Lessons Learned From Use of the Toolbox – A Utility Survey

U.S. Environmental Protection Agency
LT2 ESWTR
Monitoring Data Analysis, Occurrence Forecasts, Binning, and the Microbial Toolbox

Public Meeting Nov. 15, 2012

David A. Cornwell, Ph.D., P.E. BCEE
Nancy E. McTigue

Steve Via
AWWA Regulatory Affairs

EE&T, Inc.
ENVIRONMENTAL ENGINEERING & TECHNOLOGY, INC.

Approach

- Contacted utilities in Bin 2 to assess their experience using Tool Box
- Developed list of utilities using **Primacy Agency Reports** and **Calculated Bin Determination Data**
- Also contacted others familiar with these technologies and some State personnel

Compliance Requirements for Bin 2 Utilities

Schedule	Population Served	Compliance Dates
1	>100,000	2012(1Q) - 2014
2	>50,000 to 99,999	2012(3Q) - 2014
3	>10,000 to 49,999	2013(3Q) - 2015
4	<10,000	2014(3Q) - 2016
4 without crypto monitoring	<10,000	2013(3Q) - 2015

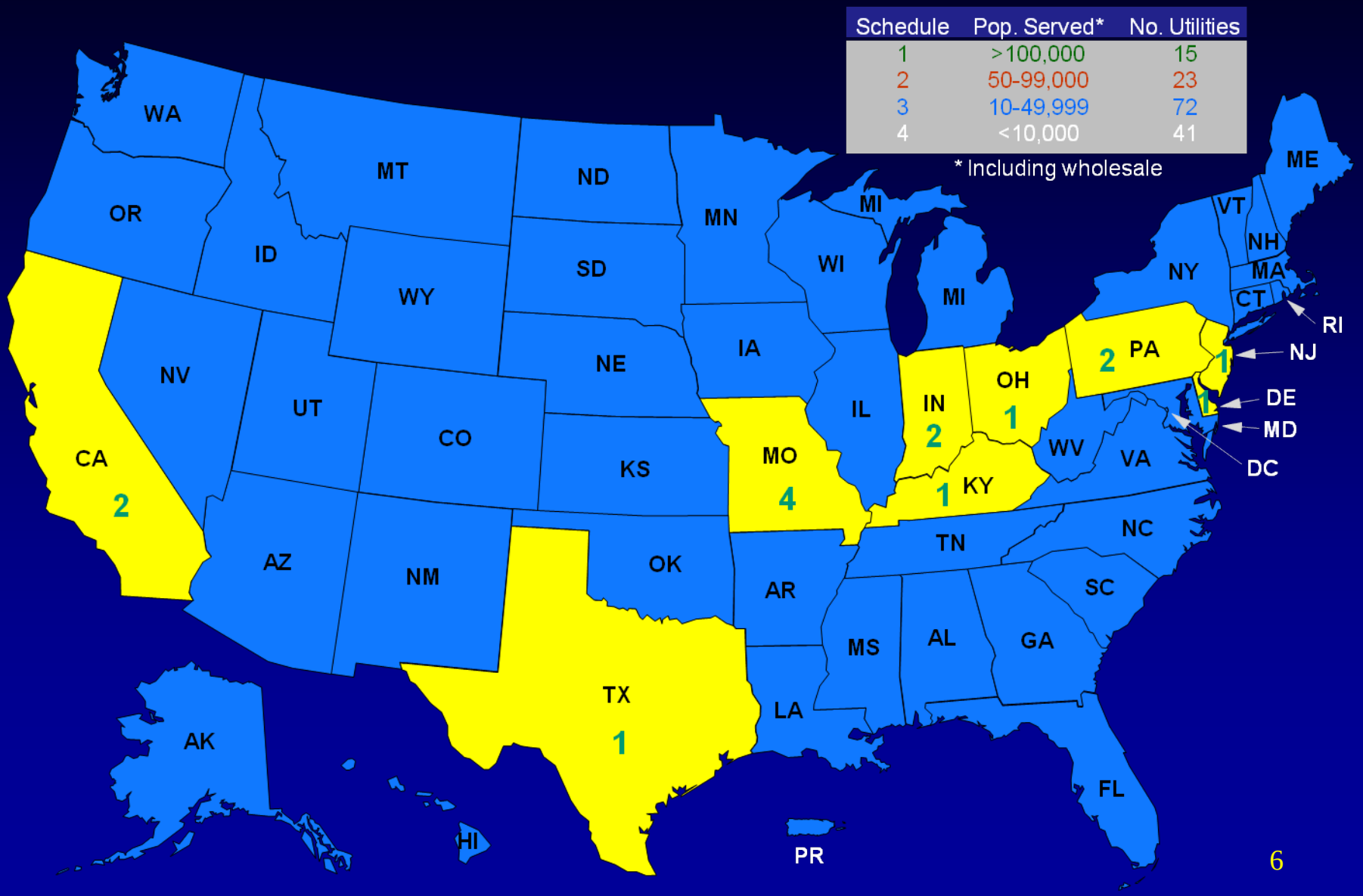
Bin 2 Databases Used for Contacts

Schedule	1	2	3	4	NA
In Both Databases	6	11	47	5	6
Primacy Agency Database only	6	10	25	36	
Calculated Bin Database only	1	1	0	0	
From EE&T contacts	+2	+1			
TOTAL	**15**	**23**	**72**	**41**	**6**

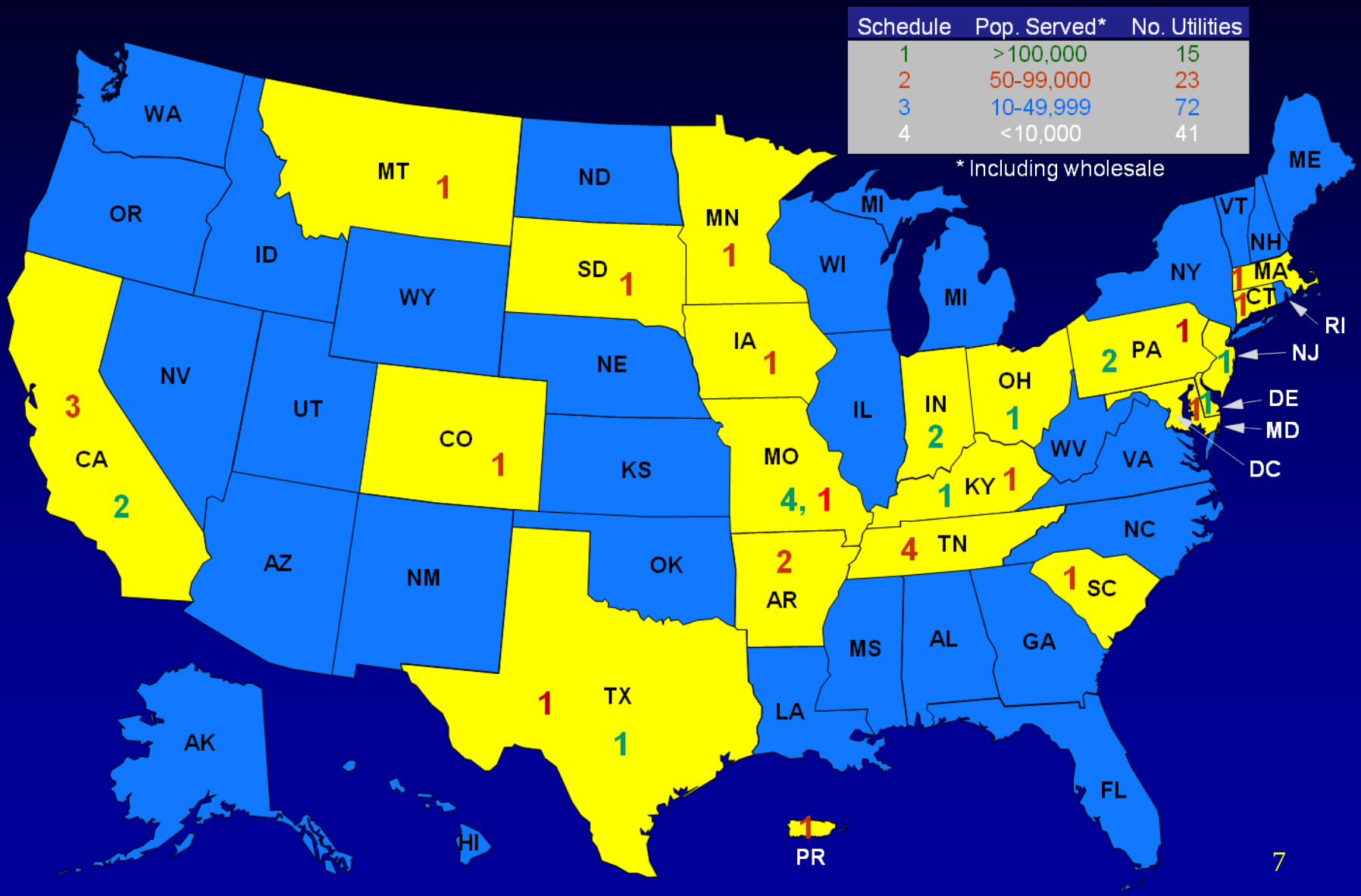
Database Summary

- Primacy Agency Reports
  - 152 utilities in Bin 2
- Calculated Bin Determination Data
  - 77 utilities in Bin 2
  - *75 utilities were in both databases*
  - *3 utilities self identified as Bin 2*
  - *3 utilities claimed they were actually Bin 1*
- EE&T talked to 19 utilities (24 Bin 2 plants) and 4 “implementation experts”

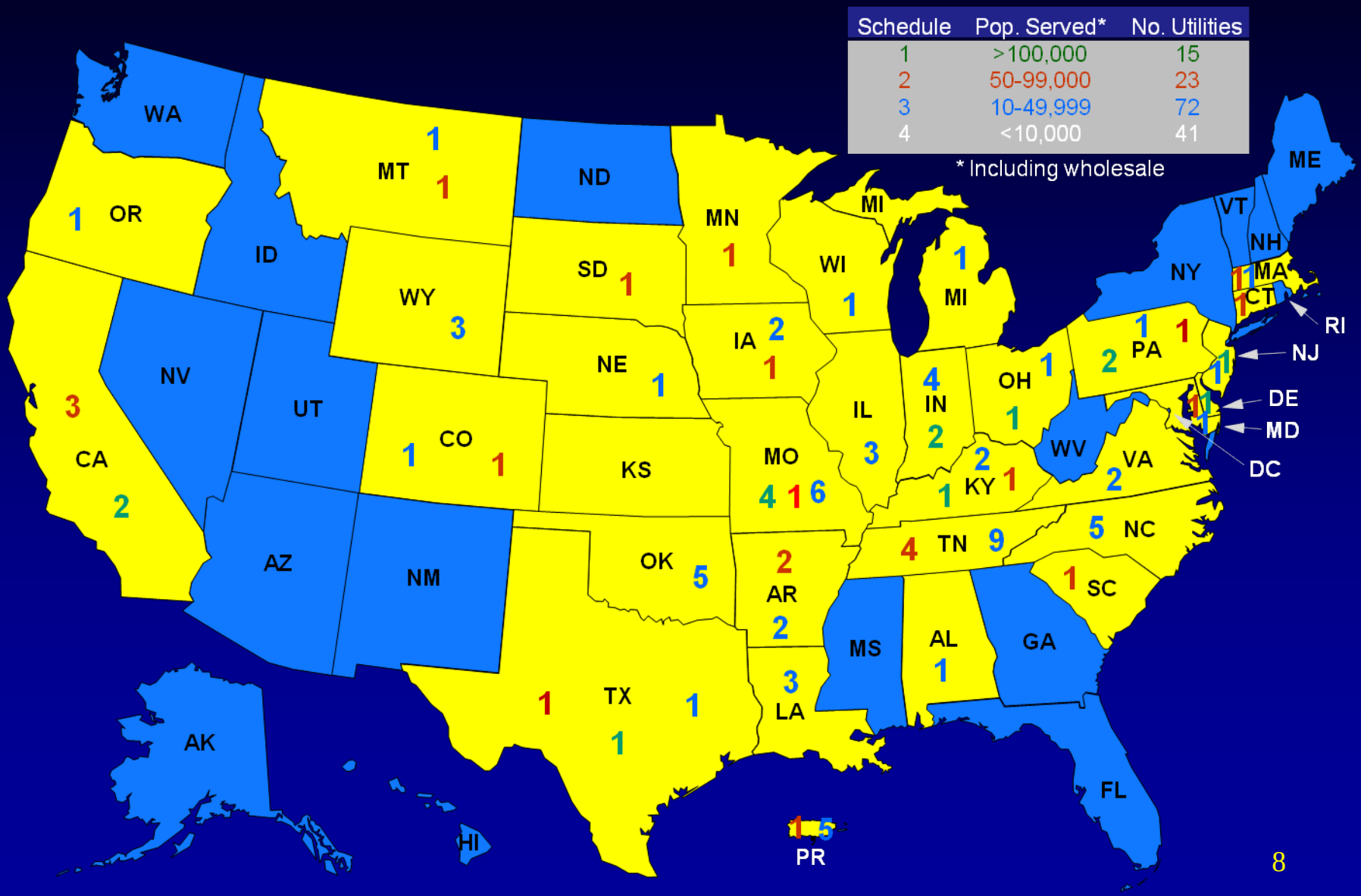
Schedule 1 Utilities in Bin 2



Schedule 1 and 2 Utilities in Bin 2



Schedule 1, 2, and 3 Utilities in Bin 2

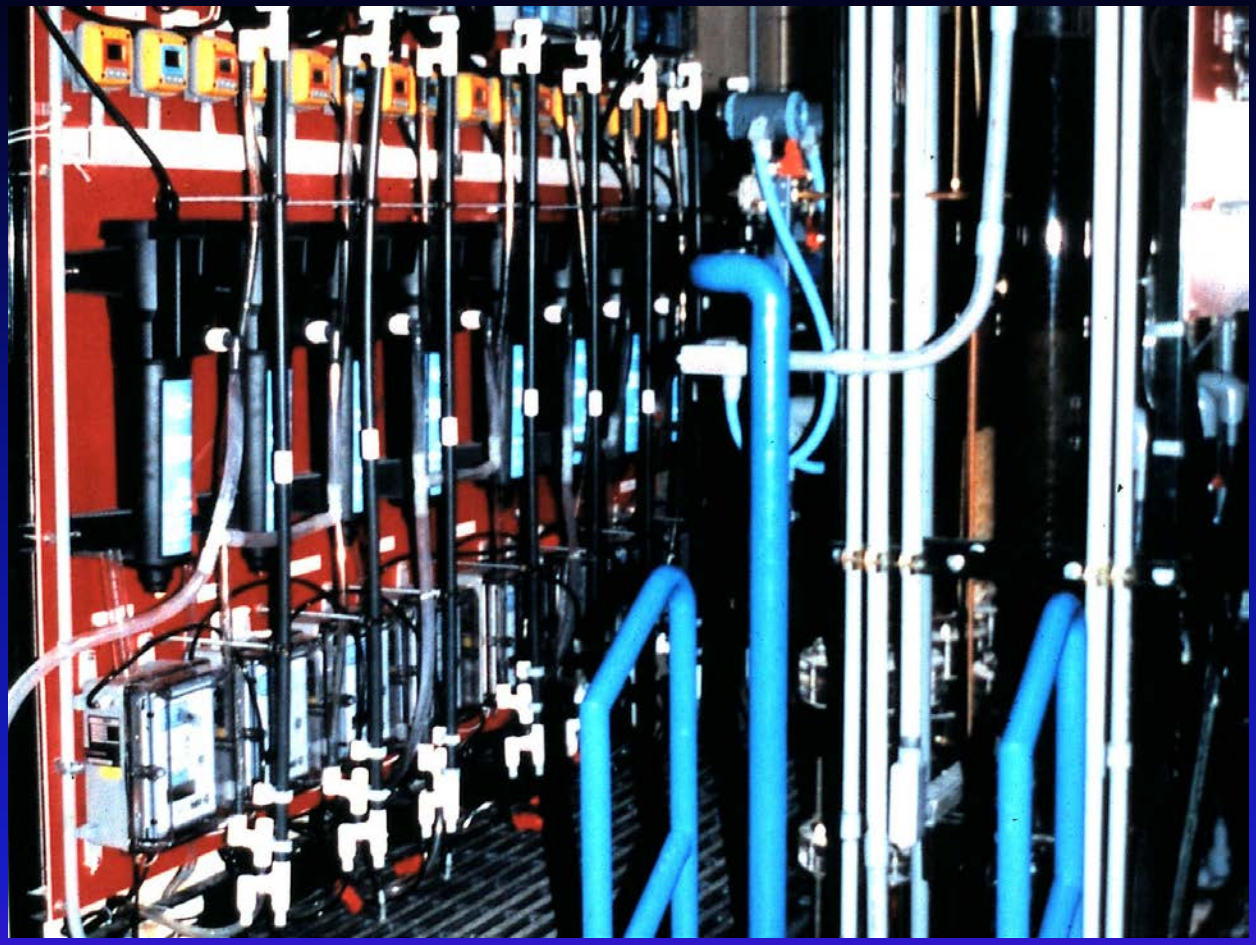


Tools Used by Utilities Contacted

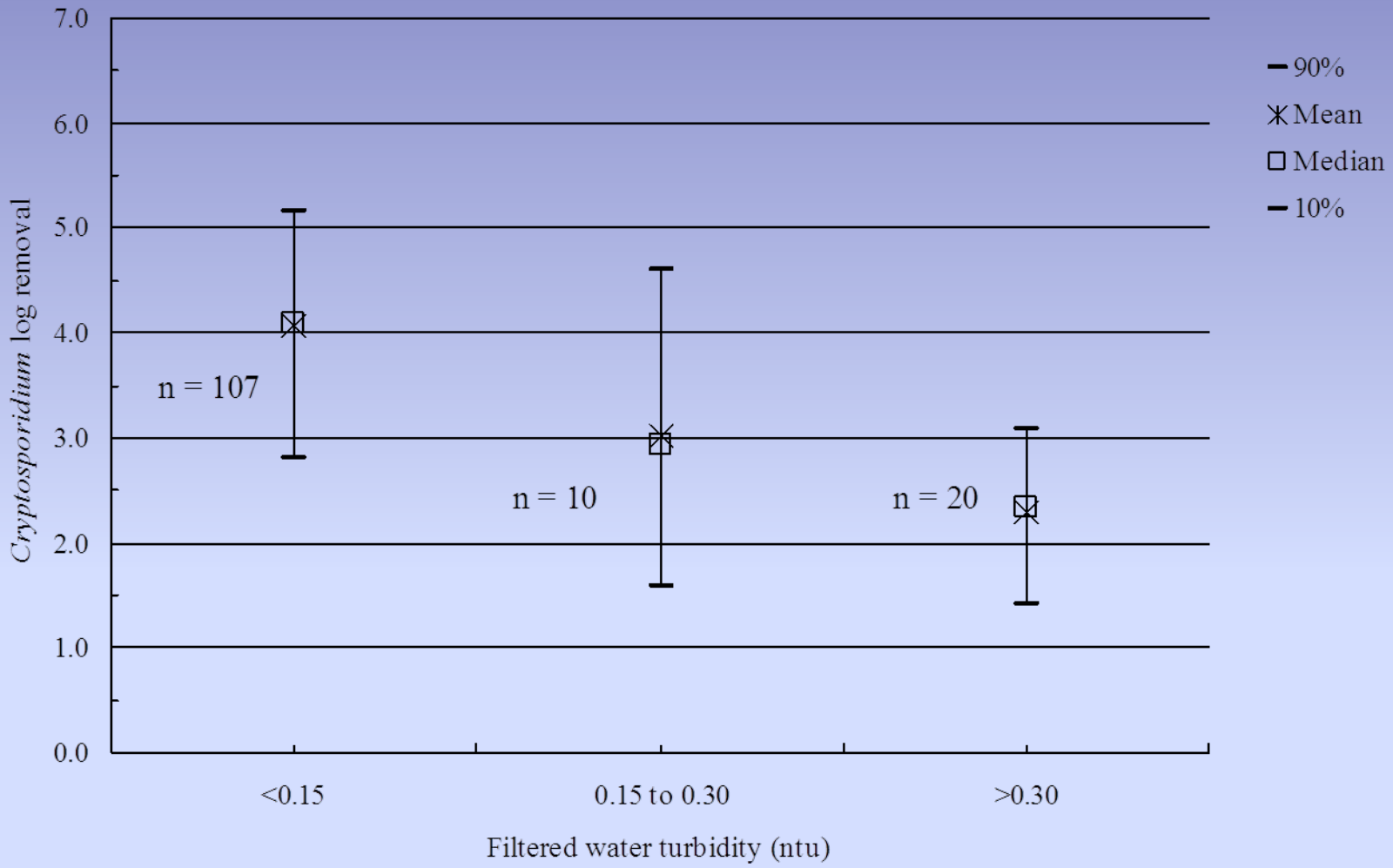
Tool	# Plants
Watershed control Plan	3
Pre Sed with coagulation	1
Bank filtration	3
CFE	7
IFE	7
DOP	5
Membrane	3
UV	8

Tool Box Strategy Used by Utilities Contacted (# plants)

Tool	Utility (# Plants)
CFE/IFE Only	2
WCP with CFE or IFE	3
DOP	4 (5)
UV	4 (7)
Membrane only	1
Membrane with IFE/CFE	1
Membrane with UV	1
Bank filtration	2
Bank filtration with UV	1
Pre Sed and IFE/CFE	1



IFE/CFE



Sources: Dugan *et al.* 1999; EE&T 1996; Hall *et al.* 1994; Patania *et al.* 1995; Swaim *et al.* 1996; West *et al.* 1994.

Figure 7.6 Impact of filtered water turbidity on *Cryptosporidium* removal during pilot-scale challenge studies (<0.15 to 0.30)

IFE/CFE

- Most commonly discussed tool
- Some utilities did not use this tool after assessing plant/filter performance
- Utilities that had been in Safe Partnership were familiar, had data to review, willing to consider it
- All utilities required upgraded monitoring equipment, SCADA, filter backwash equipment, media, under drains
- All required changes in operation

IFE/CFE (continued)

- One state reluctant to accept this tool
- No additional data to State; just statement along with MOR that the requirements were met
- Costs ranged from minimal ($20,000 for new turbidimeters) to $4 million for full filter upgrades; SCADA changes needed
- Utilities also incur costs due to more water wasted and more frequent backwashing

Watershed Control Program

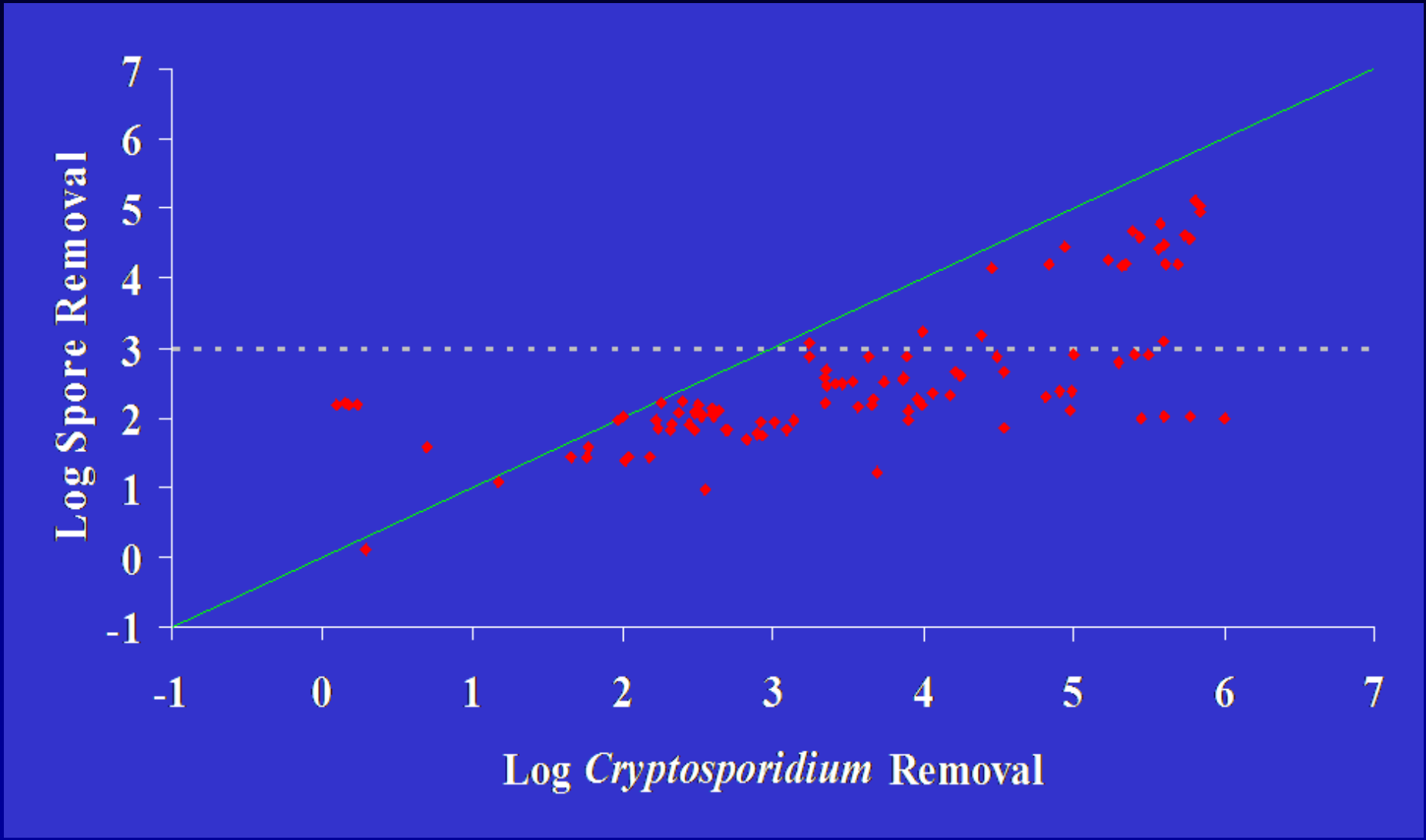
Watershed Control Program

- Of the 3 utilities planning to use this credit, one has initially been denied by the State
  - ✓ State indicated that the WCP could only be used as a back up
  - ✓ State has asked for metrics (quality meeting filtration avoidance at plant intake)
  - ✓ State required additional 1 log credit, for total 1.5 log
- Many utilities did not consider because of uncontrolled watershed

Watershed Control Program

- WCP approved for 2 utilities for 0.5 log, one used guidance document criteria (EPA Primacy), other required more measurements and details in program
- Unlikely that States would approve more than 0.5 log credit
- Some states have indicated that they would not approve this Tool
- Some utilities wanted more control of protection

Demonstration of Performance



Sources: Clark et al. 2001, Dugan et al. 2001, Huck et al. 2002, Mazounie et al. 2000, Yates et al. 1998

Demonstration of Performance (DOP)

- Two utilities used grandfathered studies using spores
- One utility used spores at two plants, enthusiastic about information learned through studies
- One utility used particle counts
- Some utilities mis-read guidance to indicate that crypto was to be spiked, others determined that the procedure was too complex

Demonstration of Performance (DOP) continued

- States willing to review studies, but not enthusiastic
- One state thought it would require expertise and resources not available at most plants
- Another state indicated that if a utility suggested this option, they would not approve it
- Utilities indicated EPA guidance too negative

Riverbank Filtration

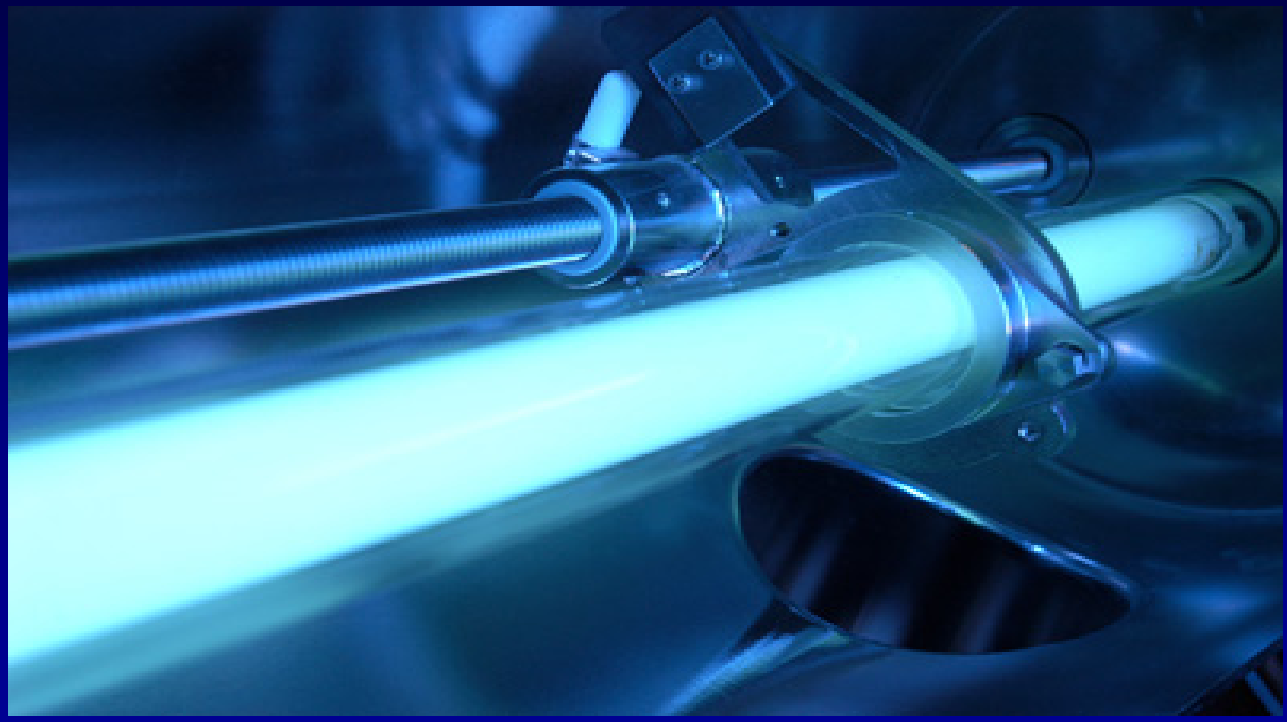
- 2 (3) utilities use this option
- All had this technology in place, or planned
- States required monitoring to show log removal
- One utility required to also install UV

Membrane Filtration

Membrane Filtration

- One plant already had complete MF treatment, so only needed to submit more data to State
- Other 2 plants chose membranes because of existing membranes in part of the plant or to replace pressure filters
- One plant membrane did not treat max flow, so had to have additional credits (CFE/IFE)
- One plant put UV on membrane reject -- recycle

UV Inactivation



UV

- 37% of plants contacted chose UV
- Small footprint, easier to retrofit than other options, can be used at most plants
- Confusing for state regulators to review and to monitor
- Some states must follow 10 state standards which conflict with EPA dosage guidance
- Validation is confusing for some states

UV (Continued)

- Many states felt overwhelmed in learning enough to review plans, dictate record keeping and submittals
- Some utilities felt states overburdened them with reporting requirements because of unfamiliarity with process

Ozone Inactivation

Ozone Inactivation

- Ozone not widely used for Bin 2 (possibly one pre-existing)
- Costs are not competitive, especially in cold climates
- Bromate can be an issue—limits what ozone would be able to do
- Some states do not allow on-line residual monitors which limits practicality of calculating CT

Tool	Contacted(24) EE&T 2012	EPA survey (96) 2012	EPA Cost Doc (474) 2005
CFE/IFE Only	8% (29%)	37.5/34.4%	3%
WCP+CFE/IFE	13%	10.4%	0
DOP	21%	3.1%	0
UV	29% (37%)	19.8%	82%
Membrane	13% (4%)	15.6%	4%
Bank filtration	13% (8%)	3.1%	<1%
PreSed with coagulation	4%	2.1%	0
Ozone	0	2.1%	9%
Alternate source	0	3.1%	0
ClO_2	0	1.0%	0
Bag filter	0	1.0%	
Filter Optimization	0	3.1%	

What Worked??

The Toolbox Approach

All Utilities enthusiastic about tool box approach – they liked being able to assess different options that met their plans, site constraints and timetables

DOP, UV, IFE/CFE widely accepted by utilities

Sound technical basis for tools but some acceptance issues

What Didn't Work?

Specific Tools

- Ozone not a good option for most plants
- Watershed control program had resistance from States – will only give 0.5 log at most credit
- Guidance manual unclear/negative about surrogate to use in DOP
- Confusion about pre-sedimentation with coagulation – utilities told couldn't grandfather the technology (redundancy?)

What Didn't Work?

Specific Tools (continued)

- Some States won't allow primary disinfectant credit for UV
- 3rd party validation for UV confusing
- UV monthly data requirements burdensome
- UV Guidance document too difficult—some states really proactive, others not sure

What Didn't Work?

- Utilities concerned that States not open to assessing Tools
- States feel they have insufficient resources to review/monitor so many Tools
- Being classified as Bin 2 has negative implications for utility, especially when other utilities on the same source were not in Bin 2
- Some States require "back up" treatment credit

What Can Be Done Better?

- States could benefit from access to designated expert for each technology
- Revision of 10 state standards re: UV dose
- Consensus on data reporting requirements for UV, membrane, ozone
- Medium pressure/low wavelength inactivation credits
- Revised Guidance based on lessons learned