E3T Energy Efficiency Emerging Technologies

Washington State University Extension Energy Program

Bonneville Power Administration

Energy Services Western Area Power Administration

EMERGING TECHNOLOGIES SHOWCASE WEBINAR:

WEST COAST IRRIGATION EFFICIENCY

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Question and Answer Session

Q: You said "very few conversions in the PNW". Is that referring to conversions from traditional irrigation to SIS or conversion between these more advanced technologies?

A: [Tom] I was talking about converting from MESA – Mid Elevation Sprays (rotators, wobblers, etc.) to LESA or LEPA.

Q: You show an application efficiency of 97% for LEPA. What is the estimated application efficiency for LESA? Is it the same?

A: [Tom] It is very close. The reports from Washington State University and University of Idaho are not finished, but it is known that they have reduced the losses by 10-15%, that gets us into the 95% range. We will have studies to put up on the Bonneville Power Website (www.bpa.gov/EE/Sectors/agriculture) sometime this winter.

Q: What are electric cost savings for lower pressure systems, and what is the payback based on this alone?

A: [Tom] There would be two sets of savings. One set is due to less water being lost to either direct or plant evaporation (this gets us into the 95% range of application efficiency). There are also some additional savings because in theory, the irrigation system could run at a lower psi. We have not calculated what that would be on these systems because we haven't changed the incoming pressure on the center pivots. In these particular demonstrations we are only converting one span of the center pivot to LESA, the rest of the system is still operating with a nominal pressure depending on elevation and other variables. Some are around 40 psi at the pivot tower, at the center pivot base. I imagine if we can use the VFDs to lower the pressure and save energy, we will be able to come up with some numbers this winter.

Q: What are typical energy savings with the VFD installations in the BPA region?

A: [Tom] In the Pacific Northwest, VFDs on turbine style pumps have shown an average of 20% energy savings; this is from the 148 pumps with VFDs that have had data collected.

[Brian] I would agree with that number on the VFDs we have installed on micro systems.

Q: It is very expensive to implement VSI and VRI on the pivot systems. Do you see this as a viable technology in the future?

A: [Tom] The VSI is a lot less expensive than VRI. VRI is probably the most expensive because sprinkler valves are installed on approximately 50 sprinklers, and each one of those hydraulic valves costs about $60 a piece. Variable Speed irrigation does not have this expense. In regards to this being cost effective, some of the growers are migrating towards higher technology to take better advantage of the diversity they have in their fields, and we see that some are moving towards VRI. I don't know yet if this will happen on a large scale (thousands and thousands of pivots being converted) because the expense is really high. The initial cost is very high to do all the soil mapping, write the prescriptions and to make sure that the prescriptions are installed and oriented properly. There are a lot of challenges, and right now our power cost is relatively low. I think it is going to happen because intuitively it makes sense. If 2016 brings another drought, I think there is going to be a stronger alignment with lots of growers trying to figure out what they can do to reduce their energy cost.

Q: What is the typical payback period for high tech VRI installations with sensors?

A: [Tom] We were not able to calculate that, but I think it is more than 10 years. However, there are many other factors that we try to collect, such as yield and crop quality. I recommend that anyone interested should read one of the NEEA reports, especially the one that is specific to the VRI/VSI test, "Agricultural Irrigation Initiative: Precision Water Application Test" (http://neea.org/docs/default-source/reports/precision-water-application-test.pdf?sfvrsn=4) . We are planning on doing some of this elemental research soon, as technology catches up. I was really excited to hear how Brian is able to make the case on their drip systems.

[Brian] As I mentioned in my presentation, I've seen that growers who I've set up with micro-sprinkler drip VRI systems who don't also change the way that they irrigate, don't save anything. (I won't talk about pivot since I don't have that experience.) There is no crop improvement, there is no benefit whatsoever; in fact, I've even seen cases where the growers make things worse. So part of the issue is educating growers on the difference between ET and a sensor-based irrigation method because the two will conflict with each other. I've needed to work pretty closely with my clients to get them to understand the way to use VRI.

Q: Have you considered using Amazon or other cloud-based processing services to get processing power or image mosaic compiling? It might be cheaper than replacing computers.

A: [Brian] I have considered it, but the amount of time it would take to upload and download the raw imagery, unless you are hardwired into a fast internet system, would take an exceptional amount of time with a cloud-based system, especially given the time it takes with constant timing out. It's just not practical compared to the system we're using now. On any given day, we might collect 15 or 20 GB of data. Right now we're able to run up to four copies of our data on the computer we built, and we are able to process imagery very quickly so that's not an issue.

Q: Brian, your final slides were eye-opening. Most of the value of the systems is not in electricity savings, but in yield and water. So is the efficiency industry the best vehicle to transform this market and promote this industry?

A: [Brian] From my perspective I think it is a team effort. We all benefit and lose if we do not do something about this water situation. I wouldn't necessarily disagree that there might be other better ways to do this. However, as an example, irrigation design companies that I have tried to work with have very little interest in this. Typical agricultural chemical companies make their bread and butter selling chemicals and fertilizers, so there's a conflict between them and me. I have tried to look at other avenues to do something about the water situation, yet what I've found is that the power companies, like PG&E in my territory who does a lot of similar things as Bonneville, are helpful. The power companies have been helpful in getting growers to at least take a look at VFD and water efficiency.

Q: BPA seems to be well positioned to help the Energy Efficiency industry understand how to quantify Non-Energy Benefits (NEBs) from water savings. Does BPA's Energy Efficiency department work with those departments thinking about the health of the rivers to work on this?

A: [Tom] We do have some elemental numbers on non-energy benefits associated with water staying in the river. We apply those in some cases, but it is very difficult to quantify all of the non-energy benefits. For instance, if we are pumping less water out of the Columbia River at Grand Coulee Dam into the irrigation districts that feed about 600,000 acres, then there are some downstream benefits produced by leaving some of that water in the river to produce more power as it hits additional dams as it heads out to the ocean. We are able to quantify the benefits of using that water to provide more power, that's pretty simple. However, it's very hard to quantify non-energy benefits to fish and wildlife and others. I appreciate the comment – maybe we should look harder at how to do that because we spend a lot of money on fish and wildlife.

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Heather Bird from the California Energy Commission:

The Water Energy Technology (WET) Program funds deployment of innovative commercial technologies that have not yet been widely deployed in California. This program is currently on hold, as of the end of September 2015, due to the legislature not voting on the funding.

However, there's an ongoing research and development and deployment program which fund pre-commercial water and energy saving technologies. Solicitations come out on a rolling basis. The two programs are the Electric Program Investment Charge (EPIC) Funding Opportunities (http://www.energy.ca.gov/contracts/epic.html) and Natural Gas R&D Funding Opportunities (http://www.energy.ca.gov/contracts/pier.html). Some of these will apply to agricultural technologies over the next year. The websites have examples of funded projects for agriculture.