

**STAKEHOLDER MEETING SUMMARY**  
**ETV DRINKING WATER SYSTEMS CENTER**  
**JUNE 4-5, 2001**

A Steering Committee Meeting was held at the Holiday Inn Cincinnati Airport, Cincinnati, Ohio on June 4-5, 2001. The meeting commenced at 9:05am on Monday, June 4<sup>th</sup>. Bruce Bartley, NSF ETV Drinking Water Systems (DWS) Center Manager, began by reviewing the Antitrust Statement, then welcomed the group and asked all meeting attendees to introduce themselves (a list of attendees and their affiliations is included at the end of this meeting summary). Bruce formally thanked the State representatives who are departing the Steering Committee. These included John Trax and David Spath. Bruce welcomed two new Steering Committee members who unfortunately could not attend the meeting, Ed Urheim and Jerry Lane, and also welcomed back to the Steering Committee Jerry Biberstine who has returned as a representative for the National Rural Water Association. Bruce introduced Angela Smith who is a new NSF Program Representative working with the DWS Center. Bruce along with Gordon Bellen, NSF Vice President of Federal Programs, gave a special thank you and tribute to Penny Hansen, the ETV Program Director, who will be retiring in September 2001.

**ETV Status**

Penny Hansen began with the sentiment that she was happy to see new faces at the meeting, and she noted that as time evolves the group evolves. Penny presented an ETV Status Report. As of June 2001, there are 118 technologies verified and 111 technologies in the ETV process (includes all ETV Centers: including air, water, monitoring, greenhouse gas, recycling and pollution prevention, and waste treatment). Vendors from 41 different States and 8 foreign countries have participated in ETV. Median time to complete a verification test and the reporting process for ETV Pilots was approximately 16 months. Median cost per product verified for all ETV Pilots was \$83,800; DWS Center median was \$54,200. The range of vendor contribution through 2000 per product verified for all ETV Pilots was \$0 to \$100,000. The following were noted as ETV key success factors:

- Meaningful stakeholder participation for market input;
- Private sector partnerships (Not-For-Profit worked better than associations, universities);
- Technology-specific, peer reviewed protocols;
- Test specific quality assurance (QA) plans;
- Web publication;
- EPA Team approach; and
- Credibility.

The ongoing ETV Program consists of six Technology Centers, including: DWS Center, Water Protection Tech Center, Advanced Monitoring Center, Air Pollution Control Center, Greenhouse Gas Technology Center, and the Pollution Prevention, Recycling and Waste Treatment Systems Center. Other topics discussed were ETV Financial support after the pilot period (EPA to provide funds for protocol development and stakeholder process; EPA and vendors to share QA and report writing costs; vendors to pay for testing), and the projected Ten-year plan. Copies of Penny's slides are provided as an attachment to these meeting minutes.

David Pearson asked if the \$54,200 median for DWS included vendor contribution. Bruce clarified that the vendor out-of-pocket contribution is included in that figure along with the ETV portion of the cost.

Kevin Brown, ETV Steering Committee Chairman, asked Penny about the new administration's perception of the ETV Program. Penny stated that Christine Todd-Whitman, EPA Director, had contacted her on the first day of the new administration. Ms. Whitman indicated to Penny that she was

aware of ETV and also that New Jersey has a similar program. Penny noted that she would like to send a special report on the DWS Center the EPA Director, and feels we have enough testing data to do so. Penny stated that the DWS Center has support of Governors and Congressmen. Penny indicated that with the huge tax cut, some EPA funding will be cut and competition will be tough for the remaining funding.

A brief introduction followed Penny's presentation of the telephone participants. Telephone participants included Bridget O'Grady and Michael Doorn.

### **Status of the ETV Drinking Water Systems Center**

Bruce Bartley presented an update on ETV DWS Center. Bruce's presentation slides are provided in the Errata for the Stakeholder meeting. The 9 final Protocols include Microbiological Reduction, Microbiological Inactivation, Removal of DBP/Ps, Removal of Arsenic, Removal of Inorganic Constituents, Removal of VOCs, Removal of SOCs, Removal of Radionuclides and Removal of Nitrate. Copies of protocols can be downloaded from the Internet ([www.nsf.org/etv](http://www.nsf.org/etv)) or requested in hard copy from Angela Smith. The DWS Center has 29 approved testing applications through June 1, 2001. There are 14 final verification reports and statements, 13 tests completed and in the report preparation process, and 2 tests that are preparing to begin. The DWS Center future activities will include:

- Enhancing the quality of ETV products;
- Increasing the number of technology verifications;
- Re-emphasizing the focus of the Center on small system needs;
- Working with the States on reducing site-specific pilot testing; and
- Updating the ETV Protocols and assuring quality and cost-effectiveness.

Tables are provided in the meeting packet on the status of each test and the quality assurance reviews that are performed on all documents involved in the verification testing process.

Steve Via asked for an explanation of the report reviews involved. Bruce Bartley answered by explaining the process of administration reviews, QA reviews and technical reviews. After a verification report is prepared by the Field Testing Organization (FTO), NSF performs format and preliminary engineering reviews, as well as a data transcription check on the document. Then the report undergoes a review by the NSF QA Officer. After NSF has completed its reviews, then the report is sent for technical peer review and EPA review. Between all reviews, the FTO makes revisions to the report.

Penny Hansen asked if one could tell which technologies are performing well. Bruce Bartley answered that performance is not as stark in data results, but the major differences may be from the standpoint of operations and maintenance (O&M) issues or chemical use. Bruce explained that "how easy it is to operate" and number of labor hours are also evaluated. Jeff Adams then discussed that performance statements guide testing and that sometimes the equipment performs well, but does not meet expectations. Joe Jacangelo asked how many claims were not met. Jeff Adams answered by saying that it was not tracked because ETV is not emphasizing this. Penny added that ETV is not a pass-fail process and all results are reported. Larry Henke mentioned that in the five reports in which he has been involved with the technologies did not meet full expectations.

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### **ETV DWS Center Scope, Mission, and Purpose**

Kevin Brown began the second half of the morning session with a discussion on the scope and mission of the ETV DWS Center. He read two comments by AWWA, ASDWA, and WWEMA (page 2-20 of the meeting packet). The comments expressed a concern about the broadening of the scope of the ETV DWS

Center and the apparent re-direction away from small system needs, concerns, and issues. Kevin asked for ideas on how the Center can encourage more verification testing of technologies that can benefit small communities. Kevin mentioned that from a State perspective, he agrees that it is important to keep the emphasis on small systems. Jerry Biberstine added that the EPA funding helps small systems. Jerry mentioned that maybe the Center should look at “feasibility” testing only and leave the details on O & M to longer pilot tests conducted by State agencies. He pointed out that it would cost less to establish basic “feasibility”. This may bring more companies into ETV participation. Steve Allgeier did a survey of State agencies and asked them if they did pilot testing and also if they used ETV. Steve said that some States were only interested in if the equipment can remove the contaminant of concern. John Dyson noted that some of the manufacturer’s biggest ETV costs is their time on-site, both equipment and personnel. He noted an interest in less cost and said that all would benefit from less cost.

Dan Uhr agreed with “feasibility” testing mentioned by Jerry Biberstine and Dan thought someone should classify water types. Gary Logsdon stated that this might work with some technologies but not all, for instance, exhaustive resin technologies and granular activated carbon (GAC) due to limited removal capacity. Jerry agreed and pointed out that on some things we might be able to do this, i.e. membranes, but that it may not be applicable for coagulation systems. Feasibility testing may be technology specific. Dan Uhr suggested setting up test sites around the country for classes of water. John Dyson responded that classifying waters or having a worst case water might not be beneficial for coagulation technologies because coagulation performance is very site specific. Steve Allgeier mentioned that for membranes, productivity is site-specific. Jeff Adams mentioned that with membranes and assessing cryptosporidium removal, one might not have to worry about site-specific conditions as with other technologies. For example, for membranes the worst-case scenario for removal of Cryptosporidium may be tap water.

Dan Uhr suggested setting up a reference water for worst-case scenario testing and doing a treatment feasibility study. Joe Jacangelo noted that if one site was chosen for all ETV testing, that it should be able to provide different water qualities. Jerry Biberstine asked how would we define “worst case” and offered that this was a problem in Colorado. Utilities believe that their water is the worst case. Gordon Bellen stated that in NSF’s experience with point of use (POU) devices, there were problems defining and producing the test water. The difference is that POU’s are used in residential units where the water is already fit for public consumption. Gordon mentioned that there may not be enough data for field sites to set up a central test location.

David Pearson said that States are looking for feasibility and O & M cost data. David suggested an intensive data collection period for feasibility data and then a lower intensity data collection period for an O & M period. Jeff Adams suggested redefining ETV Protocols to address major issues, such as Federal Regulations and meeting Water Quality Objectives (WQO), but leave operational data and productivity issues to site-specific testing. John Dyson raised the concern that there is not a lot of utility operability data out there. There is water quality data but not operational data. Dan Uhr stated that manufacturers could ask ETV to help with a manufacturer’s own studies so QA is high, and then manufacturers could help future customers and generate high quality data.

Kevin Brown asked for any other suggestions for the Center’s focus on small systems. Rick Sakaji suggested a reverse graded funding/support system for technologies that are used for small systems. Penny Hansen cautioned that it is very difficult to establish criteria for a graded funding system. Joe Jacangelo mentioned it can be argued that some systems are applicable for both large and small systems. Bruce Bartley then stated the need to be careful and fair with any type of graded-funding system and suggestions are welcome.

John Dyson brought up the point that Gary Van Stone had mentioned in his letter that vendors have not really seen much benefit and John mentioned that his company has seen minimal benefit from ETV. John

raised the question about whether or not we are seeing the benefits from the ETV Program that it was designed for. Joe Jacangelo said that he wanted to hear from Rick Sakaji on this for a State perspective. Rick said that he has pointed vendors to the NSF web site for protocols on numerous occasions. Rick has gotten the impression from a lot of manufacturers that have contacted him that the products have not been field tested before. The protocols can be used by the manufacturers for testing their products in the field.

Gorgon Bellen stated that we are beginning to see more of a benefit with more verification reports out there as more information gets into the marketplace. In terms of helping small systems, universities such as Technology Technical Assistance Centers (TTACs) can help. Dan Uhr asked if POU would come into ETV and Gordon replied that it would not because Standards for testing POU devices already exist. John Dyson stated that just because a lot of manufacturers are involved in ETV doesn't mean it is a good thing. He also stated a concern that his company would not be able to afford the cost of verification if ETV was required for all projects. Gordon clarified that we need to get more reports out in the public domain in order to measure usefulness. John said that we would only see companies with deep pockets participating in ETV. Dan Uhr expressed the point that verification of technologies is important due to the public health aspect of the product. He gave an example involving aircraft parts. Aircraft parts are an issue of public health and an aircraft part's performance must be verified. Dan raised the question about whether or not you would want to fly on a plane with un-verified parts. Dan stated that drinking water is a public health issue and all equipment performance should be verified.

Steve Via noted that States are major customers and wanted to know what the Center is doing for outreach to reach as many States as possible. Penny Hansen discussed how new technologies were having trouble penetrating the marketplace and that the same old equipment was being used and that small systems could not afford to make a mistake. Penny said that ETV should ask itself if States are seeing data on new technologies that they would not have otherwise seen. Rick Sakaji offered that the first DWS ETV verification report on Ultraviolet (UV) technology was very important in getting this new technology into the drinking water treatment field. Penny then asked if we knew of any companies that are waiting and not participating. Rick noted that some denitrification companies have contacted him but have not yet applied to ETV. It was speculated that they were not yet commercially ready to participate in ETV yet.

Joe Jacangelo noted that for outreach efforts that there are only 50 clients, i.e. the States. Joe asked that we survey the States to determine who would still require pilot testing in every situation including if ETV data were available and to concentrate the majority of the verification testing in those states that actually use the ETV reports as a tool. Joe also suggested a face-to-face approach to the states instead of surveying them to get a true amount of interest. Bruce Bartley replied that ASDWA has surveyed the States annually the past two years to assess their use of ETV documents. The survey result data from the year 1999 to the year 2000 indicated an increase in State use of ETV reports and protocols. Bridget O'Grady noted that the data is not as cut and dry, meaning that it may be premature to ask States if in every circumstance for a certain technology that they would eliminate pilot testing. Joe wondered if we could ask specific questions instead of general questions. Gary Logsdon followed up on what Joe was saying by mentioning that we could survey States with a specific question to see if States would accept ETV data on microbial challenge and then leave the O&M issues and adaptability as site-specific issues. This would eliminate one large expenditure. Jeff Adams said that States would have to be educated on how to use the ETV report data. Penny Hansen then said that we need to get more verification reports out there and that some States want to participate more than others. Penny mentioned that as a starting point, the ETV Program should concentrate efforts in States that are open to using ETV. Dan Uhr raised the question of who would do the outreach to the States; would it be all of us? Consensus was everyone should be involved.

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Bridget O'Grady asked for a summation of the morning discussion. Bruce Bartley responded that there is common ground on the fact that the Center should focus protocol/test plans on "feasibility" issues and leave more O & M or other site-specific items to the States for site-specific testing. ETV will focus on items that are transferable from site to site and State to State. John Dyson said that it was the position of WWEMA and AWWA that funding should not be used at all for the ETV Center. Bruce mentioned that those comments appeared to be associated with the perception that test results were not being used State to State. Bruce and Bridget agreed that they need to get together to determine which States will always require pilot testing and which States will use ETV data reports. They acknowledged the need for a more active outreach program. Penny Hansen said that most of the ETV reports emerged six months ago and that a year might actually be a more reasonable timeframe to assess usage. Penny said that vendors should be contacted to find out the response from States on their ETV reports.

John Dyson then said that he would like to hear from Rick Sakaji regarding whether site specific testing is being required in California. Rick answered that they list the water quality conditions and the performance in the permit and this will set the operational limits on this membrane. If a utility has water quality conditions outside this range, then they may do site testing. For things like pathogen removal, membranes can have conditional acceptance, but for operational parameters, then site testing may be required.

Jerry Biberstine pointed out that States may or may not waive pilot testing and that you are asking an engineer to give up his best judgment based on data collected elsewhere. The best that you can hope for is that they will accept the ETV data as very high quality data. States will look at each individual case. John Dyson summarized from a manufacturer perspective that they see ETV providing a benefit to only certain technologies, such as membranes and UV. John said that it sounds like O&M issues will be eliminated. David Pearson noted that good O&M is obtained in ETV. Bruce Bartley clarified that O&M will not be eliminated, but that the Center would not add lengthier requirements for O&M, which is what the States would like. Bruce added that manufacturers can always do more than minimum O&M testing requirements specified in the protocols. Penny Hansen pointed out that elimination of pilot testing in all 50 States was never a goal, and that it is unrealistic. Penny said that we should penetrate the markets of States that would accept ETV data. David Pearson stated that good O&M data can be obtained without a lot of water quality data, and with less intensive data collection than is required in the protocols.

Bruce Bartley asked if there were any other scope and/or mission issues. Dan Uhr wanted to know about a program for indemnity and warranty and was wondering if this was something that EPA or ETV was interested in considering. Penny Hansen answered that that was beyond the scope of EPA and ETV. Penny said before we move on from scope she wanted to know from John Dyson if the three organizations believed that ETV should fold and go home. John Dyson replied no, but that the benefits are minimal and a greater need to focus on minimizing cost exists. John referred to the comments in the meeting packet from WWEMA and AWWA. Jeff Adams added that the comments are broad. Jeff said that we may be able to achieve more State acceptance if we focus on areas that will be useful to the States. John agreed, for areas such as membranes, microbiological removal and UV.

### **Use of ETV Reports in Patent Applications**

John Dyson stated that there should be a documented policy on accepting monies from the EPA for ETV testing and using a report in a patent application. Penny Hansen replied that ETV is not giving vendors any money and that ETV is not a grant program. By design, ETV gives money to independent testing organizations to test the product. The information is paid for by the taxpayers and the information is available to everyone. ETV does not give money to vendors to assist them in development of their technologies. Penny does not see how this would be applicable to patent applications. John Dyson asked

what if a field testing organization applies for a patent. Penny then replied that would be a complete conflict of interest and that they would no longer be a field testing organization. Penny Hansen also added that in ETV policies, ETV states that no money given to vendors and testing organizations must be objective and have no financial interest.

Steve Via asked at what point does the ETV data becomes public. Bruce Bartley answered that the data becomes public domain when the final report is published. Steve Via noted that papers are given before the final reports are published. Bruce Bartley agreed, but added that there is a disclaimer that the data are not yet verified or technical reviewed.

### **ETV Quality Issues**

Jerry Biberstine was satisfied by the response the Center provided as outlined in the meeting packet on the questions of who will bear the cost of new oversight requirements.

### **Science Advisory Board (SAB) and ETV Policy Change on Vendor Withdrawal from ETV Program**

As outlined in the meeting packet (page 2-22), the Center recommends that a vendor may withdraw from the ETV Program only during the initial operations or shakedown testing period. The vendor may not exclude or prohibit the reporting of performance results once testing begins. Kevin Brown asked if there were any objections to this policy. Jim Bell raised a question of what if there was an error in shipping and the wrong element was on-site, would the manufacturer need to continue testing. Penny Hansen answered that the test would stop until the right element was obtained, but that the data generated from the wrong element must be reported. She added that you can start again, but all results are reported. The test continues on the vendors "dime" and not the taxpayers "dime." Jim Bell asked what if the vendor is paying for the testing. Penny Hansen replied that the SAB's view is that a vendor cannot withdraw even if they are paying for the testing, but this has not come to closure yet. Penny Hansen stated that there are a lot of items involved in ETV that a vendor is not paying for, such as protocol development. John Dyson raised the question about what if a vendor pays back the money to ETV, then can they withdraw? Penny responded that that was the original policy. However, the SAB said that with a program like ETV, there are government funds involved. The SAB said that all ETV has is credibility and if a vendor can buy his way out, then ETV will lose that credibility. Bruce Bartley added that NSF will need to be very upfront with vendors about the change in the policies and will state them in a contract to all participating vendors. Jim Bell stated that it may hurt small manufacturers if they are laying it all on the table. David Pearson noted that ETV is not a research and development program. Bruce said that there are Small Business Administration (Innovative Research Grant) opportunities for research and development. Penny mentioned that ETV gave the SAB 12 protocols across ETV and the ETV policy plans. The SAB review was a tough review and it was a positive experience for ETV. Steve Via suggested during the next SAB review that the review of the DWS Center be given to the Drinking Water Committee within SAB. Bruce and Penny agreed that was a good suggestion. Bruce and Penny mentioned that the committee was the engineering committee.

### **Verification Process Improvements - FTO System and New Criteria**

Bruce Bartley discussed that NSF will be more proactive under the Center to provide education and training to all parties involved. He also noted that NSF is responsible for verification reports and if an FTO defaults on their contractual agreement to provide a report, NSF must still produce a final verification report. Steve Via wondered if an FTO gets paid when a report is produced, and Bruce replied that NSF is already doing this, however, sometimes it works and sometimes it does not. This approach has not worked well with universities. David Pearson mentioned that right now, reports are written by

FTOs. David suggested that this report preparation could be shared with the vendor and this could be worked out on the contractual agreement with the FTO. Joe Jacangelo answered yes, but since the consultant's name is on it, we will review it. Joe asked if the driver here was the cost of producing a report and David answered yes. Bruce added that FTOs should definitely write field operations sections of the report because they are doing the testing. These report writing details can be worked out in the agreements between the vendors and the FTOs.

### **Protocol Development and Maintenance**

Steve Via started with the AWWA comment in the meeting packet (page 2-27), which questioned how the DWS Center would integrate with the current AWWA Standards, ANSI/NSF Standards 60/61 and other international standards. Bruce Bartley stated that the DWS Center is not recreating any existing standards. The Center fills in the gaps by using existing standards and creating protocols for tests that currently do not have standards associated with them. Dan Uhr noted that there are no existing standards for testing small systems for community use. Bruce agreed and mentioned that the EPA is funding the DWS Center to fill that gap and test small systems.

### **New Protocol Development Requests**

Kevin Brown explained that the Center received numerous requests for verification of products that are not currently covered by any of the DWS Center Protocol documents. The products are listed on page 2-27 of the meeting packet. Kevin started the discussion by saying that the stakeholders need to give feedback to the DWS Center on the development of any additional Protocol documents. Jim Bell responded that we should assess whether these products are commercially-available. Jerry Biberstine agreed that these products should not be in the research and development stage. Steve Via asked if the manufacturers of these products include data packages when they ask for the development of an ETV Protocol. Bruce Bartley answered that NSF usually asks for this information. David Pearson noted he thought the Pittsburgh test site was not a good site because the source water was a finished water. Joe Jacangelo disagreed and said the test was valid. Jeff Adams also disagreed and stated that the purpose of the testing at Pittsburgh was a microbiological challenge. Bruce added that the Center had a cost benefit to have four systems tested at the site. Steve Via asked about the applicability towards small systems. Jeff explained that the membranes that were tested are applicable for both small and large utilities and is also applicable to UV systems. The Center will not exclude membranes from testing just because they are also applicable to large systems. They will have benefit to small systems too. The testing at Pittsburgh just happened to be at a large utility.

Kevin Brown then stated that as a follow-up to this discussion on development of new protocols, the DWS Center will mail out information on new technologies that have requested protocol development to the Steering Committee members for ranking. The vendors will be asked for bench or pilot scale data on the performance of the system and this information will be sent to the Steering Committee for review during their ranking. The ranking will occur using numbers zero through five. Jeff Adams asked if this ranking was only for the use of Center funds to create the protocols and Bruce Bartley replied yes. If a vendor wanted to pay for the protocol development after the Steering Committee determined that the Center should not spend funds to develop one, then that would be fine. Jerry Biberstine recommended that we outline the priorities of the Center; which include treatment technologies for small systems, which are commercially ready. Bruce agreed that "treatment" of drinking water should be emphasized. Bruce said that the Center would contact the vendors that have requested protocol development and request data packages from them. The Center would then create a ranking form for the Steering Committee to fill out. The ranking forms will be sent to the Steering Committee members in the coming months.

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### **Adoptive Media for Arsenic Rapid Small Scale Column Test (RSSCT)**

The Center has received interest in refinement of the adsorptive media test plan for arsenic removal. Bruce Bartley mentioned that the RSSCT is used with granular activated carbon and contaminants such as volatile organic carbons (VOCs). Bruce mentioned that there is an interest in a RSSCT for adsorptive media that is used to remove arsenic. Bruce asked the attendees if they knew of any studies on RSSCTs with adsorptive media for arsenic removal. Larry Henke said that he would forward a study to Bruce. Rick Sakaji also mentioned that the California Water Company may have a study, either bench or pilot, and he would try to get their study. John Dyson added that Southern California might have a study and he'd look into it. Rick referenced the National Water Research Institute and that they may have a possible report, and suggested that Bruce ask Ron Lenski's group.

### **Harmonization of the ETV Protocols with the Long Term 2 Enhanced Surface Water Treatment Rule (LT2ESWTR)**

Kevin Brown moved on to item 3.3 in the meeting packet regarding the ETV documents and the LT2ESWTR. Kevin explained that several DWS Center protocols and test plans address filtration barriers and inactivation of microorganisms. These documents will be impacted by the LT2ESWTR. Prior to the June 4<sup>th</sup> meeting, Stakeholders had requested that the EPA and ETV harmonize efforts. Steve Allgeier presented on behalf of the EPA Office of Ground Water and Drinking Water (OGWDW). The OGWDW is working on rule language and guidance language for LT2ESWTR. The importance of this distinction is that anything listed in rule language is a specific requirement, while there is much more flexibility in guidance. Steve's presentation slides are included in the meeting packet, Section 3.3. A discussion regarding field integrity testing of the membranes followed Steve's presentation. Kevin recommended that all interested parties should give comments to Steve on the draft rule language for the LT2ESWTR for membranes and bag and cartridge filters. Bruce Bartley suggested a conference call and asked all interested parties to contact either him or Steve if interested in participating in a conference call and for copies of the future drafts of the rule language.

Kevin Brown asked Joe Jacangelo to follow Steve Allgeier's presentation. Joe presented on an AWWARF funded project regarding the microbial rating of low pressure membranes. Joe's presentation slides are provided in the Errata for the Stakeholder meeting. The AWWARF project involves determining a microbial rating for each membrane on a bench-scale under worst case conditions for protozoa, bacteria, and viruses. David Pearson asked why only low-pressure membranes were being considered. Joe answered that tubular and flat sheet membranes were also being considered. Joe said that a protocol for this testing is currently being developed and will be sent out for review in July. He asked that the ETV Steering Committee be a part of the review process. During their review, the Steering Committee can assess whether or not the protocol is applicable for incorporation in the ETV Membrane Test Plan.

### **Existing Data**

Gary Logsdon began the discussion on ETV's use of existing data, which is Section 2.6 of the meeting packet. Gary said that he did not think that ETV needed as much QA data on O&M information as one needs with water quality data. Jerry Biberstine added that from a State perspective, any data on O&M would be helpful. Jerry added that this is not necessarily data related to the treatment performance, however more to the question of what is the life of the system. David Pearson asked what is the required level of QA required for O&M. Bruce Bartley answered that the level of QA is different between WQ data and O&M data. Bruce continued that a panel of reviewers, which would include EPA, a technical peer reviewer, and NSF, would review existing data. For example, if a utility has data on O&M data, such as power usage, this data could be reviewed and added to verification reports. Gary noted that

NRWA circuit riders would be a good source of data. Jerry agreed that was a good idea, but that the having utility directors sign off on the data would add credibility to the data. Bruce said that a manufacturer could assemble data from existing installations for review and inclusion in a ETV report. Rick Sakaji stated that utilities in California are required to provide a report to the State on innovative systems that have been in place for one year. Steve Via then noted the need for Data Quality Objectives (DQOs) for good data, especially if NSF and EPA names are on the report. Steve said that DQOs should be set for the acceptance of the data by ETV. Bruce then asked for DQOs for O&M information be forwarded to NSF.

## **Outreach**

Kevin began the issue of Outreach with an explanation of utility compliance in Utah. He said ETV should try to reach consultants because they are usually called upon by utilities to help with compliance issues. He suggested that ETV attend larger State Rural Water conferences in order to get the word out. Rick agreed that it was a good idea to reach State agencies. Bruce Bartley noted that NSF has done a few presentations at State agencies. Bruce asked for stakeholder opinions on going to International conferences as opposed to focusing on States. The consensus was to focus on States. John Dyson asked if ETV has the funds for education and outreach at conferences. He suggested that outreach funds be used to reach State agencies and less for conferences. Kevin suggested to focus on certain States, and asked if they could be ranked somehow. Bruce said that there is some money for outreach, and wondered which was the priority, State agencies or large shows. Rick said that CA would make time available if ETV wanted to make a presentation to their staff, but cautioned not to present the entire program at them all at once. He recommended presenting one protocol and test results associated with it, as well as a technical person, such as the test plan writer or the testing organization, to discuss it. Jerry Biberstine said that Colorado probably couldn't make time to go to a training course, but suggested a video, a CD Rom, or a web course. Gary Logsdon said that if the State staff had written materials to refer to, it would be helpful to refer to that information in the future. Jim Bell said that big shows might not be helpful. Bruce Bartley suggested a conference call and information on the website course because some people like to be able to ask questions and receive answers immediately. Steve Via suggested starting with a conference call to State agencies and then following up with an onsite meeting. Bruce agreed that a combination approach would be a good idea. Gordon Bellen then noted that NSF has been working with ASDWA with the survey so we could determine which States are aware of ETV. He also wondered which States the manufacturers would recommend that ETV contact. George Westfall suggested coming and presenting at Illinois EPA because Illinois is seen as a leader in its region.

## **Protocols and Technology Specific Test Plans**

Issues regarding protocol and test plan proposed changes will be sent to the Steering Committee in the future by mail because a majority of Steering Committee members were not in attendance at the meeting to ballot the proposed changes. Bruce Bartley stated that these issues came up on Protocols since the last Stakeholder meeting. Bruce explained that since we did not have a voting quorum at the meeting, we would just discuss the issues to determine which ones to pursue and send in written form to the Steering Committee for ballot. The following issues are numbered according to their reference number in the meeting packet.

**Issue 3.1.1 – Log Conversion of Microbiological Data.** Stakeholders at the meeting agreed with the proposed language referenced in the meeting packet. Issue will be sent to Steering Committee for ballot.

**Issue 3.1.2 – 2-Point vs. 3-Point Calibration of pH Meters.** NSF will verify requirement in Standard Methods and send this issue to Steering Committee for ballot.

**Issue 3.1.3 – Calibration of Bench-Top Turbidimeters with Manufacturer-Recommended Primary Standards.** Steve Via and Larry Henke indicated that  $\pm 10\%$  allowable difference for the secondary standards is very small. Steve Via mentioned that there may be language regarding allowable difference in an ASTM language and will pass that information along. Gary Logsdon stated that flexibility in the secondary standards should be added to the protocol because the secondary standards may not be commercially available.

**Issue 3.1.4 – Calculation of 95% Confidence Interval.** Bruce Bartley recommended that statistics and calculation of 95% confidence interval only be performed on data sets with 8 or more data points. If there are less than 8 data points then all data will be presented instead of standard deviation and 95% confidence interval information. Stakeholders agreed on this issue and draft language will be sent to the Steering Committee for ballot.

**Issue 3.1.5 - Verification of Calibration of Bench-Top Particle Counters – Criteria and Procedures for Accuracy.** Gary Logsdon is proposing that the language be changed so that field verification of the calibration of the particle counters is performed with purchased particle suspensions, i.e. particle standards for 1000 particles/ml, rather than trying to dilute concentrated suspensions on-site. Gary mentioned that this approach is described in a recent AWWARF report on particle counting. Proposed language will be sent to Steering Committee for approval. Larry Henke suggested that the minimum size for microspheres be changed to 3  $\mu\text{m}$  from 2  $\mu\text{m}$  due to the bin size ranges used for particle counting.

MEETING ADJOURNED ON JUNE 4<sup>th</sup>, 2001 AT APPROXIMATELY 5PM

MEETING RESUMED ON JUNE 5<sup>TH</sup>, 2001

The meeting resumed at 8:00 am on June 5, 2001 with Bruce Bartley asking the group to send ideas on time, date, and place of the next meeting to him.

### **Protocols and Technology Specific Test Plans (continued)**

Bruce Bartley resumed discussion of Protocol and Test Plan issues.

**Issue 3.2.1 - Operations and Maintenance Data.** Bruce explained that collection of O&M data may be extended beyond the minimum test period length specified in the test plans. This would extend the collection of O&M data, not water quality data. It is proposed that language be added to the test plans to emphasize this option. Gary mentioned that O&M data may be more like business data; such as how often bag filters were changed out, or water production. David Pearson then asked if this was in addition to the existing data. Bruce answered that both O&M data compiled from other sites (existing data) and collection of O&M data beyond the minimum test period length specified in the test plans could be added to the verification report for the product. Rick Sakaji asked if the report preparation would begin after testing is all done. Kristie Wilhelm answered that NSF would prefer if testing organizations were proactive and began the report writing process before the testing was complete. She added that O&M is one section of the report that would have to wait until testing is complete; however, preliminary preparation could begin on the other sections of the report before testing is complete, such as equipment description and methods and procedures.

**Issue 3.2.2 - Osmotic Pressure Gradient.** Meeting attendees agreed with proposed change regarding these calculations. This issue will be forwarded to the Steering Committee for ballot.

**Issue 3.4.1.1.1 - Microsphere Seeding.** Meeting attendees agreed with proposed change regarding submission of microsphere seeding samples for enumeration instead of only relying on particle counters. This issue will be forwarded to the Steering Committee for ballot.

**Issue 3.4.1.1.2 - The Bag and Cartridge, Precoat, and Backwashable Test Plans allow for seeding of microspheres instead of microorganisms. Microspheres may need to be special ordered in the size range of interest.** Dan Uhr mentioned two documents that may contain useful information for this issue: a British study that referenced the use of microspheres and ANSI/NSF Standard 53. NSF to research this language and send proposed language to Steering Committee for ballot. Fluorescence and electronegativity were also discussed in relation to microspheres for counting.

**Issue 3.4.1.2 - Methods for Demonstrating of Coincidence Error.** The stakeholders suggested minor editorial change to proposed language (in second paragraph of proposed solution, delete the word ‘within’ and add the word ‘before’ after the words ‘two months’). This proposed language will be sent to the Steering Committee for ballot. Larry Henke stated that the difference in coincidence error changes across bin sizes. Kristie Wilhelm asked if this documentation is packaged with the particle counter and Larry answered no, but it can be requested.

**Issue 3.4.1.3 – Specify Meaning of “Three Replicates.”** Meeting attendees agreed with proposed clarification in the meaning of “three replicates” with one minor editorial comment to say, “three samples of the filter water”. This issue will be forwarded to the Steering Committee for ballot

**Issue 3.4.1.4 – Characterize Membrane from a Microbial Point of View.** Joe Jacangelo presented on this topic earlier in the meeting (see slide presentation in meeting Errata). Joe to write up proposed language on this for the test plan. NSF will route the proposed language to the Steering Committee for review and ballot.

**Issue 3.4.1.5 - Requirement for confirmatory density determination of supplied microbial stock and viability analysis via an excystation procedure.** Stakeholders agreed that the Coagulation and Filtration Test Plan for Physical Removal of Microbiological Contaminants does not require changes per this comment due to the physical straining mechanism involved in these technologies. No action will be taken. As an aside, Bruce Bartley added that Montgomery Watson is doing a comparison of NRWI UV guidelines and the ETV UV Test Plan. Also, there will be a conference call most likely this fall for coordination of the EPA rules for UV treatment.

**Issue 3.4.2.1, 3.4.2.2 and 3.4.4.1 - Waste Disposal.** Kevin Brown noted that in Utah, some Reverse Osmosis systems have a high concentration of Arsenic in their waste stream. Bruce Bartley responded that the requirements of the ETV test plans involve characterization of the waste streams. However, comments have been raised regarding the disposal aspect of the waste. Should the ETV test plans include requirements for waste disposal and potential impact on disposal site? Larry Henke inquired how the Radioactive Test Plan handled the disposal issue and Bruce Bartley replied that the Test Plan had not yet been tested against. Jerry Biberstine mentioned that presently characterization is about all we can do until EPA regulations come out for State disposal guidelines. It was concluded to reject proposed solution for Issue 3.4.2.1 of the meeting packet. It was also concluded that ETV will only characterize the waste streams. Bruce mentioned that we might need to contact some experts to have them review and propose the methods for characterizing the waste, i.e. TCLP. Gary noted that maybe TCLP should not be done, but the amount of solids and the amount of contaminant, i.e. arsenic, in the solids should be determined.

Rick Sakaji then asked if the test requirements for the filter backwash rule that will be coming out in the Federal Register the week of this stakeholder meeting are the same as requirements in the ETV Test Plans. Bruce said that NSF would look into this issue.

**Issue 3.4.2.3 – Filtration Rates.** Bruce explained that the comments on this issue came from Utah. Kevin Brown said he would like to see data. Jerry Biberstine agreed that he would like to see data on higher flow rates and suggested that we not require in the test plan but give the option to do more, such as three flow rates. David Pearson added that the same suggestion would apply to membranes. NSF will propose language for adding this suggestion to the test plans and will send the proposed language to the Steering Committee for review.

**Issue 3.4.2.4 – Sample Preservation for Low Levels of Arsenic.** The proposed solution was amenable to the stakeholders at the meeting. The proposed language will be sent to the Steering Committee for review and ballot.

**Issue 3.4.3.1 - Increasing Testing Frequency Requirements for Total Trihalomethanes (TTHM) and Haloacetic Acids (HAA5) in the Membrane Test Plan.** Jeff Adams said that in the one ETV test performed, there were only four samples collected over a two-month period. Jeff asked if the test plan should require a minimum number of samples or require DQOs to establish the required number of samples. Gary Logsdon recommended a minimum of 8 data points based on the conversation we had on June 4<sup>th</sup> regarding the number of samples required for calculation of 95% confidence interval. Joe Jacangelo said that the original test plan included a six month study with two samples a month. Rick Sakaji mentioned that you probably would not see that much variability over a couple week period, so more frequent samples in a smaller timeframe might not be useful. Rick asked if the number of samples was proposed to see variability of the method or variability of the water quality. Kristie Wilhelm explained that triplicate samples were included in the test plan already to assess the variability of the method. Bruce said that the issue here is how many data points would be useful to State engineers that are reviewing this data. Rick said that the sampling program should be set up to meet a minimum level of data quality, but this creates variability from site to site. Bruce recommended that the Center change the test plan to include a minimum of 8 sample points with a statement allowing for more samples to meet the DQOs. This language will be sent to the Steering Committee for ballot.

David Pearson brought up a suggestion about adding Natural Organic Matter (NOM) analysis to the DBP Membrane Test Plan. Jeff said that for membranes, swatch studies such as those in the ICR would be useful. Kevin Brown, Jerry Biberstine, and John Dyson all indicated that the additional information on the organic matter in the feed water would be useful. Bruce Bartley said that the Center would contact the test plan writer and Craig Woolard and Robin Collins about adding NOM characterization to the Initial Operations sections of the Membrane Test Plan for DBP Removal.

A reminder was given to the meeting attendees to contact Bruce Bartley if interested in the conference calls regarding the LT2ESWTR for bag and cartridge filters and membranes and to suggest dates and times for next years meeting.

MEETING ADJOURNED AT APPROXIMATELY 10:30AM

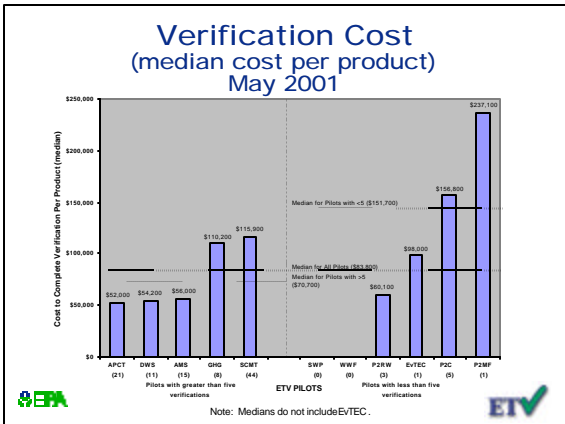
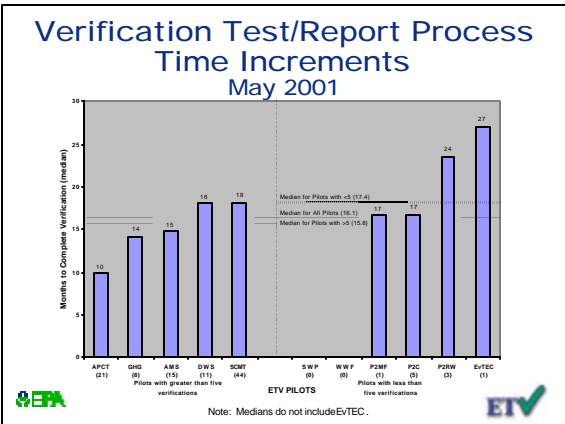
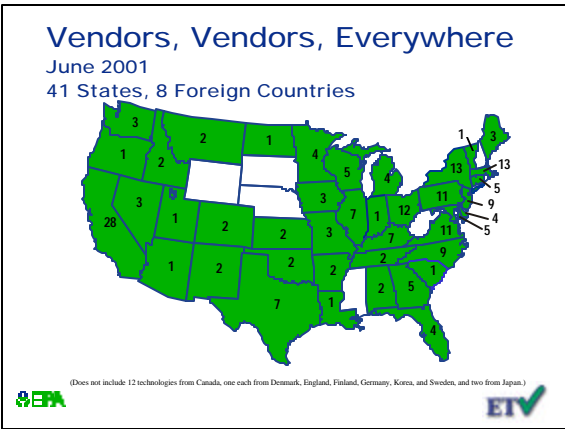
**THE LIST OF ATTENDEES IS AVAILABLE UPON REQUEST.**

**Please contact:**  
**Angela Smith**  
**[asmith@nsf.org](mailto:asmith@nsf.org)**



### ETV Statistics June 2001

- ◆ 1,062 Stakeholders in 18 Groups; 89 Meetings held
- ◆ 60 Generic protocols; 84 Technology-specific test plans
- ◆ 138 Applications pending
- ◆ 111 Technologies in testing/evaluation process
- ◆ 118 Technologies verified



## Vendor Contributions

- ◆ Range per verification (through 2000): \$0 - \$100,000
- ◆ \$1.4M contributed through 2000 (not including in-kind cost)
- ◆ Vendor funding contributions increase annually
  - ◆ FY96 - \$0
  - ◆ FY97 - \$52,800
  - ◆ FY98 - \$181,700
  - ◆ FY99 - \$300,000
  - ◆ FY00 - \$721,500
- ◆ Average vendor funding contributions per pilot per year also increase annually from \$26,400 in FY97 to \$90,200 in FY00



## ETV—Key Success Factors

- ◆ Meaningful stakeholder participation for market input
- ◆ Private sector partnerships for efficient testing
- ◆ Technology-specific, peer reviewed protocols for comparability
- ◆ Test-specific quality assurance plans and implementation for quality
- ◆ Web publication for speed, universal availability
- ◆ EPA Team approach for programmatic consistency and technical expertise
- ◆ Credibility, credibility, credibility

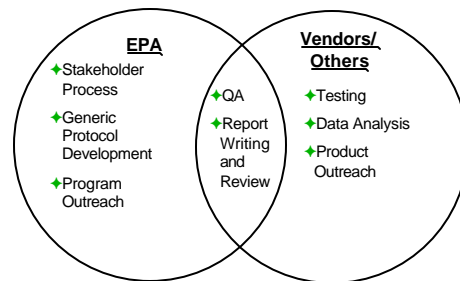


## Ongoing ETV Program

- ◆ **Six ETV Technology Centers**
  - ◆ ETV Advanced Monitoring Technology Center
  - ◆ ETV Air Pollution Control Technology Center
  - ◆ ETV Greenhouse Gas Technology Center
  - ◆ ETV Drinking Water Systems Center
  - ◆ ETV Water Protection Technology Center
  - ◆ ETV Pollution Prevention, Recycling and Waste Treatment Systems Center



## ETV Financial Support After Pilot Period



## Ten Year Plan

### 1995-2000

- ◆ Does the environmental marketplace need/value an EPA supported verification program?
- ◆ Can we design and operate a cost-effective, but still high quality verification program?

### 2001-2006

- ◆ Can technology verification prove valuable in spreading the use of better technology around the world?
- ◆ Will new and better technology continue to emerge from the private sector?



## Environmental Technology Verification (ETV) Drinking Water Systems (DWS) Center

Stakeholder Meeting  
June 4-5, 2001

EPA



## Scope of Today's Meeting

- New participants and stakeholders
- ETV and DWS Center Status Report
- Stakeholder Comments on Scope of Center
- Priorities for Validation and New Protocols
- Technical Issues for Protocol Maintenance

EPA



## *ETV Drinking Water Systems Protocols*

EPA



## Purpose of Protocols

- Provide basic requirements for verification testing of a specific contaminant
- Present an outline for the Product-Specific Test Plan (PSTP)

EPA



## Completed Protocols and Test Plans

- Microbiological and Particulates Removal Protocol
  - Membrane Test Plan
  - Coagulation/Filtration Test Plan
  - Bag Filter and Cartridge Filter Test Plan
  - Precoat Filtration Test Plan
  - Backwashable Depth Filtration Test Plan
- Arsenic Removal
  - Coagulation Test Plan
  - Adsorptive Media

EPA



## Completed Protocols and Test Plans (continued)

- Microbiological Inactivation Protocol
  - Ultraviolet Radiation Test Plan
  - Advanced Oxidation/Ozone Test Plan
  - On-Site Generation of Halogen Disinfectants Test Plan
- Disinfection By-Product Precursor Removal Protocol
  - Membrane Test Plan
  - Granular Activated Carbon Adsorption Test Plan

EPA



## Completed Protocols and Test Plans (continued)

- Inorganic Chemical Contaminants Protocol
  - Reverse Osmosis Test Plan
  - Electrodialysis/Electrodialysis Reversal (ED/EDR)
- Nitrate Protocol
  - Ion Exchange Test Plan
  - Membrane/Reverse Osmosis Test Plan
  - Biological Denitrification

EPA



## Completed Protocols and Test Plans (continued)

- Synthetic Organic Chemicals (SOCs) Protocol
  - Advanced Oxidation/Ozone Test Plan
  - Membrane Test Plan
- Volatile Organic Chemicals (VOCs) Protocol
  - Air Stripping Test Plan

EPA



## Completed Protocols and Test Plans (continued)

- Radioactive Chemical Contaminant Removal Protocol
  - Cation and Anion Exchange Test Plan
  - Reverse Osmosis Test Plan
  - Air Stripping Test Plan

EPA



## Draft Test Plans Under Revision Based on EPA Comments

- Adsorptive Media for Removal of VOCs
- Adsorptive Media for Removal of SOCs

EPA



## Copies of Protocols

- NSF web page: [www.nsf.org/etv](http://www.nsf.org/etv)  
EPA web page: [www.epa.gov/etv](http://www.epa.gov/etv)
- Request hard copy:
  - Fill out Protocol Development Status sheet
  - In person or by phone or e-mail:
    - Angela Smith [(734) 913-5770 or [asmith@nsf.org](mailto:asmith@nsf.org)]
  - Request On-Line (new web site to be launched)

EPA



## Testing Status

EPA



## Overview

- 29 Approved Testing Applications
- 14 Final Verification Reports and Statements
- 13 Tests Completed and Reports are Under Preparation
- 0 Tests In-Progress
- Remaining 2 Have Approved Product-Specific Test Plans and are Preparing to Test

EPA



## 14 Final Verification Reports and Verification Statements

- Calgon Carbon Corporation's Sentinel™ Ultraviolet Reactor
- Aquasource Ultrafiltration Membrane (tested at 2 sites)
- Zenon Zee-Weed® Ultrafiltration Membrane
- Zenon Zee-Weed® Enhanced Coagulation and Ultrafiltration Membrane
- Pall Corporation Microfiltration Membrane
- PCI/Leopold Ultrafiltration Membrane

EPA



## 14 Final Verification Reports and Statements (continued)

- PCI Membrane Systems' Fyne Nanofiltration System
- Hydranautics Hydracap® Ultrafiltration Membrane
- Ionics Ultrafiltration Membrane
- ClorTec Hypochlorite Generation System (Tested at 2 Sites)
- Hydranautics RO Treatment Module
- Watermark Coagulation Package Plant

EPA



## 13 Reports Under Preparation

- Zenon Zee-Weed® Ultrafiltration Membrane
- Rosedale Products Bag/Cartridge Filter
- Kinetico Back-Washable Depth Filter
- Kinetico Coagulation, Sedimentation & Back-Washable Filter
- Osmonics PS-150 Ozone Disinfection System
- Separmatic Vacuum DE Filter
- Separmatic Pressure DE Filter

EPA



## 13 Reports Under Preparation (continued)

- Pall Corporation Microfiltration Membrane
- OXI On-Site Halogen Generator
- PentaPure Mobile Water Purification Station
- Koch Membrane RO Treatment Module
- Kinetico Coagulation Package Plant (for Arsenic Removal)
- Lapoint Industries (formerly known as U.F. Strainrite) Bag Filter System

EPA



## 2 Waiting to Test

- Trojan UVSwift Ultraviolet System
- Atlantic UV Corporation's Megatron M250 Ultraviolet System

EPA



## *Future Activities*

EPA



## **ETV DWS Center: Future Activities**

- Enhance the Quality of ETV Products
- Increase the Number of Technology Verifications
- Re-emphasize the Focus on Small System Needs
- Work with States on Reducing Site-Specific Pilot Testing
- Update the ETV Protocols While Assuring Quality and Cost-Effectiveness

EPA



## Microbial Rating of Low-Pressure Membranes

Joseph G. Jacangelo  
Montgomery Watson

NSF ETV Steering Committee Meeting

June 4-5, 2001  
Cincinnati, Ohio

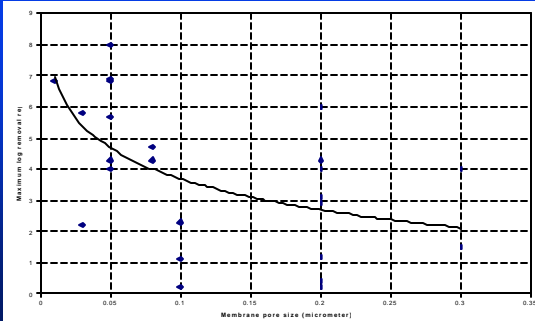
## Salient Issues Regarding Protocols

- Initial membrane filtration protocol required manufacturers to conduct a pore size distribution of their membrane
- Requirement was removed due to excessive cost and lack of third parties to conduct test
- Revised protocol requested 90 % and maximum pore size.

## Issues with Pore Size Distributions

- Normally, only nominal pore sizes reported
- No readily acceptable method for determining pore size distribution
- Removal of microorganisms occur by other mechanisms than just physical sieving

True Microbial Removal Based on Pore Size Difficult to Achieve in the Field



Adapted from "Application of Low Pressure Filtration for Compliance with the SWTR". Prepared by MPI, CH2MHill and Separation Processes (2001) for USEPA.

## Alternative Approach

- Do not look at pore size distribution, but directly at the membrane's capability to removal microorganisms
- Determine a microbial rating for each membrane under worst case conditions
- Microbial rating provided for protozoa, bacteria and viruses

## What are Worst-Case Conditions?

- Maximum pressure
- No shear force along membrane (direct flow operation)
- pH to be determined

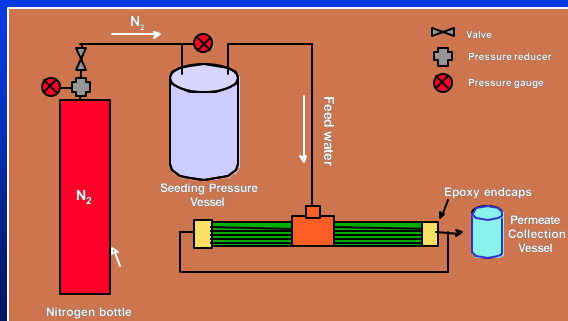
### Studied to be Conducted at Bench Scale

- Very controlled conditions with no membrane fouling or colmatage (cake layer formation)
  - Allows true testing of membrane material
- More rapid results
- Higher recoveries of organisms

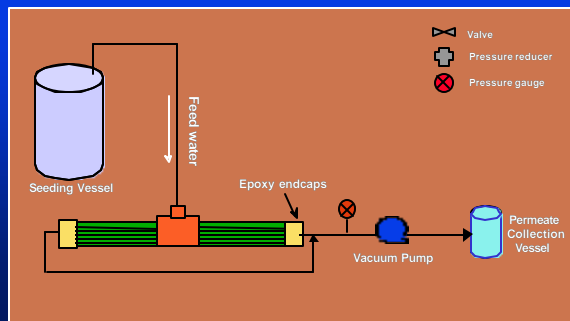
### Bench-Scale Set-Up

- Easy to construct so that any third-party can conduct the tests
- Module size and membrane area to be determined by AWWARF study
- Each manufacturer would submit a module for testing per the specifications of the protocol

### Schematic of Pressure-Driven Bench-Scale Set-Up



### Schematic of Vacuum-Driven Bench-Scale Set-Up



### Advantages of Bench-Scale Rating

- More accurate and precise results of microbial removal of membrane materials as compared to pilot testing
- Could eliminate seeding studies in the field
- Would reduce costs of conducting studies

### Does Bench-Scale Work Eliminate Pilot Work?

- No, once the membrane microbial rating is established, integrity of the membrane and membrane system must be tested vigorously
- Can only test operational conditions at pilot scale on natural waters

## Protocol Development

- Funded by American Water Works Association Research Foundation (AWWARF)
- Reviewed by:
  - NSF/ETV Steering Committee
  - AWWARF Project Advisory Committee
  - Protocol Review Panel

## Protocol Development Timetable

- Protocol currently being developed
- Will be sent out for review in early July

## What is Asked of Steering Committee?

- Review protocol
- After review, determine if applicable for incorporation into NSF Protocol on Microbial Removal by Low Pressure Membranes

## Protocol Development Is Part of a Larger Project on Microbial Removal

- Pilot-scale studies to be conducted in US and Europe
- Mechanism of microbial removal by membranes to be investigated
- For more information on study, please leave me your card