M/DBP Stage 2 Federal Advisory Committee (FACA2) Stage 1 Baseline for large and small systems, Unit Technology Costs, Microbial Occurrence and Discussion of Stage 2 Scenarios

Meeting Summary - March 2000

Meeting #9*

March 29-30, 2000
Washington, DC

*Note: The FACA meeting originally scheduled for February 2000 was canceled

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Introduction

On January 29-30, 2000, EPA held the ninth meeting of the Stage 2 Disinfection Byproducts and Long-Term 2 Enhanced Surface Water Treatment Rules (MDBP) Federal Advisory Committee (FACA). Facilitator Abby Arnold, RESOLVE, began the meeting with introductions from FACA members and reviewed the proposed agenda and objectives of the meeting. The objective of this meeting was to hear presentations by the TWG on the Stage 1 baseline for large and small systems, unit technology costs, and microbial occurrence and options for reducing levels of microbial pathogens in drinking water. The FACA discussed various Stage 2 scenarios, direct the TWG for additional analysis, and FACA members' preferred approaches and schedule for discussing scenarios. See Attachment I.a for a list of meeting participants and Attachment I.b for the draft meeting agenda.

Discussion of M/DBP FACA Groundrules. Cynthia Dougherty, Director, Office of Groundwater Drinking Water, EPA first stated that she did not blame any one at the table for the events that have transpired with a lawsuit between US EPA and the Boston utility Massachusetts Water Resources Authority (MWRA). She then went on to explain that the FACA groundrules had been violated and that is why EPA cancelled the February FACA meeting.[(1)]

Dougherty explained that she understood that the parties in the litigation did what they believed was necessary to defend their case. The problem, Dougherty pointed out, is that EPA's ability to act freely in the FACA discussions is sincerely compromised to the extent that Dougherty is questioning EPA's ability to continue to participate in the FACA process. EPA is now constrained; all Office of Ground Water and Drinking Water (OGWDW) staff must now submit microbial presentations and analysis to regional council and DOJ prior to presentation to the FACA. This compromises OGWDW staff's ability to take advantage of open and free sharing of information by the FACA and TWG. Dougherty reiterated her commitment to the FACA process. The benefit of the FACA process, stated Dougherty is the ability of its members to problem solve in an informal discussion about difficult issues. If EPA, or any other party around the table, has to worry about misuse of informal discussion and dialogue, parties will shut down and will not be able to talk openly. Dougherty pointed out that EPA staff at the table are no longer able to respond informally to ideas discussed at the table.

To address the immediate situation and ongoing litigation in Massachusetts, EPA is considering removing from the FACA's purview any discussion about regulatory controls and barriers for unfiltered systems. If unfiltered systems are taken off the table, EPA would develop unfiltered systems rules through a separate stakeholder involvement process.

There was very thoughtful and considerable discussion among FACA members. Comments pertained to 1) the value of the FACA process itself and 2) the proposed remedy to remove discussion of unfiltered systems from the table.

Those who commented on the value of the FACA process pointed out that the FACA is a robust process that has been and always will be fragile. One member pointed out that it is a tribute to the process that it has lasted so long (now three phases that began in 1993). This member further pointed out that the groundrules provide the safeguards to the parties, that there is no policing of the groundrules other than the good will of the FACA members, interested parties and public. The members at the table are bound to one other's good faith, and that each of the members are at the mercy of all in the room. Enforcement of the groundrules depends on everyone's willingness to take the fragility seriously and make certain that the groundrules are adhered to seriously. This member further pointed out that if parties carve out the process, one piece at a time, the process will be less robust This member, as well as others, pointed out that the proposed solution, that is taking the unfiltered systems issues off the table could compromise the overall process.

FACA members discussed the proposal to not address unfiltered, a number of the members were concerned that by taking unfiltered systems off the table the benefit of full dialogue among a broad array of stakeholders, each with a different perspective, would be lost. Other stakeholders were concerned about their ability to have input and provide influence on unfiltered systems issues if these issues were discussed in another forum. Some members pointed out that they represent both filtered and unfiltered systems and it would be difficult to separate their representation of these systems. All who spoke agreed that regardless of the outcome of the unfiltered systems proposal, FACA membership should not change. Ms. Dougherty and Ms. Menard agreed to bring a proposal back to the FACA.

Overview of Where We Are And Where We Are Going

Abby Arnold, RESOLVE, presented an overview and proposed schedule for this last phase of the FACA process March - July 2000. [see Attachment II.] Arnold pointed out that in order to meet EPA's schedule for rule development, the FACA must develop recommendations for the Stage 2 Rules by end of June. There will be an additional FACA meeting on July 27 to allow time for FACA members to consult with their constituents and sign the Stage 2 agreement.

To meet the proposed schedule for completion of the Stage 2 recommendations, Arnold proposed the following milestones for the remaining meetings:

March meeting:

- Agree on framework we will use to discuss various scenarios.
- Agree on the scenarios we want the TWG to conduct analysis (further analysis) on
- Agree on the FACA schedule and process for discussing the scenarios.

April meeting:

- Hear results of swat runs on selected scenarios identified in March
- Decide on which scenarios the FACA will tweak and pursue
- Identify questions for TWG
- Discuss one-text outline for Stage 2 recommendations (developed by a subgroup of FACA members before the April meeting)

June meetings:

- Hear results of TWG analysis, negotiate one-text

- Finalize agreement

July meeting:

- Get ratification from various organizations - sign agreement

During this discussion, FACA members requested updates on chloroform, EPA's health risk analysis, and the Dr. Waller and other reproductive and developmental health research.

Stage 1 Baseline (ICR and Non-ICR): TWG Presentation

Mike McGuire, MEC and Stig Regli, EPA, presented the Characterization of Technology Shifts and DBP Occurrence for Large Systems (ICR) [Attachment III.a] and for small and medium, non-ICR, systems [Attachment III.b] developed by the Technical Work Group.

McGuire began by presenting large ICR (surface water) systems and large groundwater systems. These systems serve approximately half of the US population. McGuire asked that FACA member concentrate on how the data is presented, instead of the content of the data itself. The TWG will be presenting a large amount of data in the coming meetings that FACA members will have to understand and digest. The TWG is asking for feedback from the FACA on what is the best format for the data? The amount of data is overwhelming, it will be the job of the TWG to present analysis and information that is useful to the FACA.

The TWG believes that the Stage 1 baseline is adequately described for technology selection and DBP levels. Other polling methods appear to support SWAT predictions. The Stage 1 baseline predictions can now be compared with surface water and groundwater baselines.

In response to a question from a FACA member on the distribution of surface water and ground water systems across states, Regli explained that there are scientific data from 8 to 10 states for DBP occurrence versus TOC occurrence from the 1980s, these include precursor occurrence data.

ICR/Large Surface Water Systems Stage 1 Baseline

The Stage 1 baseline compliance forecast for ICR systems (surface water systems serving over 100,000 people) was estimated using four methods: utility poll, least cost Delphi poll, best professional judgement Delphi poll, and SWAT model prediction. For each of the methods McGuire described the distribution of utilities across a list of ending technologies. Delphi polls were conducted asking experts what utilities will have to do to comply with the Stage 1 rule and recommendations for each system to comply. A FACA member noted that process described by McGuire is really a "survey of experts" and not a formal Delphi process. McGuire stated that the SWAT tool is an analytical model based on ICR data. It can analyze large amounts of data quickly. The TWG has endorsed the SWAT model and anticipates that it will be the primary method of analyzing various Stage 2 scenarios for large systems.

McGuire presented a comparison of technology shifts from different forecasting methods. Any difference between the methods should be viewed as the range of anticipated technology shifts. The final large surface water Stage 1 baseline ending technologies is included as Slide 20 [Attachment III]. These values will be used to compare with Stage 2 scenarios and to determine cost estimates. McGuire also presented cost estimates for compliance with Stage 1 and baseline TTHM, HAA5, and chlorite levels. The major shift in HAA5s will be at high levels. Stage 1 Bromate levels are not yet available. TWG has estimated that utilities will aim for over compliance for Stage 1 and set levels for 80% of the MCL. There is a mix of attitudes within the industry on how to respond to the Stage 1 Rule, that will be in effect (January 2001), and the anticipated Stage 2 rules. In developing estimates the TWG has assumed that utilities will choose the least-cost option. Though true maximum concentrations are not known, the TWG has a high degree

of confidence in the SWAT forecasts. SWAT calculations are designed to determine a national estimate and should not be used for individual plant predictions.

Non-ICR Systems Stage 1 Baseline

Stig Regli, EPA, presented the Stage 1 baseline estimates for non-ICR surface water systems, medium sized systems (serving 10,000-100,000) were assumed to have the same baseline as large systems (serving greater than 100,000) because they have similar source water quality and the same technology decision tree. In other words, the distribution of technologies among medium sized systems is assumed to be the same as for large sized systems following the implementation of Stage 1.

Systems serving less than 10,000 people have a different compliance forecast than for medium and large systems. Smaller systems have source water quality and significant economies of scale considering technology choices for meeting Stage 1 [Attachment III.b (slide 8)] illustrating technology compliance forecast for small systems using surface water. Most noteworthy for small systems using surface water is:

a) their very substantial shift to use of chloramines (about a 50 percent shift away from chlorine) and

b) their substantial reduction in DBP exposure illustrated in the graph [Attachment III.b., slide 9] for TTHM occurrence before and after Stage 1.

Large Groundwater Systems Stage 1 Baseline

McGuire presented Stage 1 baseline estimates for large groundwater systems (serving greater than 100,000 people) including cost, TTHM and HAA5 estimates [Attachment III.a (Slide 36)]. SWAT cannot be used for ground water, so estimates depend on a survey of experts. Large groundwater systems serve approximately 8 percent of the US population.

The TWG estimated technology selection for non-complying ICR groundwater plants based on two Delphi polls. One poll asked experts to predict technology shifts based on their best professional judgement, the second poll asked experts to choose the least cost option. McGuire presented the final Stage 1 Baseline technologies and technology cost levels for large groundwater systems. McGuire also presented Stage 1 baseline estimates for TTHM and HAA5.

Non-ICR Groundwater Systems Stage 1 Baseline

Regli presented the predicted Stage 1 baseline for non-ICR groundwater systems [III.b. slides 10-12]. Because of similarities in source water quality and little difference of economies of scale the non-ICR baseline can be expected to be similar for that of the large groundwater systems. Large groundwater systems are assumed to be many small groundwater systems because of the many wells needing separate treatment within each large system.

Microbial Framework for Filtered Systems

Stig Regli, EPA, presented the preliminary microbial tool box of scenarios based on FACA questions and potential framework for filtered systems [Attachment IV.a].

The TWG has divided the FACA's microbial pathogen questions discussed at the January FACA meeting into three categories:

1. Source water screening. The TWG is working on a microbial index, identifying pathogen indicators, and identifying other watershed characteristics. Identification of reliable indicators or

other characterization methods would support options that focus on systems with potentially higher risks.

2. Source water monitoring. The TWG is addressing four specific monitoring questions from the FACA. Source water monitoring is feasible, though finished water monitoring with present methods is not. FACA members asked for the following additional analyses:

- Sensitivity analysis to define our capability to characterize occurrence - including occurrence during peak events and overall mean concentrations.
- Since filtered systems have a substantial barrier, defining the effects that peak occurrence in source water has on finished water occurrence is a challenge. To what level do peak concentrations in source water translate into finished waters peaks? AWWARF is currently studying peak monitoring. The effects of higher turbidity are not understood. There may be increased removal when turbidity is high due to more particle interactions occuring. FACA members asked that issues discussed by the TWG regarding filter performance be summarized for FACA members.
- AWWARF is conducting a study, due for completion this summer, on the variance in *Crypto* occurrence. Analysis of the data will not be complete until early 2001. Measuring variance in *Crypto* occurrence based on 12 months of data is a problem due to variation between years. 12 months studied may be an unusual year.

4. Potential corrective actions. A list of "tools" in three categories have been identified by the TWG that can reduce exposure to *Crypto:* pretreatment/watershed (lower influent concentrations), operational/reliability (enhance removal), and advanced treatment (enhance removal or inactivation). The TWG is identifying a range of tools and cost implications in the toolbox in each category and definitions and capacities of each tool. Quantifying the reduction in concentration, or credit, to assign specific controls is difficult.

In response to a question, Regli explained that the TWG is developing a map for estimating inactivation by ultraviolet (UV) technology. UV is encouraging, however, the practicality of full scale commercial implementation of UV is still unclear to some TWG members.

- A FACA member requested that the TWG present to the FACA the TWG's analysis of the viability of using UV in drinking water, including any concerns individual TWG members might have.
- A FACA member requested further development of source water protection options, how to deal with distribution systems, and finished water reservoirs. EPA distributed a memorandum from EPA Assistant Administrator Chuck Fox on examination and recommendations for EPA programs on waterborne microbial disease [Attachment IV.b]. The memorandum is an effort to link EPA water protection activities (including actions under the Clear Water Act and Safe Drinking Water Act) to reduce microbial pathogen occurrence.

Unit Costs for Various Technologies

Douglas Owen, Malcom Pirnie, presented overviews and cost estimates for existing disinfection technology alternatives, options for reducing DBPs with chlorine, and technologies for removing DBP precursors [Attachment V]. These cost estimates are based on data from manufactures, plants, pilot studies, and an industry data base. Owen provided cost information and schematics on how alternative disinfectant, DBP reduction options (with chlorine), and precursor removal technologies work.

Owen presented *draft* cost summaries for alternative disinfectants, alternative disinfectants with free chlorine, and alternative precursor removal technologies:

Alternative Disinfectants:

DRAFT* Alternative Disinfectants Cost Summary (Total Costs in $/k-gal)				
Technologies	***Flow (mgd)***			
	0.1	1.0	10	100
UV	0.47	0.13	0.07	0.05
ClO2	1.04	0.26	0.08	0.04
O3 (1-log Crypto)	3.14	0.65	0.21	0.11
O3 (2-log Crypto)	4.10	0.88	0.27	0.13
MF/UF (low)	4.04	1.28	0.66	0.50
MF/UF (high)	5.13	2.17	0.86	0.57

*Preliminary DRAFT: For FACA discussion only

In addition, Owen made the following points:

- Chlorine dioxide (ClO2) is estimated to provide 1/2 log *Crypto* inactivation.
- Ozone may be feasible, however, bromate formation may be an issue. Estimated costs of ozone do not include operational changes to avoid bromate problems. In response to a question from the FACA, Owen explained that electrical power makes up 30-50% of operational costs of ozone and so may be sensitive to changing electricity costs. In response to a question, Owen explained that redundancy in systems allows for one unit to be brought offline for service without compromising treatment.
- The engineering reliability of UV technology is an issue. UV inactivation at the UV does for which the cost analysis was conducted is estimated at 2 logs for oocysts and viruses. UV systems are modular and have large economies of scale. Power consumption is 20-25% of operational costs.
- Physical removal, through filtration, may be limited by mechanical reliability issues. Micro and ultra filtration costs depend greatly on the water quality, amount of reject water, the cost of water, and the disposal method for backwash. These systems, plus a residual, could act as complete water treatment system.

Alternatives with Free Chlorine:

DRAFT Alternatives with Free Chlorine Cost Summary (Total Costs in $/k-gal)*				
Technologies	***Flow (mgd)***			
	0.1	*1.0*	*10*	*100*
Move Chlorine Application Point	0.092	0.09	0.046	0.0020
Switch to Chloramines	0.168	0.02	0.007	0.0015

*Preliminary DRAFT: For FACA discussion only

- Moving point of chlorine application is a relatively low cost approach.
- Switching to chloramination is a common approach for meeting Stage 1 rules.

Alternative Precursor Removal Technologies:

DRAFT Alternative Precursor Removal Technologies: Cost Summary

(Total Costs in $/k-gal)*				
Technologies	***Flow (mgd)***			
	0.1	*1.0*	*10*	*100*
Enhanced Coagulation	0.11	0.08	0.033	0.031
Enhanced Softening	0.52	0.26	0.10	0.055
GAC10 (60 ug/L THM target)	4.20	1.47	0.53	0.24
GAC20 (20 ug/L THM target)	4.92	2.78	0.79	0.55
NF with Direct discharge of Concentrate		6.32	3.74	1.33	1.03
Int. Membranes (MF/UF - NF)	10.36	5.02	1.99	1.53

*Preliminary DRAFT: For FACA discussion only

- Granular Activated Carbon Adsorption - costs are sensitive to quantity of water applied and frequency of reactivation

A FACA member noted that an important consideration in cost is how technology will change the footprint of the plant, and if technology changes are associated with other changes at a plant.

Examples of Stage 2 Scenarios Developed by TWG

Mike McGuire presented ***example*** technology shift selections and TTHM/HAA5 exposure outputs for two Stage 2 options using SWAT [Attachment VI]. McGuire explained that the main purpose of this presentation is to gain feedback on how the TWG should present the data to the FACA - these option predictions should not be used as a basis for decisionmaking. Stage 2 predictions are based on SWAT only (not the four estimates used for Stage 1).

McGuire reminded FACA members that compliance will be different then the SWAT output. SWAT has the option of including or excluding the use of UV. For this presentation the TWG developed SWAT (large surface water system) predictions for two options:

- 40 TTHM and 30 HAA5 (40/30) as a running annual average (RAA). This example also assumed 1-log *Crypto* inactivation requirement and ***excluded*** UV.
- 80 TTHM and 60 HAA5 (80/60 as a single highest (SH) allowed value. This example also assumed 1-log *Crypto* inactivation requirement and ***included*** UV.

For these two example runs the McGuire presented new technology selections, new technology cost levels, ending technologies, and ending technology cost levels. SWAT also estimated cumulative probability plots of TTHMs and HAA5s for running annual averages and cumulative probability plots of TTHMs and HAA5s for single highest values. In addition to the presented materials McGuire made the following points:

- 1-log *Crypto* removal is an important constraint - causes a large shift in technology, especially to UV when UV is allowed as a technology option in the model. When UV is not allowed, the primary shift is to ozone in plants with relatively low bromide levels.
- In response to a question McGuire noted that the inactivation requirement can also be met by physical removal (e.g., microfiltration or nanofiltration).

- Largest decreases in DBPs (TTHM and HAA5) occur in those systems with the highest levels of DBPs.

In conclusion, McGuire noted that the option conditions chosen (e.g. *Crypto* inaction levels and availability of UV) have a profound impact on the Stage 2 technology predictions. DBPs can be shown to dramatically decrease after the application of advanced, relatively costly technology. A very large number of SWAT runs (160 or more) may need to be examined.

Examples of Stage 2 Impacts To Non-ICR Systems

Waiting for additional comments on this section.

Stig Regli presented example estimates of Stage 2 impacts to non-ICR systems [Attachment VII]. Regli presented predicted technology changes for each system type and size for a range of six example regulatory endpoints. Examples were developed for four systems categories:

- Medium surface water systems: extrapolated from ICR SWAT Stage 2 estimates
- Small surface water systems: survey of expert
- Medium ground water systems: extrapolated from ICR GW estimates
- Small ground water systems: extrapolated from ICR GW estimates

Under many of the scenarios, utilities that made changes to meet Stage 1 rules will meet the Stage 2 requirements. There is now decent small systems impact data, including data on why systems are choosing to make technology shifts for Stage 1.

- In response to a question from a FACA member Regli noted that UV is less expensive than ozone and is a frequent choice for Stage 1 compliance when UV is included as a technology option.

Framework and Examples To Discuss Stage 2 Scenarios

Ephraim King, EPA, presented a suggested approach for thinking through data and providing direction to the TWG [Attachment VIII]. King explained that the data in this presentation are examples of data that could be generated by the TWG - not actual data. The TWG can develop methodology for identifying systems with different levels of pathogen exposure and identify how systems can lower pathogen exposures. The TWG can characterize impacts of rule options (Stage 2 DBP and LT2ESWTR) including; percent of systems affected, technology shifts, costs, and changes in exposure. It is not possible to accurately estimate changes in risk.

King recommended that the FACA develop rule options for the TWG to evaluate that consider microbial (LT2ESWTR) and DBP (DBP2R) simultaneously. Impacts of each rule can also be evaluated separately by setting no action for either rule.

Suggested Framework for FACA Discussion				
→	Stage 2 DBP Level of Stringency			
	option a	option b	option c	option d
↓ LT2ESWTR Level of stringency	option a			

	option b		
	option c		
	option d		

King also presented example summaries of SWAT preliminary screening runs:

Example M-DBP Scenario Matrix: Sample only- Draft applies only to filtered systems

DBP rule options (stringency increases)					
LT2 **ESWTR options** (stringency increases)		*TTHM/HAA5 80/60* *annual average @ max* *Bromate 10*	*TTHM/HAA5 80/60* *quarterly average @ max* *Bromate 10*	*TTHM/HAA5 80/60* *single max* *Bromate 10*	*40/30 annual average* *Bromate 5*
	Framework Option 1(systems with mean Crypto.conc >1/10 L provide additional Crypto control)	% systems affected Simple characterization of technology shift DBP shift Relative costs	% systems affected Simple characterization of technology shift DBP shift Relative costs	% systems affected Simple characterization of technology shift DBP shift Relative costs	% systems affected Simple characterization of technology shift DBP shift Relative costs
	Framework Option 2 (systems with mean Crypto conc > 1/100 L provide additional *Crypto control)*	As above	As above	As above	As above
	1 log inactivation for all systems	As above	As above	As above	As above

Initial SWAT screening runs of regulatory options have been performed:

- TTHM/HAA5 number at 80/60, 70/50, 60/40, and 40/30.
- Determinations of compliance at current, maximum annual average, or single maximum at 120/100, 110/90, 100/80, and 90/70
- Bromate at 10 ppb or 5 ppb
- *Crypto* inactivation at 0 log (assumes 2 log removal) or additional 0.5 and 1 log

- UV on or off
- Over 200 regulatory options screened.

Changes from Stage 1 Baseline for Stage 2 Scenarios - Draft applies only to filtered systems					
	% Shift in Technology Cost Categories For SW Systems >100,000				
DBPR Scenario	<25c/1K gal	25-50c/1K gal	$1-3/1K gal	Total % Shift	% Chloramine shift
does not include LT2ESWTR Option					
Stage 1 Baseline (w/ HAA6)	0	1	0	1	0
120/100 Single Max	0	2	0	2	5
80/60 Annual Average of the Max	0	4	0	4	1
110/90 Single Max	0	5	0	6	5
80/60 75%ile of the Max	2	4	0	6	7
100/80 Single Max	4	7	0	11	10
80/60 90%ile of the Max	3	10	0	13	6
80/60 Quarterly Average of the Max	4	10	0	14	12
90/70 Single Max	6	10	0	17	13
80/60 Single Max	6	18	0	24	13
70/50 Single Max	5	24	1	31	17
40/30 RAA	12	25	0	37	15
40/30 Annual Average of the Max	6	30	1	38	17
60/40 Single Max	7	32	2	41	16
40/30 75%ile of the Max	8	35	2	44	18
40/30 90%ile of the Max	7	38	2	47	17
40/30 Quarterly Average of the Max	8	40	3	51	21
40/30 Single Max	6	47	5	59	17

	Stage 1 Baseline Ending Technologies				
Stage 1 DBPR (80/60/10)	Ozone or Chlorine Dioxide	MF/UF or GAC 10/20	Nanofiltration	Conv/No Change	% Chloramine
Stage 1 Baseline	17	4	0	78	53

DRAFT SWAT Preliminary Screening Runs: Sample Only applies only to filtered systems

Microbial and Technology Conditions	Regulatory Option		Total Fraction CLM	Fraction of Advanced Technology	TTHM, ug/L		HAA5, ug/L	BrO3, ug/L
				90% Annual Avg, DS Avg	90% Quarterly Avg, DS Max	90% Annual Avg, DS Avg	90% Quarterly Avg, DS Max	90% Annual Avg
1.0-log Incremental Crypto Inactivation	80/60 RAA	10	99	0	3	49	63	38
	40/30 RAA	25	52	0	2	39	49	29
	80/60 Locational Quarterly Avg	11	40	0	2	55	66	38
	40/30 Locational Quarterly Avg	22	99	0	5	37	46	29
	120/100 Single Highest	9	99	0	5	46	60	37
	80/60 Single Highest	24	40	0	4	40	49	30
	40/30 Single Highest	12	27	0	3	55	65	38

King presented the estimated range of technology costs for the following scenarios for all systems and broken down by large, medium and small systems:

- 40/30 running annual average, 1 log removal, with and without UV
- 80/60 single maximum, 1 log, with and without UV

Scenarios for TWG Analysis and FACA Deliberation

FACA members met in caucus and cross-caucus meetings to develop a set of scenarios for TWG analysis. The TWG will analyze the following scenarios for presentation at the April FACA meeting:

Regulatory Option Matrix From March 30, 2000 FACA Meeting (corrected by TWG)

29 runs + 5 "sorts"					
DBPs:	120/90 Single Highest	**80/60** **Locational Running Annual Ave**	80/60 Annual Ave of the Maximum	**80/60** **Single Highest**	40/30 Single Highest
Microbial:					
0 log *Crypto*	x	**x**	x	**x**	x

removal (UV off)					
0.5 log *Crypto* removal	xx (UV on/off) (Bromate=10)	**xx** **(UV on/off)** **(Bromate=10)**	xx (UV on/off) (Bromate=10)	**xxxx** **(UV on/off)** **(Bromate=5/10)**	xx (UV on/off) (Bromate=10)
Sort Only 20% 2.0 log *Crypto* removal-(UV on)					
2.0 log *Crypto* removal	xx (UV on/off) (Bromate=10)	**xx** **(UV on/off)** **(Bromate=10)**	xx (UV on/off) (Bromate=10)	**xxxx** **(UV on/off)** **(Bromate=5/10)**	xx (UV on/off) (Bromate=10)
		+Small Systems & National Costs		**+Small Systems & National Costs**	

In addition to the scenarios, FACA members requested that the following information be provided or analyses be performed:

- Work on Microbial Framework (toolbox) for source waters: monitoring feasibility & control enhancement measures.
- Monster SWAT Run: GAC 10 (1986 SDWA Amendment definition); prepare a cumulative probability distribution of TTHM and HAA5; set MCLs for the DBP levels at the 90th percentiles; perform Smart SWAT runs based on these MCLs.
- Distribution System Water Quality Framework: reliability issues (EPA has some information)
- Screening SWAT Runs: Sort 160 screening SWAT runs by significant technology shifts (UV is a significant tech shift), national costs of SWAT utilities, and DBP exposure (is there a "knee in the curve"?)
- For Stage 1 Baseline SWAT run (80/60 Running Annual Average), sort monthly DBP predictions for all 273 plants by increasing levels of TTHM and HAA5 and determine how many plants are over 120/90 as single highest value the following number of times (1, 2, 3, etc.).
- Next, for Stage 1 Baseline SWAT run (80/60 Running Annual Average), sort monthly DBP predictions for all 273 plants by increasing levels of TTHM and HAA5 and determine which plants ever exceed 120/90 as single highest value; then go to the SWAT run for 120/90 and identify what those plants had to do to comply with 120/90. Present technology shifts meeting 120/90 single highest value under these conditions (this may be an example of a composite regulatory option combining RAA and SH).

The following additional points were made during FACA deliberations:

- In response to a question from the FACA, EPA agreed to provide data on water quality criteria for microbial pathogens and data on tools for regulating upstream users. The FACA can make recommendations regarding a source water protection approach. FACA members requested information on what streams are designated drinking water sources and data on where utilities

are versus water quality characteristics. However, implementing upstream rules will be more difficult because states will have primary implementation responsibility.

- The traditional risk calculation and cost and benefit analysis of the Stage 2 MDBP options will be performed by EPA, however, EPA anticipates that the FACA's best professional judgement will be the driver in the regulations because of the high level of uncertainty.
- In the past, EPA has defined affordability as a cost increase of $500 per year per household for all regulations.

Public Comment

Sidney Ellner, Ultratech, addressed the FACA on UV technologies. UV technologies have the experience to handle large systems and tools for monitoring effectiveness of UV exist. UV cannot overdose water and leaves no detectable residual in water. Bioassays and electronics are used to test effectiveness of system. UV systems are highly reliable, and typically consist of a fluorescent lamp (without phosphorus) and ballast. There are percentage failure data for systems. In response to a question from the FACA, Ellner explained that mercury is used in the lamps, however there is less mercury in a UV lamp than in a normal fluorescent lamp. UV lamps are housed in a quartz jacket that separates the lamp from water and allows maintenance of lamps without interfering with water flow. There is no significant history of breakage of lamps. Possible concerns of irradiation of water by the public have not been addressed. However, among other uses, Johnson and Johnson uses UV to disinfect baby products. These uses have not raised public fears.

Next Steps

FACA members discussed the following next steps:

1. TWG will perform analysis of the scenarios requested for the April meeting.

2. FACA subgroup will meet to develop one-text agreement *draft*.

3. Anticipated April FACA agenda items:

    - TWG Report
    - Discuss one-text FACA perspective on health risks (reproductive & developmental /cancer, DBP/micro).
    - Caucus Time

4. June FACA meetings - possible agenda items:

    - UV safety and reliability
    - Reproductive and developmental health effects data update
    - Status report on chloroform

Adjourn

1. The MWRA is a member organization of a party represented on the FACA. Defense attorneys representing MWRA used materials discussed by EPA staff during informal telephone conversation and at a TWG meeting in litigation with US EPA. The Attorney represented that the materials as EPA's position. The M/DBP groundrules state that: *"Specific offers, positions, or statements made during the discussions may not be used by other parties for any purpose outside the discussions or as a basis for future or in current litigation".* (Section 6.a. page 3).