved, rather than attempt to continue to secure these savings through utility programs.

7. Next RTF Meeting Date.

The next meeting of the Regional Technical Forum was set for Tuesday, February 8. Meeting summary prepared by Jeff Kuechle, NWPCC contractor.

RTF Meeting Participants October 19, 2004

<i>Name</i>	<i>Affiliation</i>	<i>Email</i>
Tom Eckman	NWPCC	teckman@nwcouncil.org
Paul Stuke	CWMA	Pdstuke7@atnet.net
Greg Minden	Grant PUD	gminden@gcpud.org
Jay Himlie	Mason PUD 3	jayh@masonpud3.org
Tom Schumaker	Benton PUD	schumact@bentonpud.org
Hossein Haeri	Quantec	hosseinh@quantecllc.com

Bruce Cody	BPA	bwcody@bpa.gov
Bob Lorenzen	EWEB	bob.lorenzen@eweb.eugene.or.us
Mark Johnson	BPA	mejohanson@bpa.gov
Gary Nystedt	City of Ellensburg	nystedt@cityofellensburg.org
Bob Davis	Ecotope	bdavis@ecotope.com
John Larson	Grant/Adams Conservation Districts	john-larson@wa.nacdnet.org
Mark Nielson	Franklin Conservation Dist.	mark.nielson@wa.nacdnet.org
David Baylon	Ecotope	david@ecotope.com
Adam Hadley	BPA	arhadley@bpa.gov
Philip Degens	NWEEA	pdeyens@nwalliance.org
Lori Sanders	Energy Incentives Inc.	loris1988@verizon.net
Kevin Smit	Snohomish County PUD	klsmitt@snopud.com
Lavelle Perin	Climate Crafters	lavelle@climatecrafters.org
Tom Eckhart	UCONS LLC	tom@ucons.com
Dave Wimpy	Tillamook PUD	davew@tpud.org
Shelly Strand	Ecotope	shelly@ecotope.com
Jim Lazar	Private citizen	