ORIGINAL

BEFORE THE ILLINOIS POLLUTION CONTROL BOARD

IN THE MATTER OF:	)	
	)	
	)	
WATER QUALITY STANDARDS AND	)	
EFFLUENT LIMITATIONS FOR THE	)	R08-09
CHICAGO AREA WATERWAY SYSTEM	)	(Rulemaking - Water)
AND THE LOWER DES PLAINES	)	Subdocket C
RIVER: PROPOSED AMENDMENTS	)	
TO 35 Ill. Adm. Code Parts	)	
301, 302, 303 and 304	)	

REPORT OF PROCEEDINGS of the above-entitled cause held at 100 West Randolph Street, Suite 02-025, Chicago, Illinois, before HEARING OFFICER MARIE TIPSORD, at 9:00 o'clock a.m. on Wednesday, March 9, 2011.

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MS. TIPSORD: I have 9:00 o'clock. Are we ready? Good morning.

My name is Marie Tipsord and I've been appointed by the Board to serve as Hearing Officer in this preceding entitled Water Quality Standards and Affluent Limitations For the Chicago Area Waterway Systems and Lower Des Plaines River, Proposed Amendment to 35 Ill Admin Code 301, 302, 303, and 304. This is docket number RO8-9 Subdocket C today.

With me today to my immediate left is acting Chairman G. Tanner Girard, Board Members Carrie Zalewski and Tom Johnson will be joining us momentarily, and Board Member Gary Blankenship to my far left. To my immediate right is Anand Rao and to his right Alisa Liu from our technical staff. In addition today, we have two of our interns, Nick Garmisch and Kristin Carl back in the back and Daniel Robertson who is Gary Blankenship's assistant.

This is the third day of hearings in Subdocket C, but it is the 47th overall day of hearings for those of you still keeping track. A prehearing conference was held on March 7th, 2011 and a schedule was decided upon. I did not do a Hearing Officer order so I will set forth the schedule today. We will first

hear from Mr. James Huff on behalf of CITGO and he will be questioned first by the IEPA and then Three Rivers and the Sierra Club, and finally by the District. After Mr. Huff, we will turn to Mr. Ray Henry on behalf of Midwest Generation. He will be questioned by the IEPA, then Prairie Rivers and the Sierra Club. Tomorrow we will begin with Mr. Scott Bell on behalf of the Metropolitan Water Reclamation District of Greater Chicago. He will be questioned first by the IEPA, then Prairie Rivers and the Sierra Club, and finally by Midwest Generation. After Mr. Bell, Mr. Scudder Mackey will testify and he will be questioned first by the IEPA, then Prairie Rivers and Sierra Club, then Openlands, Midwest Generation, and finally by CITGO. We do not anticipate completing Mr. Bell's testimony tomorrow so additional hearings will be scheduled tomorrow. The testimony in this hearing will be marked as an exhibit and entered as if read, anyone may ask a follow-up question, you need not wait until your turn to ask questions. I do ask that you raise your hand, wait for me to acknowledge you. After I have acknowledged you, please state your name and whom you represent before you begin your question. Please speak one at a time. If you're speaking over each other the court

reporter will not be able to get your questions on the record. Please note any questions asked by a Board Member or staff are intended to help build a complete record for the Board's decision and not to express any preconceived notion or bias.

Dr. Girard.

MR. GIRARD: Good morning. Welcome to day 47 of the hearings in this rulemaking. Sometimes I do lose track. Obviously, with 47 days of hearing, we've had a tremendous investment of time and energy and even resources into all the preparation for both the testimony, the questioning, over several years now. So, the Board is very appreciative of all the time and effort that's been put into this rulemaking and it is becoming a very special event. We may have to have a yearly reunion because it's sort of like old home week, to see all the friendly faces every year, so thank you all. We look forward to the testimony and questions today, let's get on with it.

MS. TIPSORD: All right. With that, can we have Mr. Huff sworn in.

JAMES E. HUFF

having been first duly sworn by the court reporter, was examined and testified on his oath as follows:

MS. TIPSORD: Do we have a copy of Mr. Huff's testimony?

MR. TESHER: We do.

MS. TIPSORD: Thank you very much.

If there's no objection, we will enter the testimony of Mr. James E Huff as Exhibit 437.

Seeing no objection, it's Exhibit 437, and with that we will begin the questioning.

MR. TESHER: Madame Hearing Officer, if I may just introduce the Witness briefly?

MS. TIPSORD: Sure.

MR. TESHER: Good morning. My name is Ariel Tesher. I'm here with Jeff Fort representing the Lamont Refinery.

We're going to hear from Jim Huff this morning about the uniqueness of a stretch of the Lower Ship Canal and proposed Use C designation for that stretch. This testimony was initially scheduled for the prior hearings that we had regarding the electric fish barrier, but it was pushed forward to this time. Jim will be talking this morning about the Ship Canal generally, but he will be also discussing that barrier. As a result of the unique characteristics of this stretch, the proposing regulatory language for Use C,

that would encompass the electric fish barrier which is not currently envisioned by the regulatory language. The map of that area was included as Exhibit A to Mr. Huff's pre-filed testimony and the regulatory language was included as Exhibit B to that same testimony.

Our proposed Use C language was crafted to fit within the existing proposal before by the agency, although it certainly would fit within any framework such as that proposed by the district. In order to increase compatibility with the agency's proposal, we took the Use B standard that they had and the Use B explanation and modified it only where necessary to fit this particular area. The main difference that Use C recognizes is the very unique conditions that apply to this stretch of the Ship Canal. The most obvious is the electric fish barrier, but there are others as Jim has noted in his pre-filed testimony.

With that I'd like to present Mr. Huff to testify. You have his testimony. If anyone needs extra copies I have them here, including all the exhibits.

MS. TIPSORD: Thank you very much.

Ms. Diers.

EXAMINATION

BY MS. DIERS:

Q. Good morning, Mr. Huff. My name is Stephanie Diers and I represent the Illinois EPA today and I will be asking you pre-filed questions. I'll begin with question number one.

In their current altered state, what is the difference between the natural waterways and the artificial stream?

A. Natural streams existed in one form or another before anthropogenic alterations changed them to the present form. Artificial streams constructed for commence rarely incorporate features which incur biodiversity.

Q. And 1(a), does the natural stream have a gently sloping riparian area and well developed littoral zone?

A. Natural streams may have gently sloping riparian areas, well-developed littoral areas, and in many cases canopy cover that also provide woody debris habitat, especially in the littoral zones.

MS. TIPSORD: Mr. Huff, could you slow down just a little bit?

THE WITNESS: Okay.

BY MS. DIERS:

Q. One (b), do you believe that since the Chicago

Sanitary and Ship Canal is not a natural waterway, that it cannot support tolerant types of aquatic life populations?

A. Past fish collections by the MWRDDC have taken two to nine species at Lockport on the Ship Canal and those collections have been dominated by the gizzard shad and carp, and occasionally there's a few game fish that have been collected.

Q. Is that yes? I'm sorry.

A. I think that the stream is dominated by non-tolerant fish species.

Q. Do you know what type of fish were found during the application of rotenone?

A. Only from the article that was published in the Chicago Sun-Times where the IDNR reported the results of the public.

Q. One (d), are channel catfish tolerant in respect to dissolved oxygen?

A. I think this question would be better directed to a fishery biologist. My suspicion is that channel catfish are more tolerant to lower dissolved oxygen than other game fish because of the bottom-feeding tendencies, and temperature has some factor in this as well. DE Moss and DC Scott in October 1961 in

transactions of the American Fishery Society published an article entitled "Dissolved Oxygen Requirements of Three Species of Fish." The channel catfish was one of the three species. At 35 degree C, the channel catfish was more tolerant of low-dissolved oxygen than the bluegill or largemouth bass, but at the lower temperature studies the bluegill were more tolerant of lower-dissolved oxygen levels. In addition, the Catfish Farming Handbook published by Springer notes that channel catfish can tolerate 0.5 milligram per liter dissolved oxygen for several hours and below 2.0 milligram per liter for several days.

MR. RAO: Mr. Huff, do you have a citation for the book from Springer?

THE WITNESS: Just -- published by Springer, but I can get that though.

MR. ETTINGER: Excuse me. This is Albert Ettinger. I represent Prairie Rivers Network and Sierra Club.

You said 0.5 milligrams per liter dissolved oxygen for how long?

THE WITNESS: Several hours.

MR. ETTINGER: Several hours. Do they have any figure as to how long they can handle that? Several

hours beyond that they die or what happens?

THE WITNESS: Yes.

BY MS. DIERS:

Q. Pre-filed question number two. Will discharges under your proposed Use C designation need to meet water quality standards downstream?

A. I would think this question is really a permitting question. That is not what we are considering in this area. However, I don't think this is any different than the transaction from the secondary contact waterways currently to the primary contact that occurs at the I55 bridge on the Des Plaines River.

Q. Is that a yes?

A. I think I answered the question as best I could. I don't think yes-no; it's a permitting question.

Q. Question three, the electric barrier is expected to block fish while moving through the barrier. Will macro invertebrates be impacted from the barrier?

A. There are minimal data on electric barriers and their effects on macroinvertebrates, but effects would be expected. The electric current is applied at the floor of the Ship Canal where the benthic organisms are located. An Australian paper by Brown in 2000 suggest that electric fields in a small stream can skew the

mayfly caddisfly ratios. My personal observations when electro fishing is that the crawfish exit the area rapidly and I expect that other macroinvertebrates would decline in population due to the stress of the continuous electric current.

Q. Question four, does your proposal protect the macroinvertebrates?

A. First, I think you need to look at the current macroinvertebrate quality on the Chicago Sanitary and Ship Canal from the technical memorandum number one, "Characterization of the Macroinvertebrate Community in Chicago Area Waterway Systems," prepared for the MWRDGC by LimnoTech in 2009. This report provides benthic data from the closest sampling location to Romeoville at AWQM Station 92, located downstream of the Lockport controlling works. The collection was dominated by 90 percent oligochaeta worms and is not considered rich for macroinvertebrates. The electric current is a large stressor on the macroinvertebrates and will further limit both quality and populations of macroinvertebrates beyond what is already present along the Lower Chicago Sanitary and Ship Canal, and the Lamont refinery's proposal will have no impact on the quality or population of macroinvertebrates in the proposed Use C

zone. It should be noted that the collection of biotic data would be difficult in this region due to the electric shock hazard.

Q. Question five, the black safety zone includes all of the electric barriers. The Coast Guard has set up a regulated navigation zone upstream and downstream of the black safety zone. Do you know why they set up the regulated navigation zone?

A. The Coast Guard set up the regulated navigation zone based on the safety hazards associated with electric current flowing through the waterway and the health affects of higher voltage on people and vessels that pass over and adjacent to the barriers, and especially people that potentially could fall into the water. As noted at the Federal Register at page 756 on January 6, 2010, quote:

"The final report concluded that the possible effects to a human body if immersed in the water include paralysis of body muscles, inability to breathe, and ventricular fibrillation."

MR. RAO: For the record, could you please explain what black safety zone means?

THE WITNESS: If you look at Exhibit 1 to my testimony --

MR. TESHER: Exhibit A.

THE WITNESS: A, there are two sections, the black safety zone is where the electric barriers are and then the regulated navigation zones are on both the upstream and the downstream location of that area where they prohibit any type of small vessels from entering into those areas as well.

BY MS. DIERS:

Q. Question six, are fish expected in the regulated navigation zone?

A. Fish are not expected in the regulated navigation zone, they will avoid that area as well from the current.

Q. Do you know how long the regulated navigation zone is?

A. Again I'll refer you to Exhibit A of my testimony. It goes from river mile 295.5 to 297.2, so that would be 1.7 miles in length.

Q. Do you know how far the electric barrier will drive the fish away?

A. I do not have data on that.

Q. Go to question seven, these are questions that are based on Exhibit C that was attached to your testimony. Do you know the cause of the non-winter high

chloride levels and I'll start with A), 580 milligram per liter on July 7th, 2010?

A. Can I give you one answer for all of those?

Q. Sure.

A. Based on the historical chloride and water quality date that's present in Exhibit C, that was collected by the Lamont refinery on their water intake from the Ship Canal. The only year that we see those spikes is 2010. You don't see those summer-fall spikes in the other years, so I believe those individual data are outliers. I would discount those data.

MR. RAO: Did you do any analysis to figure out whether they're outliers?

THE WITNESS: Well, again, you go back and look in the wintertime when the chlorides spike, they stay up for a period of time and every single one of these that are referenced in the question, they went from being spiked to the very next sample, they dropped back down again and much too quick of a recovery if it were a real chloride loading to the Ship Canal. And again we didn't see those in the first three years, I suspect that the analyst at the refinery changed and there's a labeling issue on samples or something along those lines.

MR. RAO: Yes. Because when you look at the data it's -- like you said, it all happened in 2010.

THE WITNESS: Right. I included that data so you can draw your own conclusions. I didn't want to bias what I was submitting.

BY MS. DIERS:

Q. Question eight, in paragraph three of page two of your pre-filed testimony you state: "A proper consideration of the uniqueness of the artificially created and physically constrained Lower Ship Canal is lost by including it in this aquatic life Use B grouping."

With respect to aquatic life, please describe how the Lower Ship Canal differs from all other waters the agency has included in its proposed aquatic life Use B designation?

A. The electric barrier will result in essentially creating a zone without fish and fish passage will not occur. The use obtainability analysis completed by Camp Dresser & McKee in 2007 in support of this rule change indicated the goal of the Ship Canal was, quote, "To maintain water quality to meet general use criteria where attainable and to allow for navigation and fish passage. This regulated navigation zone makes this

stretch totally unique from all other portions of the Chicago area waterway system. This is also a stretch of the Chicago area waterway system where rotenone had been applied and also receives all of the pollutant loadings from the various sources throughout the Chicago area waterway systems."

MS. TIPSORD: For the record, the Camp Dresser is attachment B to the proposal.

BY MS. DIERS:

Q. Question nine, on page six of your pre-filed testimony you state:

"These electric barriers will not only prevent the aquatic invasive species from migrating, but they will also prevent all other fish from migrating up or down the Lower Ship Canal at Lockport, effectively terminating the water body at this point from a biological perspective."

A), what do you mean by terminate the water body from a biological perspective?

A. It stops. Fish will not be able to successfully pass through this regulated navigation zone due to the electric current.

Q. B), do fish have access to the Lower Chicago Sanitary and Ship Canal above and up to the electrical

barrier from locations further upstream?

A. Yes.

Q. C), do fish have access to the Lower Chicago Sanitary and Ship Canal below and up to the electric barrier from locations further downstream?

A. Yes.

Q. Ten, how many discharges are there to the proposed Use C waters?

A. One.

Q. What do you mean by discharge, is that Lamont?

A. That would be the CITGO Lamont refinery.

Q. Question 11, why can't CITGO achieve 500 milligrams per liter chloride in its effluent?

A. The Lamont refinery's water intake is from the Chicago Sanitary and Ship Canal above its discharge. When the Ship Canal above the Lamont refinery exceeds 500 milligrams per liter chloride due to highway deicing practices, the refinery effluent discharge backs into the Ship Canal exceeds 500 milligrams per liter. To meet this limit would require the refinery to install multi-effective evaporators on its effluent to remove the sodium chlorides which the Illinois Pollution Control Board and the Illinois EPA have consistently determined is not an economically reasonable and every

adjusted standard case brought before the Board historically for totally dissolved solvents, including the Lamont refinery and PCB 08-33, chlorides cannot be removed by precipitation technology and if reverse osmosis is utilized a 30-percent concentrate needs to be disposed of somewhere, either back into the Ship Canal or deep-well injection. The Illinois EPA has already determined that at the Lamont refinery this would require a class-one underground injection control permit which requires a cap rock above the zone where injection will occur. There is no cap rock present in the Lamont Romeoville area and this area has been determined not suitable for class-one disposal wells by the Illinois State Geological Survey. The Lamont refinery investigated this with the agency when the wet gas scrubber was installed previously, in addition to evaluating the multi-effective evaporators.

Q. What concentration of chloride does Lamont contribute to the effluent?

A. I don't know the answer to that. They certainly -- there's three factors. You have the water intake that comes in. They have extensive cooling through the use of cooling towers, so they then concentrate those chlorides further in their wastewater

that's being discharged. So on a mass basis they're not adding from the cooling tower, but from a concentration point of view that is a very significant effect. And then crude oil, itself, that's chlorides in there and the first process in a refinery is to basically wash out the chlorides and other impurities through a unit called a desalter, and so they do contribute chlorides through that. I've not done any mass balance on how much that accounts for.

MS. DIERS: I have no other questions.

MS. TIPSORD: With that, let's move to Prairie Rivers.

MR. TESHER: I have a quick follow-up.

EXAMINATION

BY MR. TESHER:

Q. Mr. Huff, are you aware of exceedances beyond 500 milligrams per liter that occurred when the background level in the effluent was not exceeding 500 milligrams per liter?

A. I am not. I don't think that the contribution from the desalter is efficient to cause a water quality violation when the upstream achieves 500 milligrams per liter.

MR. ETTINGER: May I ask some questions,

some of which are in the nature of interpretation of the regulations? I'm not asking you to do these necessarily as an expert on interpreting the regulations, but I believe it's necessary for us to understand your interpretation to the regulations, to understand some of the regulatory consequences that you draw from the current situation. I'll still probably draw a bunch of objections anyway, but I'm going to try.

EXAMINATION

BY MR. ETTINGER:

Q. What is the basis for your statement on page three of your pre-filed testimony that no net increase in sulfates is allowed when the receiving stream exceeds 500 milligram per liter chlorides?

A. The current sulfate water quality standard for general use streams is based on a formula that includes chloride concentrations. However, the chloride concentration is limited to a maximum of 500 milligrams per liter of chloride. Above 500 milligrams per liter of chloride the sulfate water quality standard cannot be calculated. So in deriving NPDS permit limits based on water quality standards, it is impossible to derive in effluent limits that is appropriate during periods when the chlorides in the receiving stream exceed 500

milligrams per liter.

Q. So you believe that whenever the receiving water has 500 milligrams per liter or more, that there can be no mixing zone for chlorides?

A. Could you read that question back? You were mixing sulfate and chlorides, I got confused. I'm sorry.

Q. I could well have done that. You believe that when the receiving water exceeds 500 milligrams per liter of chloride, that there can be no mixing zone for chloride?

A. That's correct.

Q. Thank you. Also on page three you refer to the agency proposed upgraded use of the Lower Ship Canal. How is the agency proposing an upgrade?

A. Well, they're going to take the standards from the secondary contact standards up to the proposed Use B standard.

Q. As to what parameters? They're not doing that as to all parameters, are they?

A. Pretty close to all of the parameters.

Q. What parameters aren't they doing it?

A. Well, let's turn that around. The ones that I'm interested in today are the sulfates, the chlorides

temperature.

MS. TIPSORD: Just to clarify. Those are the ones they're taking --

THE WITNESS: That will be more restrictive under the agency's original proposal.

MS. TIPSORD: Thank you.

BY MR. ETTINGER:

Q. On page four you state that the Lower Ship Canal is typically 200 to 300 feet wide. Why does that matter?

A. The width, depth, and straight sided nature of the Lower Ship Canal were cited to demonstrated that the habitat quality is limited for such a large water body. Canopy cover is of course more difficult the wider the stream. From a geomorphological perspective, the wetted perimeter of the channel which incorporates both the depth and the width was one of the variables found by LimnoTech in its habitat evaluation report of 2010 as correlating with fish metrics.

Q. That's interesting, but the Mississippi River is more than 200 to 300 feet wide much of its distance. Would you suggest that we declare the Mississippi River should have a lower classification because it's too wide?

A. No, sir.

Q. Why is that?

A. Because if follows more of a natural pattern to it, it's got a lot more habitat area for fish spawning and things like that.

Q. So it's not really the width, it's the habitat area and other factors rather than the width?

A. I think if you look at the correlation work that was done by LimnoTech, that there was a correlation between the wetted perimeter which incorporates both the depth plus the width.

Q. There's mention that the Lower Ship Canal has depths greater than 27 feet, is it all over 27 feet deep?

A. The Chicago Sanitary and Ship Canal deepens as it flows downstream. By Damen and Cicero Avenue the depths are typically 18 to 21 feet and then the depths gradually increase to 27 feet at the downstream and near Lockport and that's taken directly from the LimnoTech report habitat evaluation report at page 73. The water depth is maintained at depths required for commercial navigation. Water depth between 18 and 27 feet will limit light penetration, thus limiting macrophyte beds which can be used by fish as habitat.

MS. TIPSORD: For the record, the LimnoTech report is public comment 284.

BY MR. ETTINGER:

Q. What do you mean on page five of your pre-filed testimony that overall stream use is designated as non-spored?

A. Three stream sections on the segments on that Chicago and Sanitary and Ship Canal has been designated in the Illinois EPA's 303(d) list in 2010 as not supporting aquatic life use.

Q. Does the Lower Ship Canal violate existing standards for PCBs, iron, oil and grease, dissolved oxygen, total nitrogen and total phosphorus?

A. The Lamont refinery would not be contributing to PCB water quality violations. Given the significant evaporation of water in the refinery cooling operations, I would expect on an annual basis that the Lamont refinery is discharging less iron, total nitrogen and phosphorus than it removes from the Ship Canal in its water intake. Huff & Huff using the MWRDGC's dissolved oxygen model modeled the Lamont refinery's ammonia impact on dissolved oxygen on not only the Ship Canal but also on the downstream Des Plaines and Illinois River. The modeling effort determined that any impact

from the Lamont refinery was so small that it could not be measured. With respect to oil and grease, the effluent from the Lamont refinery consistently achieves the water quality limit so they would not be contributing to oil and grease violations.

Q. I think we missed each other on our scripts here. Did you just answer is the CITGO refinery contributing to any of these violations through its operations?

A. I believe I just answered that.

Q. That's right, that's right. That's not the question I asked, but that is the question you answered so we'll let the record reflect that and go from there.

On page five you mentioned rotenone applications. What information do you have about future applications of rotenone?

A. The Asian Carp Regional Coordinating Committee released the 2011 Asian Carp control spread, the framework document in December of 2010 that includes rotenone as one of the tools for potentially controlling silver and bighead carp in the future.

Q. Do you have any idea how often they're going to be able to do that in the future or will want to do that in the future?

A. I think it's a question with respect to where the

electric barriers are and how often they have to be taken down for maintenance and how effective those are, and so every time that they want to test to see based on the EDNA, that there may be Asian Carp present, rotenone may be used under those cases to investigate it.

Q. Regarding the electric barrier, are you aware of any information regarding the conductivity level and its affect on the operations of the electric barrier?

MR. TESHER: Excuse me. Is this a follow-up question?

MR. ETTINGER: No. We're just talking about electric barrier, we're just talking electric barriers now.

BY MR. ETTINGER:

Q. Are you aware of any impact of conductivity or increased conductivity on the efficiency of the electric barrier?

A. Not specifically.

Q. Have you heard any discussion of the affect of conductivity on the efficiency of the electric barrier?

A. Again not specifically, no. With respect to as the conductivity of the water goes up through the presence of dissolved solids it becomes more conductive, so that's going to have an affect on the electric

barriers I would expect.

Q. Page six in your testimony you mention fish migrating up and down the system. Have you studied fish migration in the system?

A. Have I? No.

Q. Do fish currently migrate into the Lower Ship Canal?

A. Fish can certainly migrate both up and downstream of the Lower Sanitary and Ship Canal, from downstream they pass through the Lockport locks. If this was not occurring, there would be no need for the electric barriers. From upstream, migration from both the Upper Ship Canal and the Cal-Sag Channel into the Lower Ship Canal occur. The electric barrier has created an impediment to fish migration through that regulated navigation zone.

Q. Fish actually can migrate down, can't they?

A. Migrate down?

Q. Downstream? Maybe migrate's not the right word. Limp downstream, can't they?

A. Not sure I understand the question. Where are they starting?

Q. Upstream of the electric barrier. Have you seen the data on what fish they found below the electric

barrier?

A. With respect to when they rotenone?

Q. Yes, after they rotenone?

A. Again only what was published in the Sun-Times.

Q. Does that include coho salmon?

A. Not to my knowledge, no.

Q. I'm going to skip eight. Nine, have you determined how many violations there would be in the Sanitary and Ship Canal if Illinois adopted the federal criteria for chloride or the recently EPA approved Iowa criteria?

A. I have a handout that will answer that question.

MS. TIPSORD: Point of clarification. When you say recently EPA approved, U.S. EPA approved?

MR. ETTINGER: Yes. I'm sorry.

MR. TESHER: If I may introduce the two exhibits. The first exhibit compares the water intake to the U.S. EPA criteria, the second compares the same water intake to the Iowa criteria.

MS. TIPSORD: I need a couple more copies up here, please, and I'll wait until he looks -- gets these passed around.

If there's no objection, we'll take the comparison to the chloride levels at Lamont intake

compared to U.S. EPA criteria as Exhibit 438 and compared to the Iowa criteria as Exhibit 439, if there's no objection, and I'll give you all a chance to look at that.

Is there any objection? Seeing none, the comparison to the U.S. EPA criteria as Exhibit 438 and comparison to Iowa criteria as Exhibit 439.

THE WITNESS: So if I could respond to your question now? You have the data in front of you.

BY MR. ETTINGER:

Q. Yes, I'd like some explanation as to what underlying means and bolding, and all that stuff.

MR. TESHER: The only item that has any of the bolding would be the comparison to the U.S. EPA and that would be data that exceeds the acute criteria. Otherwise, any of the underlying "ital" will be exceeding the chronic criteria for either of them and there's no violation of the acute in the Iowa.

BY MR. ETTINGER:

Q. There's no violation of the Iowa acute. And we think there's a violation of the chronics, but we don't really have chronic figures here, do we, or --

A. Could I read my answer first and maybe you can follow up with your question which might clarify?

Q. That's a good idea.

A. The attached table compares the Lamont refinery water intake chloride levels to the federal criteria which are acute 860 milligrams per liter and chronic 230 milligrams per liter from 2007 to 2010, four years of weekly data, the acute federal criteria of 860 millimeters per liter was exceeded three times over that period. The federal chronic criteria of 230 milligrams per liter of chloride is basically exceeded for prolonged periods each winter-spring. In the case of the winter 2007-2008, it lasts from December 7th, 2007 through April 28th, 2008. For the recently EPA approved Iowa criteria and using the critical hardness for the Ship Canal of 192 milligrams per liter, the calculated acute chloride criteria is 1051 milligrams per liter and the chronic criterion is 340 milligrams per liter. The Iowa acute criterion has been achieved for the entire four years presented in the attached table. However, the Ship Canal remains above the Iowa chronic criterion for extended periods during the winter-spring months, but not for as long as compared to the federal criterion. What is missing in Illinois, Iowa, and the federal criteria is the temperature component for chlorides similar to that that's used for ammonia.

There are limited studies on the effective temperatures on the toxicity of chlorides, however the limited data suggests that at lower temperatures the chlorides are less toxic and additional research in this area would be prudent before adopting revised standards.

Q. That's interesting. So you're saying as the temperature goes up chloride becomes more toxic, or as stated, there's some studies that suggest that as temperature rises chloride becomes more toxic?

A. That's correct.

Q. Are those studies cited somewhere?

A. Yes.

THE WITNESS: Do you have that one Silver study?

MR. TESHER: I don't have it right know, but you can read it to him.

THE WITNESS: PS Silver and M Rupprecht, R-u-p-p-r-e-c-h-t, and MS Stouffer published an article entitled Temperature Dependent Effects of Road Deicying Salt on Carana Mid Larvae, and it was in Wetlands Volume 29, page 942 to 951 in 2009.

MS. WILLIAMS: Can we request that?

MR. TESHER: We can file that article with the record and have it --

BY MR. ETTINGER:

Q. On page 10 --

MR. GIRARD: Albert, can I just clarify that? That study sounds like it was not on fish, is that correct?

THE WITNESS: That one was on benthic organisms, that's correct.

MR. GIRARD: Do you have some other studies that were done on fish, in terms of chloride levels and temperature?

THE WITNESS: I do not. I think that that would be a wonderful area for additional research, much like the Illinois EPA led that effort with the sulfate toxicity several years ago and Iowa's now done some additional work with chloride. That's again one more variable that the state water survey should undertake, because I think it would really help in our proceedings here on addressing chlorides and making sure it's protective to the environment as well.

MR. GIRARD: Thank you.

I'm sorry, Albert. Go ahead.

MR. ETTINGER: No, that's all right. Every once in a while we learn something here.

BY MR. ETTINGER:

Q. Question No. 10, on page eight you state that on an affluent dominated stream chlorinating incoming water is important to prevent biological growth on the heat exchangers. Why is this?

A. Microscopic biota become established on the inside of the heat exchangers as well as the piping and the biological coating becomes established quicker on effluent dominated streams just because of the other organic food sources that are there. Without chlorinating the water intake and or the cooling towers to retard and remove this growth, the biological coatings become so thick as to reduce the heat transfer efficiency, reducing the capacity of the process.

Q. What is it in the effluent dominated streams that causes there to be more need for chlorination than there is otherwise?

A. Two-part answer. One would be the higher concentration of just microbes in general and there's also more food there, the organic matter that's there.

Q. What kind of microbes are in the effluent dominated streams that you wouldn't expect in a less effluent dominated stream?

A. Well, just because you've got a higher food source there, you have a higher equilibrium population

of microbial growth.

Q. What's in the food -- what's in the food source?

A. Biochemical oxygen demand, BOD, total organic carbon, it's going to be discharged from the wastewater treatment plants also be present -- overflow.

Q. That's even if the plants are meeting secondary treatment levels?

A. Yes, sir.

Q. Because even meeting secondary treatment levels, you'll be higher than you would be in a typical natural -- more natural water?

A. That's correct.

Q. Here on number 11, I really didn't follow your math here. You state on page eight that a 50-percent reduction of salt used during the heaviest storm events would be required to achieve a 500-milligram per liter chloride standard. How did you calculate that?

A. If you go back and look at Exhibit A of my testimony, the background levels in the summer, the Ship Canal gets down to about 100 milligrams per liter, plus or minus. If you look at the peaks each year, they're on the order of 900 and I believe the highest was 998 milligrams per liter, and so if you're trying to get the 500 and you're at 900 now, and background's a hundred,

there's an 800 milligram per liter spread and you have to basically get half of that down to get the 500 milligrams per liter and then the worst year it's over 60 percent.

Q. I guess my problem was it's not a direct relationship between salt used and how much salt gets in the water or is there?

A. Sure there is. They would be incredibly well correlated.

Q. Well, there's nothing we could do to keep the salt out of the water once we've used it?

A. I believe that's substantially correct. You better reduce what you're applying as opposed to trying to remove that somehow through -- what you can do, Albert, is through retention you can retard the rate of runoff. So instead of the salt being laid in the storm sewer over one or two days, it may emerge from a retention basin with a slower release over a couple weeks. So you could retard the rate which would certainly reduce the peaks.

Q. Question 12 of the pre-filed questions, in footnote one of page eight of your testimony you state that the agency seeks to impose more restrictive water quality temperatures on secondary contact waters and

general use waters with regard to temperature and arsinic. Please explain why you believe this as to temperatures?

A. I was comparing the primary contact temperature limits in 302.211(e) to the proposed temperature limits that were in the agency's proposal for the Chicago area waterway.

Q. Did you take into account 35 Illinois Administrative Code 302.211(c) or (d), which provide for the 5 degree Delta T limitation and the requirement that temperature variations over a day be natural?

A. Not specifically, no.

MR. ETTINGER: I'm dropping number 13. We can talk about that later.

MR. TESHER: I have a quick follow-up for Jim, then, regarding the chloride question and the application of salt. Are there other methods besides retention ponds, any BMPs or anything else like that that can be done to reduce the impact of chloride?

THE WITNESS: Well, most of the BMPs are directed at reducing the amount of sodium chloride that is actually applied, whether it's parking lots or highways through such things as the beet juice or pre-wetting a surface so you have a more efficient

application that goes on.

MR. RAO: I'd like to ask Albert's thirteenth -- you know, the thirteenth question because may have to deal with this proposed language and you have a fairly detailed explanation in the rule language which we usually don't include in the rule languages. So if you want to take a look at it now or later, it's fine but -- then you take a look at that in context of what the agency has proposed and, you know, proposed consistent language?

THE WITNESS: I think that with our exact attempt, was we modeled that after the justification of the agency's proposal for Use B.

MS. TIPSORD: Is there anything further for Mr. Huff?

MR. TESHER: Jim, would the explanation necessarily need to be part of the regulation or was it there only to match the agency's proposal?

THE WITNESS: I think more to match the agency proposal than incorporation in the regulation, is how I envisioned it.

MR. RAO: All right. That helps, Thanks.

MR. ETTINGER: That was my question. There was some statements in there that are either arguably

debatable or could become debatable in the future and I don't think it's appropriate normally to make statements like that in the regulatory language itself, but we can discuss that later.

MS. TIPSORD: Anything else? Then we move to the district and Mr. Andes, please identify yourself for the record.

MR. ANDES: Fred Andes. I'm counsel for the Metropolitan Water Reclamation District of Greater Chicago. Excuse the hoarse voice, colds are going around.

EXAMINATION

BY MR. ANDES:

Q. Good morning, Mr. Huff.

A. Good morning.

Q. Let's start with question one. Why is snow-melt runoff more of a beneficial use for the Lower Ship Canal than it is for the Upper Ship Canal or for any other portion of the cause?

A. The Lower Ship Canal receives the snow-melt runoff from essentially all of the Chicago area waterways, and that was the point I was making. The chloride-laden water has to go somewhere and the drainage through the Chicago area waterways is a key use

of the Lower Chicago Sanitary and Ship Canal.

Q. Are you saying the drainage from, say, the area of the north shore channel of snow melt goes to the Lower Ship Canal?

A. Yes.

Q. All of the storm water runoff from the entire system goes directly to the Lower Ship Canal?

A. It passes through the Lower Ship Canal.

Q. Does it pass through any other areas of the system?

A. Well, certainly, it has to pass through the North Shore Channel or the Upper Sanitary Ship Canal or the Cal-Sag Channel.

Q. It passes through those areas and then goes through the Lower Ship Canal?

A. Correct.

Q. So it's the last point in the system that gets all the runoff, is that your point?

A. Yes, that and they're all going to go down through that area, yes.

Q. But they all receive some degree of snow melt?

A. Absolutely, yes.

Q. You state that some of the waterways covered by the UAA are natural streams and I think -- I had assumed

the question before, but it was a little hard to hear, in the back. How do you define natural streams?

A. The streams that existed in one form or another before anthropogenic influences modified them.

Q. You include channelized straightened waterways as natural?

A. Yes.

Q. Are the altered waterways in the cause sometimes as artificial and lacking in physical habitat as the manmade channels?

A. Yes. Referring to the LimnoTech report habitat evaluation report in 2010, pages 138 and 139, they rated the habitat quality of the entire Chicago Sanitary and Ship Canal as the poorest in the Chicago area waterway, tied with the south branch of the Chicago River which is a heavily modified natural stream.

Q. You identified the Lower Ship Canal as effluent dominated. Isn't the whole system effluent dominated?

A. Similar to my response on the first question, my point was just that all of the effluence ultimately goes through the Lower Sanitary and Ship Canal.

Q. You talked about segments of the cause and the natural waterways on page two. Is the Upper Ship Canal a natural waterway?

A. No.

Q. Let's move to question five. You discuss depth, width, vertical walls, and steep embankments. How do those characteristics for the Lower Ship Canal differ from those in the Upper Ship Canal?

A. The Lower Chicago Sanitary and Ship Canal is dominated by vertical walls and in part by a steep rock filled embankments, while the Upper Sanitary and Ship Canal is more trapezoidal shape with areas of vertical back walls and that's from the MWRDGC report description of the Chicago area waterway systems May 2002. The Lower Ship Canal receives more effluent from the watershed than the upper canal does, the lower canal contains the electric barrier as well.

Q. I think you've answered 5B, so let me -- by your answer just then, so let me move on.

On page four you stated, "With the potential exception of the Cal-Sag Channel as described later in my testimony," however, you didn't mention it again in your testimony. What was the point that you wanted to make, is the Cal-Sag similar to the Lower Ship Canal?

A. Yes, sir, it is. Except that it doesn't have the thermal loading that the Sanitary Ship Canal has.

MR. ANDES: Thank you.

MR. TESHER: A quick follow-up. Does it have an electric barrier?

THE WITNESS: The Cal-Sag Channel?

MR. TESHER: Yes.

THE WITNESS: No.

BY MR. ANDES:

Q. That goes to my next question which I'll rephrase. Are you saying the main factor that makes the Lower Ship Canal unique is the fact that it is specifically associated with efforts to control the spread of evasive species?

A. If you had to pick one factor, that would be the most important factor, yes.

Q. On page five you listed a number of water quality impairments. Are you aware that in the draft 2010 303(d) lists total nitrogen and VO are not listed impairments in the Ship Canal?

A. As this is still a draft document, I did not believe it was appropriate to cite. However, the draft version that's posted on the Illinois EPA website, I checked on March 4th, continues to show dissolved oxygen as a cause of impairments in all three segments of the Chicago Sanitary and Ship Canals. I believe the Illinois EPA discontinued total nitrogen as a cause of

impairment while maintaining nitrates where the water is used for public water supply. I'm not aware of any conditions on the ship canals that would change the dissolved oxygen levels or the total nitrogen levels compared to the levels utilized in the 2008 303(d) list. So, perhaps, your question should be directed to the Illinois EPA as to why total nitrogen was dropped and whether dissolved oxygen is a cause of impairment and --

Q. Are the listed impairments for the Lower Ship Canal similar to those listed for the Upper Ship Canal, the north branch of the Chicago River, the Little Cal, Cal-Sag, and the Grand Calumet River?

A. Yes, sir.

MR. AMES: Thank you. I'm done.

MS. TIPSORD: Anything else for Mr. Huff?

MR. TESHER: No.

MS. TIPSORD: Okay, anything else?

Thank you very much.

Let's take a 10-minute break and we'll come back and go with Mr. Henry.

(Recess.)

MS. TIPSORD: Let's go back on the record.

Next we're ready with the testimony of Ray E. Henry, on behalf of Midwest Generation. Can we have

the witness sworn in, please?

RAY E. HENRY

having been first duly sworn by MS. TIPSORD reporter, was examined and testified on is oath as follows:

MS. TIPSORD: Do we have a copy of his testimony?

MS. FRANZETTI: Yes, we do, Madam Hearing Officer. This is a copy of his pre-filed testimony with Exhibit A his resume, and this is Exhibit B, the Sargent & Lundy cooling tower study report.

MS. TIPSORD: If there's no objection, we will mark the pre-filed testimony and exhibits as Exhibit 440.

Received as Exhibit 440.

With that, are we ready to go to questions?

MS. FRANZETTI: Yes.

EXAMINATION

BY MS. WILLIAMS:

Q. Good morning, Mr. Henry. My name is Deborah Williams and I'm going to be asking questions on behalf of Illinois EPA today. Welcome; nice to meet you.

A. Good morning.

Q. Why don't we start with question one. Which of the five Midwest Generation facilities on the Chicago

area waterway system and Lower Des Plaines River were designed by Sargent & Lundy?

A. The unit and the commercial operating date of the units designed by Sargent & Lundy are as follows: Joliet Unit 6, 1959; Crawford Unit 7, 1958; Crawford Unit 8, 1961; Will County Unit 4, 1963; Joliet Unit 7, 1965, and Joliet Unit 8, 1966.

Q. You went through those pretty quickly. Does that cover all the facilities?

A. No, it does not. There were two units that were not designed by Sargent & Lundy and those are Fisk Unit 19 and Will County Unit 3.

Q. Do you know how old those two facility are?

A. No, I don't. I don't know the commercial operating date of those two units.

Q. Do you know if they predated the ones you named or you just don't know at all?

A. I don't know at all.

Q. I don't want to insult you with Question A, but did you work personally on any of these facilities?

A. No, I did not.

Q. They predate you, is that --

A. Yes, that is correct.

Q. What is the expected life of the five Midwest

Generation facilities?

A. Well, the end of life of coal-fired units is really an economical rather than a technical issue. With proper maintenance, coal-fired plants can operate for a very long time. And really it's a matter of what does it cost or capital improvements and operating and maintenance costs versus the potential revenue, so it's an economic decision and not a technical issue.

Q. Was there a useful life for these facilities when they were originally designed?

A. I don't know.

Q. Did you design the existing -- this is Question D. Did you design the existing cooling towers at the Joliet 9 facility?

A. I think you mean the Joliet 29 facility?

Q. I'm sorry, yes. I misread the question, Joliet 29?

A. No, we did not.

Q. Do you know when they were built?

A. I understand that the construction was started in 1999 and completed in 2000.

Q. Do you know why they were built?

A. No -- well, I guess I'd say that they were built to meet the temperature, the current temperature limits

which are at the I-55 bridge.

Q. Can you explain what you mean by meet the limits?

A. Well, by using those cooling towers they can minimize their D ratings. With the current limits, one way to meet the limit would be to de-rate the units. With the cooling tower they are able to cool the water and minimize the amount of de-rates that they are required on the units.

Q. So it enabled them to generate more power and still comply with the existing standards, is that correct?

A. That is correct.

Q. Do you know for the facilities at least that Sargent & Lundy designed, can you tell us what the rate its generating capacity was for each facility at the time it was built?

A. That's in our report and it's also in my testimony, but I don't remember the number, off the top of my head.

Q. You think it was, like, the background in your report or, like, which part of your report would we want to refer to to find that information?

A. I don't know. I do know it's -- I can tell you in my testimony I listed the capacity of each of the

stations.

Q. I guess maybe that helps answer my question. I think the question I'm trying to ask is when the facilities were built was that the capacity they were built at, what's listed in your testimony?

A. I believe so.

MS. TIPSORD: That's table two of your testimony.

THE WITNESS: That's correct.

MS. TIPSORD: Table two on page 14, just for the record.

BY MS. WILLIAMS:

Q. So these numbers, can you just explain what station total growth, gross megawatt, means for those of us who are not familiar?

A. That would be the maximum output at the generators. By gross that means the gross output is generated by the plant and then the plant uses some of that power for axillary. So, what the plant actually sells or exports is less than that number.

Q. Thank you. I have to strike question two from the pre-filed questions. It was a mistake on my part, I apologize.

Question three, why were the Will County

units one and two retired effective December 31st, 2010?

A. I don't know.

Q. Are there any other Midwest Generation facilities or units that will be retired in the future?

A. I don't know of any plans to retire any of the other Midwest Generation facilities.

Q. When you say you don't know of any plans, do you mean that there aren't any or you're just not aware, one way or the other?

MS. FRANZETTI: I think that he doesn't know.

THE WITNESS: I don't know.

BY MS. WILLIAMS:

Q. Do you know who would know?

A. I don't know.

Q. Question four, your report states that on page 1-1 that, quote, "None of the Midwest Gen operating stations are capable of achieving and consistently maintaining compliance with the proposed thermal standards at existing operating levels."

The question is, is it possible to maintain compliance by de-rating the facility?

A. I reviewed the inlet water temperatures to each of the five stations for 2007 through 2010 and there are

a number of instances at some of these stations, as many as 100 days per year, when the inlet river temperature is higher than the proposed thermal standards, which means that more than 100 days per year those units, if they don't have cooling facilities, would have to completely shut down, and there are other days when the proposed limits are close to the measured river temperatures where you could potentially meet those by de-rating. And I don't know of any coal plant in the world that operates where they shut down 100 days per year, I don't think that's practical to run units like that. These units take several hours to safely shut down and probably eight or ten hours to start up. So, shutting these down and starting them up based on river temperatures which can change quickly is not a practical --

Q. Now, let's talk about this just a little more. These inlet temperatures that you look at as violating the standard, are you talking about the maximum numbers or the average numbers?

A. Maximum or average over what period?

Q. Maybe you should --

MS. FRANZETTI: I'm sorry. You're referring to the period average numerical standards and the daily

max standard contained in the proposed --

MS. WILLIAMS: Right. I'd like to understand what he compared the inlet temperature to.

THE WITNESS: We looked at both.

BY MS. WILLIAMS:

Q. When you say you found 100 days, that 100 days could include a violation of a period average that wouldn't truly be a violation because you didn't look -- you couldn't look at a day as an average, right?

MS. FRANZETTI: Objection to form. If you can answer.

THE WITNESS: I don't understand the question.

MR. ETTINGER: Excuse me. May I ask a question? If you're referring to a chart or something which is on your testimony, that would be helpful.

THE WITNESS: No.

MS. FRANZETTI: No.

MR. ETTINGER: Oh, you're not. Okay, sorry.

MS. FRANZETTI: He just looked at the intake data.

BY MS. WILLIAMS:

Q. Let me ask it a different way. Can you split that number up, how many days violated the maximum

versus how many days violated a period or are you lumping them together?

A. I'm lumping them together. I didn't look at that in that regard.

Q. Can you give us a rough idea of percentage, how many days violated the maximum?

A. No.

Q. Is it true that Midwest Generation continuously monitors its temperature and its effluent --

A. Effluent I don't --

Q. Midwest Generation, do they rely on continuous temperature monitoring? I mean, they don't take one sample a month of temperature, do they?

A. I don't know.

Q. Is it your understanding that if the inlet temperature was violating a period average, the plant would have to de-rate that day?

A. Not necessarily. But since I can't predict -- if it's early in the month, you can't predict what's going to happen the rest of the month, it's hard to say, and some of the periods are only 14 days, so that would be even shorter.

MS. FRANZETTI: Ms. Williams --

THE WITNESS: It wasn't rare when they were

exceeding the daily maps and sometimes the exceedance was as much as 10 degrees.

BY MS. WILLIAMS:

Q. Did you look at all the plants?

A. Yes.

Q. What did you find for the most upstream facility?

MS. FRANZETTI: Do you want to name that, so the record's clear?

MS. WILLIAMS: I hope it's Fisk.

MS. FRANZETTI: You're not sure? Fisk? Can I help you?

MS. WILLIAMS: Okay. I was going to guess Fisk.

THE WITNESS: I don't remember -- I don't think Fisk was the worst. But I do remember that Fisk, there was one year where the inlet temperature exceeded the proposed limit by more than 50 days.

BY MS. WILLIAMS:

Q. But you don't recall whether any of those violated the maximum?

A. I don't recall.

Q. Let's move on to question five. On page 3-1 of your report you state that, quote:

"When this study was originally prepared in

2005, the design considerations were based on General Use Thermal standards. Under the General Use thermal water quality standards, the probability of being able to operate in open cycle mode during parts of year is greater than under the stricter proposed UAA rules."

Question A, explain how you reached this conclusion?

A. I reached that conclusion by looking at the numerical temperature. For example, the general use standards for April are a daily maximum temperature limit of 90 degrees Farenheit and the proposed thermal standard for April 1st to 15th is a period average of 60.8 degrees Farenheit. So, under the general use standards for the first 15 days in April, you can operate with a discharge temperature of 90 degrees. Whereas under in the proposed standards, you would have to average a discharge temperature of 60, so that's 29.2 degrees less so I consider that to be stricter.

Q. Did you do the same analysis with the general use standard that you just described for us with the proposed water quality standard, as far as looking at how many days the intake temperatures would violate the general use standards?

A. No.

Q. Did you consider the requirement in the general use standard not to allow the temperature to go -- we call it five Delta T requirement, do you understand what I mean when I say that?

A. Yes.

Q. Do you consider that aspect of the general use standard when you made that statement?

A. My understanding of the general use regulation is that's 5 degrees above the normal temperature and since these waterways are manmade and altered and affluent dominated, I haven't seen any real definition of what is a normal temperature in these waterways.

Q. But would you agree that that makes the agency proposal less stringent in one aspect, in that one aspect in the general use standards?

MS. FRANZETTI: Objection to form, but if you can answer.

THE WITNESS: It may be less stringent and that 5-degree temperature rise is not defined.

BY MS. WILLIAMS:

Q. Do you know what I mean when I say excursion hours?

A. Yes.

Q. Did you consider that aspect as well, the amount

of hours that the affluent can exceed the standard?

MS. FRANZETTI: Object to form, counselor. What do you mean, did he compare the number of excursion hours allowed under general use versus that allowed under the proposed standards?

MS. WILLIAMS: Correct.

THE WITNESS: No, because in our analysis we look at it and we don't really design to make use of excursion hours. We basically want to design the plant so it meets the requirements all the time, and excursion hours is kind of an extra margin you would have for upsets in the plant for extreme conditions. We don't really factor that in as part of the design consideration.

BY MS. WILLIAMS:

Q. Interesting. Is it your understanding that that's how Midwest Generation operates, not relying on excursion hours as part of the planned operation, but for extreme situations?

MS. FRANZETTI: Objection to form, counsel. That's not what he said. He's talking about how he designed a system --

MS. WILLIAMS: Absolutely.

MS. FRANZETTI: Now you're asking a totally

separate question.

MS. WILLIAMS: Right.

MS. FRANZETTI: Not based on how one designs a system, correct?

MS. WILLIAMS: Correct.

MS. FRANZETTI: Okay.

THE WITNESS: The difference is when we design, we don't design where we're going to use those excursions because that's a margin that gives the operation some flexibility. If we design up to the absolute limit using the excursion, they have no operating flexibility.

BY MS. WILLIAMS:

Q. I understand and I think that's useful information, I didn't realize that. Do you know if that's how the facilities are operated or do you -- or are the facilities operated to maximize the excursion hours as part of the operation?

A. I don't really know the details of the operation.

MR. ETTINGER: Just a follow-up on that briefly. Did you look at any of the studies that were done in the late '80s and early '90s to enable the Joliet plant to avoid violating the I-55 bridge regulations?

THE WITNESS: No.

MR. ETTINGER: So you're not aware of the testimony that was before the Board at that time, in which then Commonwealth Edison put plans in as to how they would operate the plant so as to avoid violating the variance that they were seeking for the I-55 bridge standards?

THE WITNESS: I am not aware of any have those studies.

BY MS. WILLIAMS:

Q. Let's move on to question six -- actually, before I have move to question six.

MS. WILLIAMS: Would Midwest Generation be willing to provide the analysis that Mr. Henry described regarding the 100 days of intake temperature exceeding the agency's proposal? I think that's information that we would like to see, to be able to --

MS. FRANZETTI: Counsel, it's not really an analysis. He looked at the intake temperature data and had standards, the proposed standards next to him and was just looking to answer your question, looking at approximately -- you know, were there times and were they frequent when the intake temperatures were exceeding the daily max and/or the period average. So

there's really not an analysis that I can produce to you.

BY MS. WILLIAMS:

Q. Maybe I should have asked it this way. You looked at the intake data, correct?

A. That's correct.

Q. Is that data in the record, the intake data? I don't believe it is, so I guess we would like to have that data, then, so we can make our own comparison?

MS. FRANZETTI: We'll consider it. It's a lot of data, 2007 through 2010 for every plant and I think it may be more relevant in Subdocket D, but we'll take a look.

MS. TIPSORD: Don't we already have some exhibits with some of that data?

MS. FRANZETTI: Well, that's why I'm hesitating. I just don't know --

MS. TIPSORD: From the hearing back in Joliet, I think we may already have it.

MR. ETTINGER: I think I put some in too, some that we got from the FOIA and we put in some intake data.

MS. FRANZETTI: I don't remember how old yours is, though. He did look at more recent.

MR. ETTINGER: I don't know that I looked at -- I don't remember what I put in.

MS. FRANZETTI: Right.

MS. TIPSORD: Certainly we haven't had any 2011 data in.

MS. FRANZETTI: No, that's true.

MS. TIPSORD: But I do think there are some 2007 intake -- I mean, we have some.

MS. WILLIAMS: Most of the data that's been entered, Marie, is from the stream. That's why I'm asking, I mean this is unusual. We don't require Midwest Gen to provide us with that kind of --

MS. TIPSORD: Right, but I --

MS. FRANZETTI: I would ask counsel, would you --

MS. WILLIAMS: If we've got it, then we don't need it.

MS. FRANZETTI: We'll see about whether it can fairly and readily be put on a CD and we'll get it to you. It's not anything that isn't, quite frankly, out there.

MR. ETTINGER: I will note, actually, that the Illinois Environmental Protection Agency may have the data, even if you don't, because that's where I got

it.

MS. FRANZETTI: That's kind of what I'm hinting at without coming right out and saying, but, you know, we can gather it. It's pubically available information.

MS. WILLIAMS: Thank you.

BY MS. WILLIAMS:

Q. Question six, explain any differences in the design basis between the 2005 study performed for Midwest Generation and the current study which began in 2008?

A. There's not a lot of differences in the design basis between the two studies. One difference is that for the later study we had more water quality data that we got from MWRD on total suspended solids in the waterways and we took a close look at those and we were able to determine that we could use a less expensive type of fill in the cooling towers, which we reduced the cost and that's the only real change in the design basis that I'm aware of.

Q. Question A, have the recommended compliance alternatives changed?

A. No. In both cases we still believe that the most practical solution to meet either regulations is to go

to a closed cycle cooling with mechanical draft cooling towers.

Q. That was the recommendation that you made to Midwest Generation in 2005?

A. Yes, that's what our report included.

Q. Can you explain -- question B asks what factors resulted in the increase capital costs and operating maintenance costs between the two studies?

A. The primary cost at increase were material and labor.

Q. So generally increasing costs over time from inflation, what have you?

A. Yes.

MS. FRANZETTI: Well, objection, counsel. I don't know that the cost of materials and construction labor is inflation.

MS. WILLIAMS: He can explain then.

MS. FRANZETTI: No, he did. I'm objecting to you characterizing that as simply inflation.

BY MS. WILLIAMS:

Q. I guess your counsel is implying that -- do you believe the cost has gone up more than inflation I guess? Is there something else that's the basis for those costs going up?

A. I don't recall exactly how much they went up and I didn't compare it to inflation.

Q. Question C, why did you use the 75-percent capacity factor in evaluating operating and maintenance costs?

A. I guess first I'd like to explain what is meant by a capacity factor and basically how that's defined is it's the actual energy generated over a period, usually a year, versus a theoretical maximum. So, for example, if a plant operated at 100-percent load 75 percent of the time during the year, would have a 75-percent capacity, or if it operated at 75 percent load for 100 percent of the time, that would be a 75-percent capacity factor, so it's really the energy generated versus the maximum potential. And the 75-percent capacity factor was an input from Midwest Gen based on their recent operation of the units and their projections for the future.

Q. So --

A. I think -- yeah, 75 is the actual from the past. I'm just kind of extrapolating that that's following in the future.

Q. Do you know whether -- you gave two examples?

A. Yes.

Q. That it could be operating at 75 percent 100 percent of the time, 100 percent of the year, or could also be operating at 100 percent 75 percent of the days of the year?

A. Or --

Q. Or anywhere in between?

A. In between. And typically they'd operate 100 percent load some days, maybe 60 percent other days, and when you take basically the weighted average it comes out to be 75 percent. If you take the average load times the operating time, you get 75 percent.

Q. Do you know over what historical period that figure was derived?

A. No.

Q. Do you know if the figure is the same at each station or was it just average across all five stations?

A. I don't know.

Q. So you didn't ask for a capacity for Fisk, one for Crawford?

A. No. We did not request separate capacity factors for each station.

Q. Question D, did the 2005 study also include the following assumption from your 2008 analysis that, quote:

"As part of the design basis, the proposed cool systems were designed with the goal of allowing the stations to run at full capacity under the most demanding conditions".

A. Yes. The same design basis was used for 2005.

Q. When you say, though, in this statement full capacity, can we just explain now that we've explained what capacity factor is, by full capacity do you mean 75 percent or 100 percent?

A. A hundred percent.

Q. I'll move onto E -- well, I just want to understand, I'm just curious. I'm not an engineer so this is a struggle for me. When you say -- I think this is a pretty simple distinction, but when you say you're looking at operating maintenance at 75-percent capacity, but you designed for 100 percent, can you just sort of explain for the layperson --

MS. FRANZETTI: Why is that reasonable?

MS. WILLIAMS: Yes.

THE WITNESS: Okay. The 100 percent means we basically designed the system so that almost on any day you could run the unit at 100-percent load. But when we calculate operating and maintenance costs, operating and maintenance costs are going to be a

function of how many megawatt hours per year you operate the unit. Because we know you're not going to operate the unit 100 percent load every day of the year. But our design basis is that on any day of the year they can operate -- almost any of the days of the year they can operate at 100-percent load. But when we calculate the operating and maintenance costs, we realize that there's going to be times when the units are not going to be operating, you have outages or reduced load, and so you would be overestimating the operating and maintenance cost if you were to assume that the plant's going to operate 100 percent load 365 days of the year.

MS. FRANZETTI: Counsel, can I just ask a couple of questions?

MS. WILLIAMS: Can I say this particular -- just to make sure I understand.

BY MS. WILLIAMS:

Q. Just to be clear. Obviously it would be unreasonable to assume 100 percent when you're doing the cost estimate, but if you did that would lower the cost, correct?

MS. FRANZETTI: Counsel, I just ask you to be clear because we have different types of costs, capital versus O and M. I believe your question is

asking him about O and M costs.

BY MS. WILLIAMS:

Q. The capital costs would remain the same, but O and M would go down, is that correct?

A. No. The O and M cost would go up, because if you operate the plant 100-percent load -- on a day you're operating, if you're operating one day, you're going to have an operating and maintenance cost for the cooling tower. If you're not operating, that cost goes down. So by using a --

MS. WILLIAMS: We'll get into this more in detail probably later --

MS. FRANZETTI: I just wanted a couple of questions. By using the 75-percent capacity factor to estimate the O and M cost, if these closed cycle systems were built at the Midwest Gen plant, do you believe that that was a reasonable assumption based on what Midwest Gen said had been the actual observed capacity factor for these plants?

THE WITNESS: Yes.

MS. FRANZETTI: And if you had used instead 100-percent capacity factor in establishing O and M costs, do you believe that would have been arguably overstating the amount of the annual O and M costs for

these plants if they were to be converted to closed cycle systems?

THE WITNESS: Yes.

BY MS. WILLIAMS:

Q. Let's move on to E. I think it was helpful when you explained --

MR. ETTINGER: Can I just ask one quick --

MS. WILLIAMS: Yes.

MR. ETTINGER: Did you use the same capacity factors on all of the plants that you considered?

THE WITNESS: Yes.

BY MS. WILLIAMS:

Q. Explain the term approach temperature?

A. On a wet cooling tower that we based our estimate on, the approach temperature is the difference between the cold-water temperature coming out of the cooling tower and the wet bulb temperature. The wet bulb temperature is the driving factor that's cooling the water and so the approach temperature is the difference between that cold-water temperature and the wet bulb temperature is a measure of the cooling tower performance.

Q. Based on your previous answers, both studies relied on 7 degrees Farenheit approach, 2005 and 2008,

is that correct?

A. Yes, that is correct.

Q. Can you explain why you selected that figure?

A. The reason we selected that figure was that one of the concerns that we have is the cooling towers have a blow down because you're making up water to the tower, a lot of the water evaporates and the water that evaporates is pure so you're concentrating the dissolved solids in the water that's remaining. So you need to blow down some of that water in order to maintain the dissolved solids to a certain level in the cooling tower. And although we're blowing down that water from the coldest point in the cycle, it's still going to be high and I believe in many cases it's going to exceed the proposed limits. But by using a 7-degree approach temperature, we were able to get the lowest practical blow down.

Q. One question that I had, it might come up later but I'll ask now since you brought it up. Is the blow down continuous or is it periodic?

A. Continuous.

Q. What would be the blow down temperature with the 7-degree approach?

A. Well, in our report we have a table where we list

the blow down temperatures, but the maximum blow down temperature, or based on our design, would be 85 degrees. That would cover -- you know, there's a 1-percent time when it could be higher than that 1 percent during the summer months, but for most practical purposes the maximum temperature would be 85.

Q. Can you explain for us, Mr. Henry, your report mentions that you rejected using a 12-degree Farenheit approach temperature. Can you just explain why you made that decision and what difference it makes in the blow down temperature?

A. We looked at different approach temperatures because that affects the cost of the cooling tower. A 12-degree approach cooling tower would be less expensive than a 7-degree approach, but there are two impacts. One is the 12-degree approach is going to result in a higher temperature, it would be 90 degrees Farenheit. So we would have a warmer temperature going to the plant which would reduce the plant output and plant deficiency and the blow down temperature would be higher. So we selected the 7-degree approach as giving us the lowest practical blow down temperature.

Q. I believe you stated in your report, but tell me if this is correct, that had you been -- had you

selected the 12-degree approach temperature, that would have decreased the capital cost by 20 percent, is that correct?

A. I believe we say in the report is that it would decrease the capital cost to the cooling tower by 20 percent. A lot of other costs -- and the cooling tower I think is 25 to 30 percent of the total cost. A lot of other costs would be fixed, all the pumping, the piping and the structures and everything would pretty much be fixed.

Q. Question F, explain what is meant when you state that, quote, "All of the stations were designed for an 80 degree Farenheit cold water temperature"?

A. Well, as I explained the --

Q. They say I said 80 instead of 85, I apologize. It says 85 in my pre-filed questions.

A. Okay. Well, the design summer wet bulb temperature is 78 degrees and the cooling towers were designed for a 7-degree approach, so that gives you an 85-degree cold-water temperature. So that would be the water temperature that would only be exceeded 1 percent of the time in the summer months.

MR. ETTINGER: Let me ask, does the cold bulb temperature, is that the same as the discharge

temperature?

MS. FRANZETTI: Mr. Ettinger, I think you mean wet bulb, not cold bulb.

MR. ETTINGER: Whatever the bulb is, your bulb temperature, is that the same as the discharge temperature?

THE WITNESS: No. The wet bulb temperature is the wet bulb temperature in the air, you know, what the normal temperature that's mentioned in air. Like if it's 80 degrees in here, that's the dry bulb temperature. The wet bulb temperature is the function of the relative humidity and the wet bulb temperature is always equal to or lower than the dry bulb. It's the wet bulb temperature that affects the cooling tower performance so that's the important design.

BY MS. WILLIAMS:

Q. When you say you added the 7-degree approach temperature to the 78 degree wet bulb to get 85, is that -- so I understand from your previous answer, that's the temperature that the blow down will be, is that correct?

A. Yes. That is the coldest water temperature in the cycle. That's coming -- the water coming out of the tower which would go to the condensers and the blow down

is taken at that point, so you have the lowest possible blow down temperature from the cycle.

Q. Will the effluent temperature be lower than the blow down temperature at all times or -- does that make sense?

A. What do you mean by effluent? What I'm referring to here is a closed cycle cooling where the water would go from the condenser to the cooling tower back to the condenser and then in order to maintain the water chemistry a small amount would be discharged to the river. That's what I am talking blow down, and the blow down would be, essentially, the only effluent from the system.

Q. Do you know what the volume of blow down effluent would be?

A. No, I don't. We'd have to calculate that, but I would expect it would be in the range of maybe 1 or 2 percent of what the total water flow is. It depends on the water chemistry.

MS. FRANZETTI: Counsel, just so the record is clear. This is Mr. Gary Ault who was project manager of the report preparation at Sargent & Lundy. Mr. Ault, can we swear him in?

GARY M. AULT

having been first duly sworn by MS. TIPSORD reporter, was examined and testified on his oath as follows:

MS. FRANZETTI: Counsel, for that question I'm going to have Mr. Ault -- why don't you just generally state that the information is in the report.

MR. AULT: The quantity of blow down required is, in part, determined by the quality of the incoming water, and these towers were designed for what we call five cycles of concentration, meaning we run the water in a circle until the total dissolved solids or whatever reaches five times the incoming level and then if you limit that from a materials design standpoint, that varies depending on the incoming water quality, which varies throughout the year. So the blow down flow rate required is going to vary as a function of river water quality and that data is in one of the tables in the report.

MS. FRANZETTI: So the plant would be able to do more than five cycles if the CVS values are low, diluted, at a certain time of year, is that what you're saying or am I missing --

MR. AULT: I suppose theoretically it could, but --

MS. FRANZETTI: But it's not designed to do

that?

MR. AULT: I don't think it planned to do that. But, yeah, you're right. What you're trying to achieve is a level of chemical concentration in the cooling water that doesn't exceed a certain value so you don't core with the condenser and so forth.

BY MS. WILLIAMS:

Q. We've gotten into G a little bit, but I will ask it for the record's clarity. Did you use the 78 degree wet bulb temperature in the design of the cooling towers in the 2005 study?

A. Yes.

Q. Does that temperature represent the 99 percentile wet bulk temperature in the summer months in the Chicago area?

A. Yes.

Q. Can you just explain a little bit how you decided to use the 99 percentile?

A. That's a standard practice for cooling towers for power use.

Q. It makes sense to me, Mr. Henry, that you're saying this is a standard design parameter. Did you consider, however, using, say, 97 percentile given the excursion hours and the standard or something like that?

A. Well, for the cool-cycle cooling the excursion hours really don't apply.

Q. Well, you're designing for the blow down so the excursion hours would apply to the blow down at discharge, correct, or no? I mean -- I guess I just want to know if you considered it. So you didn't think it was applicable, is that your answer?

A. No.

MS. FRANZETTI: While Counsel's looking for her next question. Mr. Henry, is it correct that it is not standard practice in the industry to design closed cycle cooling tower systems such that they exhaust the potentially allowed excursion hours under the applicable regulations?

THE WITNESS: I don't understand the question.

MS. FRANZETTI: Okay, let me try it again. You said it's standard practice for the design of cooling towers for power plants to use the 99 percentile wet bulb temperature, correct?

THE WITNESS: That's correct.

MS. FRANZETTI: Counsel wants to know whether or not why -- why wouldn't you design a cooling tower for a power plant to use up all of the allowed per

year excursion hours over the thermal standard?

THE WITNESS: Well, in the particular case we're looking at, we're looking at a cold cycle tower. So if we were designing it for 1 percent wet bulb, so 1 percent of the time during the summer months the water temperature is going to be higher than what we're designing for, which is going to be a further restriction on the plant. If we size the towers for the 97 percentile, then 3 percent of the time the plant would be restricted. Now, if we designed it for 97 percent, the blow down temperature would be higher, but if you look at our blow down temperatures in our report, the blow down temperature will be exceeding the proposed limit much more than the allowable excursion for anything we design, it's going to be exceeding it much more than what's allowed.

BY MS. WILLIAMS:

Q. Question seven, are you aware of other existing facilities that have installed closed cycle cooling retrofits?

A. Yes.

Q. Have you or your company worked on any of them?

A. Yes.

Q. What were the dates and locations of those

retrofit projects?

A. It was the Noblesville plant in Noblesville, Indiana, and that was in 2003.

Q. Is that the only one?

A. That's the only one that we worked on.

Q. Are you aware of some others that you didn't work on?

A. I'm aware of one other plant that is in the process of doing that.

Q. Is that mentioned in your testimony?

A. No.

Q. What plant are you referring to?

A. I understand the Brayton Point plant in Massachusetts is retrofitting closed cycle cooling.

Q. Do you have any cost information either for Noblesville or the other plant, the Brayton Plant?

A. Well, Noblesville was for a regulated utility and they were allowed -- at the same time they did the closed cycle conversion they were doing a lot of other major plant modifications, and so for the overall project it's a matter of public record that they were allowed to put $210 million into the rate base, but we don't know how much of that was for cooling tower versus how much of it was for other projects.

Q. Have you worked on retrofits to existing plants for open-cycle cooling?

MS. FRANZETTI: To go from closed to open?

MS. WILLIAMS: No. I'm sorry.

BY MS. WILLIAMS:

Q. To add like -- helper cooling towers might be the proper term?

MS. FRANZETTI: Like we have at one of the Joliet stations?

THE WITNESS: Yes, we have done that.

BY MS. WILLIAMS:

Q. Generally can you speak to the cost differences between converting to closed cycle cooling versus install upper cooling towers in open cycle operations?

A. No, I don't remember the costs on anything I've done and any costs would be very site specific.

Q. So you wouldn't say generally whether it's cheaper to do open cycle than closed cycle cooling?

A. If people put in open cycle versus closed cycle, I would assume that they did that because it was cheaper, but it wouldn't necessarily be in every case.

Q. Number eight, why didn't your analysis factor in mixing with the receiving stream?

A. That goes back to the inlet temperatures. If the

inlet temperature which as I mentioned earlier exceeds the proposed limit as much as 100 days per year for some stations, the problem we have is if the inlet temperature is already exceeding and the river temperature is exceeding the proposed standard, by mixing our outlet water with the river temperatures that always exceeds the limit, we cannot achieve the limit by mixing. For example, if the limit is 60 degrees and the river is already at 65 and we're heating the water up to 75 degrees, we cannot achieve 60 degrees by mixing 75-degree water with 65-degree water.

Q. So your assumption wasn't - it was a technical one, not a legal one I guess I should ask?

A. That's correct.

Q. It wasn't that you wouldn't be allowed to have it, but you found that it would not be achievable?

A. Well, there were many times when a mixing zone is really irrelevant if the river temperature is already higher than what you have to achieve.

Q. Question nine asks would it have been less expensive to add smaller cooling towers and rely on some mixing in the receiving stream?

A. Well, as I explained in the -- when the river temperature is already above the proposed limit, if we

were to operate once through with helper cooling towers, we would have to not only dissipate all the heat from the plant, we would actually have to cool the water from the river below where it came into the plant. So the cooling tower would actually have to be bigger than a closed cycle tower.

MS. FRANZETTI: Does bigger mean more expensive?

THE WITNESS: Yes. I guess -- maybe I can explain by example. If we have a day where our limit is 60 degrees, and the river temperature is 65 and the plant heats it up to 75, we have to cool it from 75 all the way down to 60 to meet the limit.

BY MS. WILLIAMS:

Q. Question ten asks are once-through cooling towers currently being built?

A. I think you mean once-through cooling power plants?

Q. Yes, and that's what I wrote, isn't it? Are once-through cooling power plants currently being built?

MS. FRANZETTI: Just to show you, counsel, we do read what you write.

THE WITNESS: Yes. One example that I'm aware of is the Elm Road generating station which is

located in Oak Creek, Wisconsin. That's two coal-fired units 677 megawatts each. That plant was completed earlier this year and that uses once-through cooling from Lake Michigan. Worldwide there are many examples of plants that are under construction that use once through cooling.

BY MS. WILLIAMS:

Q. Question 11, how much of the cost of electricity increases with the installation of closed-cycle cooling?

A. I don't know.

Q. Question 12, what would the interest rate be if Midwest Generation could get a loan for these proposed upgrades?

A. In our cost estimate we did not include any financing costs which would be over and above the cost that we estimated, so we had no need for an interest rate number.

Q. Question 13, on page 1-6 of your report you discuss the construction timeline and conclude that at least 72 months should be allocated. Are you recommending that Midwest Generation begin construction of cooling towers at the upstream facilities first and then proceed downstream and if so, why?

A. We did not make any recommendation for the order

of construction. There are a number of site specific conditions that would have to be taken into account in determining the order of building the plant, because on some of the plants transmission lines have to be moved and so that would have to be factored into the overall schedule.

Q. Question 14 --

MS. TIPSORD: Ms. Williams, just for a second. I apologize, but I just noticed the second student is recording the proceedings and I just have to note for the record that they are recording, audio recording. Is there anyone who objects to that?

Okay. Seeing no objection, go ahead.

MS. FRANZETTI: I'll restrain myself from singing.

MS. TIPSORD: Off the record.

(Brief off-the-record discussion.)

MS. TIPSORD: Back on the record.

BY MS. WILLIAMS:

Q. Questioned 14, explain the following statement on page 2-8 of your report, quote:

"Low-clog film fill was selected by SPX Marley as suitable for the Midwest Gen application based on the total suspended solids levels in the make-up

water."

A. First, SBX Marley is the cooling tower company that we use to get budget quotes for the cooling towers. And as I explained earlier, in the more recent report we had more river data, we looked at total suspended solids and we talked to the cooling tower supplier and they said with the lower suspended solids we can go to this low clog film fill which was cheaper and would lower the cost.

Q. Question 15, were all the cooling towers equipped with drip eliminators or just those that were projected to exceed new source review threshold?

A. All of the cooling towers were specified with drip eliminators, that has been our standard for a number of years. The high-efficiency drift eliminators are considered that and they are pretty much industry standards for large cooling towers.

Q. How much would it save in the cost if they were only installed at plants that were required?

A. I don't know because we've been specifying the high-efficiency drip eliminator for a number of years. As far as I know, we've never had a cooling tower supplier object or take exception to providing that. I've never seen a cost breakout and I believe most of

them will tell you that that's their standard design, so I've never seen a cost for that. Since it's their standard design, I think it would be small, but I don't know.

Q. So regardless of whether new source review thresholds were exceeded or not, that would have been how you recommended they be designed anyway?

A. That is correct.

Q. Question 16, you mention at least two, quote, "constructability issues" in your report, moving high-voltage power lines and performance problems related to locating cooling towers too close together. Are there any others?

A. From my experience, on almost any large retrofit project you run into problems once you start construction. If you walk around the sites you'll see that there's manholes and covers and evidence of underground capable and pipe, and based on my experience a lot of those underground abandoned facilities are not shown in the drawing. And when you look at the Fisk station, which is over a hundred years old, although Fisk unit 19 is not 100 years old, the reason they call it unit 19 is it's the nineteenth generating unit at the station. Units one through 18 have been retired and

demolished so there's been a lot of construction, over a hundred years in that plant, and once you start digging to build a foundation for a cooling tower you're going to run into a lot of pipes, tunnels, and who knows, foundations and a lot of other things. So we can't really specifically identify what those problems are so we couldn't really put a cost on something that we can't quantify. But we expect that as any large project on an existing plant, that there's going to be other problems you're going to run into.

Q. Do you feel comfortable that those problems will be able to be overcome?

A. Yes. I'm confident they can be overcome, just a matter of time and money.

Q. Question 17, on page three dash four of your report you discuss your calculation of the, quote, "megawatt output gain or loss." Explain how this was calculated?

A. Earlier we talked about the ratings of these units and the ratings of these units are based upon specific conditions and one of the important parameters for the output of a unit is the inlet water temperature. And so if we convert from open cycle to closed cycle, most of the time the water temperature going to the unit

is going to be higher and as a result the output, the gross output generated by those units is going to be lower so that's what we calculated here. Now, this is different than the axillary power, because the higher water temperature will mean that the generator output will be lower. Over and above that, more of the plant's gross power will be used to run the cooling towers and pumps. So this output loss is basically an efficiency loss, which means lower output and is an addition to any axillary power used by the new cooling facilities.

Q. Can you explain how it was calculated and what the results of the calculations were used to determine?

A. We calculated using design information that's mostly from the steam turbine, the original steam turbine design information, and we looked at each month, looked at what the river temperature is, looked at what the cooling tower temperature would be and calculated what the difference would be. There's a few instances where actually the cooling tower gives you a little bit lower temperature in the gain, but in most of the months there's a loss and overall there's a net loss.

Q. This is represented on table 5-3 of your report, is that correct -- well, one example I should say. You did it for each plant, correct?

A. Yes, we did it for each plant.

Q. One example would be table 5-3 for Fisk?

MR. AULT: It sounds right.

BY MS. WILLIAMS:

Q. I would like, Mr. Henry, for the record, if you could take a look at that table and just sort of walk us through what the different columns represent so that we understand?

MS. FRANZETTI: Counsel, for the record, table 5-3 is entitled Fisk 19 megawatt loss due to closed versus open-cycle operation and it is on page 5-3 of Exhibit B to Mr. Henry's testimony.

THE WITNESS: In the first column we have the periods, these are the period average for the proposed thermal standards. The second column is closed cycle megawatt loss and you can see we show a loss for every month, and basically that loss is calculated from the nominal design basis of the plant. And then we did the same thing for the open cycle loss and I think in almost all of the months you have a loss, in January and February you have a gain. And, again, that gain or loss is relative to the nominal rating of the unit which is based on a fairly low cooling water temperature. So then by taking the difference between the open cycle

loss or gain and the closed cycle loss or gain, we got the net loss or gain which represents the loss or gain of closed cycle versus open cycle.

BY MS. WILLIAMS:

Q. In some months -- can you explain why some months are a positive number and some are a negative number?

A. Yes. Because in some months the -- let's see. In some months the closed cycle would actually have a little bit colder water temperature going through the condenser than an open cycle.

Q. Those would be the summer months generally, right, or am I getting it backwards?

A. Yes.

Q. Has the design of the plant -- I'm sorry. Has the design of the closed cycle cooling retrofit allowed for optional open cycle in the months where that would be beneficial?

A. Yes, we did that. The way we laid these out, we have moveable gates at the intake and discharge. So if the river conditions are favorable that we could open those gates and operate open cycle, which would reduce the axillary power consumption and the operating and maintenance on the cooling towers.

Q. Does your cost estimate assume closed cycle all

the time or does the cost estimate provide a range, depending on whether it's an open or closed cycle?

MS. FRANZETTI: Counsel, again are you talking -- are you switching to capital costs?

MS. WILLIAMS: No. He said axillary power would go down and O and M would go down. I want to understand if that's reflected in his testimony when he says the range of costs or that would be outside.

BY MS. WILLIAMS:

Q. Is that something not reflected in your costs?

A. In the megawatt loss and gain -- let's see. Our operating and maintenance costs were based on operating in closed cycle all the time.

Q. So those could potentially go down if it was determined that open cycle operation --

A. Yes. During the times that you could operate open cycle, yes, those could potentially --

MS. FRANZETTI: Based on table 5-3, how much of the year would you expect to be -- for the plants to be able to operate in open cycle?

THE WITNESS: We didn't look at it on a daily basis, we just looked at monthly data. It could be done on more of a daily basis than --

MS. TIPSORD: You trailed off there, I'm

sorry. Excuse me, you trailed off when you were speaking to Ms. Franzetti.

THE WITNESS: We looked at the open cycle versus closed cycle using monthly averages, we didn't look at it on a daily basis. And you would have to do it on a daily basis to really calculate how many hours per year, days per year, you can operate the open cycle.

MS. FRANZETTI: Mr. Henry, all I'm trying to do is give the Board some sense of -- since the costs weren't included, you know, try to pinpoint how many days a year could you operate in open cycle versus closed. But can you give the Board some sense as to whether or not that was going to be -- you expect that to be frequent, that they can operate in open cycle?

THE WITNESS: No. I don't think it would be very frequent and that was one of the comments that we made, is with the proposed thermal standards it would be less frequent than with the general use standards.

BY MS. WILLIAMS:

Q. Question 19, in your operating and maintenance cost estimates how is, quote, "power costs" calculated for Midwest Generation?

A. The unit costs, like the dollars per megawatt hour we obtained from Midwest Generation, and they

calculated that for the short term based on actual contracts they have and for the longer term based on their estimates of the average between peak and off-peak hours. So we're not in the business of estimating power costs, so we obtained that from Midwest Generation.

Q. Are you saying that Midwest Generation purchases electrical power off the grid?

MS. FRANZETTI: Objection, counselor, that misstates his testimony.

MS. WILLIAMS: Well, that's the next thing -- I'm sorry. That is the next -- I did rephrase it.

BY MS. WILLIAMS:

Q. Does Midwest Generation purchase electricity off the grid?

A. I don't know if they do or not, but that's not really relevant to what we're saying here.

MS. FRANZETTI: Why don't you think it's relevant?

THE WITNESS: Because the power costs that they use for operating these towers is going to be generated by that particular plant, it's going to come of the books and it costs them money to generate that power. For example, if -- for example at Fisk which is

rated at 348 megawatts, if they're generating 300 megawatts on a given day and they need to operate the cooling tower, they're going to need to generate a few more megawatts to power that cooling tower, which means they're going to burn more coal, have more emissions, more consumables. So it costs them money to generate power, in addition to the potential loss of revenue of selling that power.

BY MS. WILLIAMS:

Q. That's the value I'm trying to get at. What is the -- what does that value represent, how is it calculated, how much is it, what was it based upon, and you're saying you were given the figures?

A. That's correct.

Q. What were the figures that you were given, were they different for each plant?

A. I don't recall.

MS. FRANZETTI: It's in the report.

THE WITNESS: It's in the report.

MS. FRANZETTI: Mr. Ault, you've been sworn in so why don't you answer it.

MR. AULT: We use the same value of $36.71 per megawatt hour for all units based on -- from Midwest Generation.

MS. WILLIAMS: $36 --

MR. AULT: And 71 cents.

MS. WILLIAMS: And 71 cents.

MR. AULT: I believe that's the numbers.

BY MS. WILLIAMS:

Q. I want to try to understand because I think there are some terms that are used that I'm not sure I understood or I'm not sure I understood which ones were the same. I've asked you about power costs. I think we've also talked about -- I think you also use the term estimated power loss revenues, does that sound familiar?

MS. FRANZETTI: Counsel, can you direct us to either the report or a page of his testimony so we can see the exact language you're referring to?

BY MS. WILLIAMS:

Q. At the bottom of page 13 of your testimony, the last sentence partly cut off, it says, quote:

"These estimated costs include capital and O and M cost estimates and estimated power loss revenues." Let's talk about what you meant by that.

MS. FRANZETTI: Are you there?

THE WITNESS: Yes. The power loss revenues are what we were talking about in the tables on section five, like the 5.3.

BY MS. WILLIAMS:

Q. Then on page 16 there's a subpart and use of a phrase "loss of plant generating capacity." Is that the similar concept or is that different?

A. Yes, it is. That's a similar concept.

Q. Can you explain axillary power use? I know you explained it a little bit, but can you flush out for us the use of the term axillary power use?

A. Axillary power is the power that's used by the generating station to run pumps and fans and other equipment within the plant, and we calculated that for the cooling towers because these cooling towers have a lot of fans with this system, also would require additional pumps, and so the power used to run those pumps and fans is axillary power.

Q. That's part of the O and M cost?

A. Yes, it is.

Q. Would the information we've been discussing from tables like 5-3, loss of generating capacity or power loss revenues, are those part of the operating and maintenance cost as well -- are they part of the costs, I guess I should ask?

A. Well, they're not part of the capital costs and they're not part of the O and M, operating and

maintenance costs. That is a separate cost that we calculated and identify as a loss of revenue.

Q. When you outline in your testimony the total costs, does that include the loss of revenue?

A. What are you --

MS. FRANZETTI: Counsel, again, where are you -- I think it depends on where you're referring to as the total costs.

BY MS. WILLIAMS:

Q. I was envisioning -- and I may be wrong. I'm sort of picturing hearing how we'll sum this up and Midwest Generation saying oh, this project's going to cost X, and I know you provided a range. Have you -- maybe you didn't add a total. Do you always provide capital and operating costs separately in your report?

A. Yes.

Q. Did you provide a total cost anywhere?

A. Well, the capital cost is basically a one-time cost, where the operating cost we gave on a per-year basis.

MS. FRANZETTI: Counsel, I'm not -- it may help. In the last paragraph of his pre-filed testimony on page 18, is that what you're trying to find, where he said for all five Midwest Generation stations,

converting them to closed cycle cooling systems would require an estimated total capital investment of nearly $1 billion and would result in over $23 million per year in operating and maintenance costs. Is that what you're trying to find?

MS. WILLIAMS: It may be -- that clearly separates the two, right?

THE WITNESS: Yes.

BY MS. WILLIAMS:

Q. Those two figures -- when you sum those up for all five plants -- do not include loss revenue, is that correct?

A. That's correct.

Q. The only power cost is -- well, is the only power cost included in the O and M cost the axillary power cost when you provide this per-year figure of 23 million? If I wanted to know what elements of the power costs are included, is there anything besides axillary power costs?

A. In the 23 million per year that's just axillary power, the only power cost in the 23 million. There are other operating and maintenance costs, but just maintenance spare parts.

Q. But not power?

A. But not power.

Q. Thank you. That's very helpful. I believe my last question 20, on page five of your testimony you state that the Joliet seven and eight towers are used primarily to maintain compliance with the I-55 bridge adjusted standards. In your analysis, how do you differentiate between the technology and cost of that technology necessary to achieve compliance with the proposed rules and those necessary to allow Midwest Generation the flexibility of never having to de-rate?

MS. FRANZETTI: Counsel, can I just ask you to clarify that question? What do you mean by in his analysis, how does he differentiate between technology and the cost thereof to achieve compliance with the proposed rules? I think that's what he did, right? I mean, we would agree that's what he did and Sargent & Lundy did in their report, correct?

MS. WILLIAMS: Right.

MS. FRANZETTI: That's what you're referring to there, okay. But I don't know that he ever did do -- try to figure out if there was a technology that would give him the flexibility of never having to do that. That's the problem, I'm not sure what you're referring to as the alterative.

BY MS. WILLIAMS:

Q. Well, let's -- let me change never having to de-rate to the terminology that you used in your report which is to operate up to a capacity --

MS. FRANZETTI: I'm not trying to be difficult. Do you just want him to say to what extent did you give consideration to an approach that would have involved perhaps more de-rating, but could have worked to achieve and maintain compliance? Is that what you're trying to get at? Is there -- is there some alterative like that?

MS. WILLIAMS: Right.

MS. FRANZETTI: That is something different than going to closed cycle with all these plants?

MS. WILLIAMS: That would be fine. Let's try that.

THE WITNESS: No, we didn't consider that because when we looked at the water temperatures we felt that something that would require some of these plants to shut down more than a hundred days per year was not practical.

BY MS. WILLIAMS:

Q. When did you look at those numbers, the intake numbers that you're describing that you found the

hundred days? When in the whole process did you look at those numbers and make that comparison of how many days per year it has to be de-rated?

A. A few months ago.

MS. WILLIAMS: Thank you.

I don't have anything further.

MS. FRANZETTI: That's him personally.

THE WITNESS: That I personally looked at.

MS. WILLIAMS: Okay. I don't think I have anything further.

MS. FRANZETTI: I have a question to follow up on that last one.

EXAMINATION

BY MS. FRANZETTI:

Q. If you were going to try to take into account a higher frequency of de-rating across all of these plants, what's the effect of that on what you would have designed, what Sargent & Lundy would design, what's the alternative? Because it isn't just simply no additional cooling, correct?

MS. WILLIAMS: I would like to object or ask you -- you said higher amount of de-rate. Higher than what, higher than 75 percent or higher than 100 percent?

MS. FRANZETTI: Higher than what's in the

closed cycle. I'm doing the same comparison you were.
BY MS. FRANZETTI:
Q. Can you explain again, can you explain to the Board why not go that direction? Why not have some de-ratings with some cooling and not all the way to closed cycle?
A. Because with the -- like I said, 100 days a year you would have to shut down. If you wanted to put cooling towers and operate once through, like Joliet does now where you have the towers cooling the water from the plant, if you wanted to avoid shutting down 100 days per year, those cooling towers would be bigger and more expensive than what we're doing for closed cycle. So the options are on meeting these requirements, putting in -- you know, shutting down 100 days per year plus de-rating, putting in cooling towers that are bigger than what we have for closed cycle and de-rate and shut down less than 100 days per year, but you would still have to do some de-rating and shut down or go to closed cycle, which is less expensive and allows you to operate essentially all of the time. So to us it was obvious that going closed cycle with cooling towers was less expensive than putting in towers to try to meet the conditions some of the time, it's a lower cost and

allows you more operating flexibility. So we don't see any advantage of going to a scheme where you're combining de-rates and shut downs and cooling towers.

Q. Mr. Henry, just so -- because I know you kind of keep using it and I don't want it to take on a greater meaning than I think you intended. You mentioned the fact that in some cases it's as much as 100 days a year based on the 2007 to 2010 data. But am I right in understanding your testimony to mean even if it's -- it might be 80 days or 70 days, your conclusions would still remain the same?

A. Yes, that is correct.

MS. TIPSORD: Anybody else?

MR. GIRARD: I have a question.

EXAMINATION

BY MR. GIRARD:

Q. Mr. Henry, from your testimony in the area of page five, so if you take a look at page five of your testimony. Specifically I'm going to refer to the first full paragraph in this area on page five, you're just giving some general background information on power plants. The first sentence there, in that first full paragraph on page five, you make a general statement that the amount of heat generated from condensing the

turbine exhausted steam is greater than the amount of electricity generated. And then you go on and give a specific example looking at units at Joliet 7 and 8. But my question is also general, why can't this thermal energy be put to a beneficial use before it's dissipated in the environment? It's a lot of energy.

A. Yes, it is a lot of energy. A lot of people looked at that. As far as I know, there is nobody who has ever made a use for that energy. The problem is it's at a low temperature, it's only a few degrees above the ambient temperature and when you have a low temperature differential it's not really practical to use that. We've done in the past a few studies of people who had ideas for using that, but as far as I know nobody's done any more than studying it.

Q. Is that only in plants in the U.S. or are there plants overseas that use any of that waste?

A. I'm not aware of any plants overseas that do that and we've looked at plants overseas. There are some plants -- and more overseas than in the U.S. -- where they will take energy from the middle of the cycle, maybe at pressures of 100 pounds and 6- or 700 degrees and use that for a cogeneration process for district heating, which is very common in Europe. But that's

taking it from the middle of the cycle, the tail end of the cycle where it's only a few degrees above ambient and it's a tremendous amount of energy. But at such a low temperature, nobody's really found a practical way to use that energy.

MR. GIRARD: Thank you.

MS. TIPSORD: Off the record for just a second.

(Brief off-the-record discussion.)

MS. TIPSORD: Let's go ahead and go back on the record and we'll go with Prairie Rivers and the Sierra Club.

Mr. Ettinger.

MR. ETTINGER: By the way, I represent both so it's not two sets of questions.

EXAMINATION

BY MR. ETTINGER

Q. Were you asked by Midwest Generation to look at the cost of reducing impingement at any of the plants?

A. No.

Q. I never get to -- just to make sure I don't make a mistake here. I never understood the difference between impingement and entrainment, but were you asked to look at entrainment either?

A. No.

Q. Would moving to a closed cycle system reduce impingement or entrainment?

A. Well, I haven't studied impingement or entrainment at any of the Midwest Generation plants, so I'm not really in a position to answer that question.

Q. But it will take less water in through the system, so presumably you've got less critters going into the intake?

A. It would take less water, yes.

Q. We've gone over this a little bit, but you said at page one of your testimony you state that Sargent & Lundy conducted at least 15 studies for addition of cooling towers that will last 30 years. What other plants were studied?

A. I'll list those plants by the location. In the State of Illinois we did studies for Clinton, Coffeen, Dresden, and Zion stations. In Indiana Cayuga, Wabash River stations. Wisconsin, Rock River station. Florida, Bayside, Crystal River, and a recent project that's confidential. In Louisiana we did a study for the Baton Rouge cogeneration facility. In California for Potrero. New Jersey, Salem. North Carolina, Allen. Delaware Indian River. Texas, Monticello.

Pennsylvania, Shawville, and in New Zealand, Huntly. That's 18 in total and that does not include the five that we did for Midwest Generation.

Q. You said that they're actually doing a retrofit on a Belleville plant in Indiana, was that one of the ones you studied?

A. Well, it was a Noblesville plant --

Q. I'm sorry, Noblesville.

A. It was a Noblesville plant and that was in done in 2003, but we never did a study. The utility made a decision to go to closed cycle.

Q. Do you know why they did that?

A. I don't know.

Q. You studied 18 plants and what did you conclude from those 18 studies?

A. Well, in most of these studies we did a similar study that we've done for the Midwest Gen plants. We did a conceptual design and cost estimate and we've evaluated the performance impact. So the conclusion was really what's it going to cost and what's going to be the impact of the cooling towers.

Q. You concluded 18 times it was too expensive or what did you come up with?

MS. FRANZETTI: Well, wait, counsel,

objection. He didn't say that that's what their reports covered. They lay out the cost for the -- to the client. It's up to the client to decide.

BY MR. ETTINGER:

Q. You got 18 studies in which you laid out the cost for 18 plants, and to your knowledge how many times did the utility decide not to build the cooling based on your study?

A. I think in the majority, I'm aware of a few of these where they put in helper towers similar to Joliet 7 and 8, but to my knowledge none of these plants converted to closed cycle cooling.

Q. Some of them did put in helper towers?

A. Yes.

Q. You don't know which ones those are?

A. I know Cayuga station in Indiana put in helper towers, that's one I know.

Q. It was decided it -- well, you don't know. They felt it was cheaper to put in helper towers in the case of the Cayuga plant than it was to go to a closed cycle system?

A. I don't know that for a fact, but I assume that's probably.

Q. I think we've done three. Four, what is the

basis of your statement on page six that Fisk, Crawford, Will County, and Joliet plants all lack land necessary for ponds or sprays?

MS. FRANZETTI: Okay, hang on. We have a pictorial to handout to help with the answer to this. So let me offer as -- we can do this as a group exhibit with one exhibit number or you can give each one a different exhibit number. They're all -- I'm sorry. They're all aerials of each.

MS. TIPSORD: Since they're each a different plant, let's give them a different exhibit number.

MS. FRANZETTI: Okay. Hang on just a second.

THE WITNESS: There are four exhibits because we included both Joliet stations on one.

MS. TIPSORD: For the record, I have been handed four pictures, one is Crawford station, Google Crawford station, Google Fisk station, Google Joliet station, and Google Will County station.

If there's no objection, Crawford station will be marked as Exhibit 441, Fisk as Exhibit 442, Joliet as Exhibit 443, and Will County as Exhibit 444.

Seeing no objection, those are marked.

MS. FRANZETTI: Just for the record, the

Joliet aerial, you can actually see both Joliet stations on that one aerial. So that's why there's only one aerial for both Joliet stations.

Albert, can you go ahead then, using these, to start to answer your question?

BY MR. ETTINGER:

Q. I think there was a question pending. You can now use your exhibit to answer the question.

A. Okay. If you look first at the exhibit for Joliet station --

MS. FRANZETTI: 443.

THE WITNESS: 443, as we mentioned that includes both Joliet unit six which is on the south side of the river and unit seven and eight which is on the north side of the river. Joliet six we looked at and we felt that that was the one that was close to being feasible for having a cooling lake and so we laid out in orange here the size of the cooling lake we would need. We'd need about 380 acres of cooling lake and you can see that's quite a large area. Midwest Generation does not own that property. Most of it is open farmland, but the one area there on the right I believe is an asphalt plant. So to build a cooling lake, Midwest Generation would have to buy all this property, demolish the

existing structures and clear the land. Plus, in the area of Joliet, you go down just a few feet and you hit rock, so it probably would not be practical to dig a lake here. You would have to build berms around the outside and have a perched lake where the lake would actually be above the ground. And based on that, we don't believe there would be any real costs savings with doing that and the schedule would be longer, especially if you consider the time it would take to buy property from multiple property owners who may decide not to sell.

BY MR. ETTINGER:

Q. Did you talk to any of these quarry owners?

A. No. But I don't think there's any quarries nearby that are 380 acres.

Q. I understand that. But there's -- you can buy property from more than one guy and combine them, can't you?

MS. FRANZETTI: Objection to form, counsel. Because I don't even know where you're talking about and whether or not wherever you are talking about it would be feasible to locate the cooling pond there.

BY MR. ETTINGER:

Q. Well, that wasn't my question. My question is

you've got 380 acres that you identified here and I see a quarry to the left of it or to the west of it, right?

A. Right.

Q. There's a quarry to the right of it?

A. Yes.

Q. I agree with you that the whole 380 acres could not be made up of any one of these quarries. My question is did you investigate the possibility of acquiring one of the quarries and combining that with some portion of the 380 acres that you've identified here?

A. No, we did not look at that. But for the lake to really be effective it has to be more or less contiguous, than doing a piece over here and a piece over there, because you would have to pipe and pump the water between the various sections.

Q. And that's impossible. What's this down here in the bottom left-hand of the Joliet plant, it looks like a couple of ponds. Do you know what that is?

A. No, I don't.

Q. Did you investigate the possibility of combining the acquisition of this property with conversion of this property with some sort of treatment wetlands for nitrogen or phosphorus?

A. No.

MS. FRANZETTI: Just for the record, objection on relevancy on that question.

BY MR. ETTINGER:

Q. And --

MS. FRANZETTI: Counsel, he's not done with his answer to your question.

MR. ETTINGER: I'm sorry. I was just going to get done with Joliet before we went on.

MS. WILLIAMS: Can I ask a quick question?

I would just like to -- if it's possible to verbally identify the intake of the plant on the map?

I see there's a canal going to the northern facility, is that the intake?

THE WITNESS: You're talking about Joliet seven and eight, the ones north of the river?

MS. WILLIAMS: Yes.

THE WITNESS: Yes. If you look, there's a canal and the intake is -- you can see it, the inlet of that canal flows to the canal into the plant and then a discharge is the canal that's along the cooling towers to the southwest.

MS. WILLIAMS: Can you describe where the intake is for the other facilities?

THE WITNESS: For Joliet six it's a little bit difficult to explain, but you can see there's -- actually this is an ash pond and immediately to the left there's a lighter area, the intake structure is there.

MS. WILLIAMS: Thank you.

THE WITNESS: And then the discharge is that small canal to the southwest.

MS. FRANZETTI: Can you do that one more time; show the Board members.

THE WITNESS: The Joliet six, this is the ash pond I'm talking about. The intake is right here, the discharge is down there.

MR. ETTINGER: Ms. Franzetti, if you want to go on to the other plants or do you want us to finish Joliet?

MS. FRANZETTI: You can finish Joliet. We're going to stay on the same topic, correct, when you say finish Joliet?

MR. EETINGER: We're going to talk about other pieces shown on your map of land and we're going to discuss --

MS. FRANZETTI: Your topic that if there's room for a cooling pond?

MR. ETTINGER: If there's room for a cooling pond -- let's ask something else related to this.

BY MR. ETTINGER:

Q. You said in your testimony also a spray. What is a spray?

A. Well, a spray pond is where people use -- usually it's a series of canals with mechanical devices that spray the water into the air to get extra heat transfer.

Q. What's the advantage of that?

A. It requires less land area than a cooling lake, but I'm not aware of any large power plant that uses that. Some people have tried using it, but they were basically failures and they eliminated it.

Q. Which ones are you aware of that initially they tried it and failed?

A. Quad Cities station.

Q. That's Exxon now.

A. Yes.

Q. Nuclear plant on the Quad Cities?

A. That's correct.

Q. North of this area that you've identified as 360 acres, there's also some stuff up here. It looks like sort of a putrefied pond or something above it, do you know what that property is?

A. Where is that?

Q. If you look at your 380 acres, there's a thing that's sort of pinkish at the bottom and then a kind of murky green above that. Do you know what that property is?

A. That is a quarry that the plant uses for disposing of their ash.

Q. So that's currently being used by Midwest Generation as an ash disposal site?

A. That's correct.

Q. Then over -- the other side of the road here, there's a couple of other ponds. Are those also abandoned quarries?

A. I don't know where you're talking about and -- I guess I don't know.

Q. I'm sorry. Look to the north, it looks like the northeast, there's two little -- they look like ponds with a thing called Cecelia Avenue between them?

A. Yes, I see what you're talking about. I don't know what those are.

Q. You don't know what those are either. Do you believe it would be impossible physically to connect these sites, so as to find your 380 acres by combining these plants to these sites?

A. I wouldn't say it would be impossible, but I think impractical and expensive.

Q. Why impractical?

A. Well, because you would need lots -- again, you would -- again you would have to purchase the land, I don't know who the owners are. You would have to purchase some land in between to build canals or piping, plus the cost of the piping and pumps could be very expensive.

Q. The only thing I see in between these are roads. Can't you just put a pipe under the road and, lo and behold, they're connected?

A. You still need access to the property between them.

Q. Well, those are roads, right?

A. Right.

Q. So we'd have to cut a deal with the county to build a hole under their road?

A. Right.

Q. Let's go on to the other plants --

A. I guess on Joliet we didn't lay out a cooling lake for Joliet seven and eight, but it would have to be three and a half times the size of a cooling lake we identified for Joliet unit six.

Q. I happen to know there's a little less space over there, but we don't have the map -- I thank you for the map, of course. But did you look at the -- there is some area, I've forgotten what else is over there, but there is some area to the north of seven and eight where there's also some space too, isn't there?

A. Well, we'd need 1100 acres for a cooling lake and we didn't really look at that site, that area there, but I think it would be very difficult to find 1100 acres of land. Plus, Midwest Gen would have to purchase the land because they don't own it.

Q. In any of your considerations here did you consider, like, a combination of using an open cycle system with having less than a completely sufficient cooling pond?

A. You said open cycle or do you mean closed cycle?

Q. I'm sorry, open cycle. Did you consider looking at your -- how many days you're going to have to be shut down, how many days you would have to be shut down if -- maybe you don't have a 380 acre pond, but only a 200 acre pond. Did you look at sort of combinations of what you might use as an approach?

A. No, we didn't look at that. But when you look at the temperatures, I still believe that any cooling lake

with size, any practical size, we would still not be able to meet the limits all the time.

Q. All the time. Let's go on.

A. The next one to take a look at is the drawing for Fisk station.

MS. FRANZETTI: That is Exhibit 442.

THE WITNESS: Putting a cooling lake at Fisk station doesn't pass the laugh test.

BY MR. ETTINGER:

Q. I agree with you, so let's go on.

MS. FRANZETTI: Now just for a minute, before we all start laughing. Is the area that you would need for the cooling pond depicted in orange, those orange lines?

THE WITNESS: Yes, it's depicted in orange and we'd need about 350 acres of cooling lake. We need all the land between Cermak Road and the canal, from Racine, through Ashland, beyond Damen.

The other issue with Fisk and it also applies to the Crawford station is on a cooling lake in the wintertime you're going to be generating a lot of fog because you're heating up that water higher than the air. And if you have a north wind which we frequently have in the wintertime, you're creating a lot of fog,

you would produce fog and icing on Interstate 55 and we consider that a fatal flaw, we don't think that would be acceptable. A cooling tower, mini cooling towers you will see generates a lot of fog, but we based our cost estimate on using plume abated towers which minimize the amount of fog and we believe that the plume abated towers would not cause a problem for fogging and icing on the interstate that something like a cooling lake would.

The next one is Crawford station --

MS. FRANZETTI: That's Exhibit 441.

THE WITNESS: We didn't lay out a cooling lake here. The plant is located just about in the center of the drawing.

MS. FRANZETTI: Why don't you hold it up and show it to them.

THE WITNESS: It's just north of the canal and east of Pulaski and for a Crawford station we would need about 585 acres, so we didn't even lay that out. That would be similar to the Fisk station and not at all practical and again you would have an icing problem with Interstate 55.

The next one is Will County station.

MS. FRANZETTI: That is Exhibit 444.

THE WITNESS: On Will County station we'd need about an 850 acre cooling lake. Again we didn't lay it out. Again it would require the purchase of a lot of land. There are highways in the area that could -- you know, could be a potential fogging problem in the wintertime. So we don't believe any of these sites would be practical for putting in cooling lakes.

BY MR. ETTINGER:

Q. What's on the east side of the river here on Will County?

MS. FRANZETTI: I'm not sure what you mean when you say what's on the east side?

BY MR. ETTINGER:

Q. Well, I see green here, a big blob of green to the east of the plant and that's what I mean.

MS. FRANZETTI: So is your question is there property on the east side of the plant?

MR. ETTINGER: I realize that there's part of the earth there. I asked what is there?

BY MR. ETTINGER:

Q. Do you know what the ownership of the property is or anything about it?

A. No, we don't.

Q. You didn't inquire whoever that owner is as to

whether there would be any possibility of putting a cooling plant there?

A. No, we did not.

Q. I'm going to withdraw five. When I read the question -- when I read the sentence I didn't understand it, but I just had an epiphany. So maybe we'll --

MS. FRANZETTI: No, actually you are right there. There's a mistake.

MR. ETTINGER: Oh, okay. Please correct your mistake. Maybe I'm reading past something I saw before.

THE WITNESS: There was an error in the statements in two places where we said -- where I said once through, that should have been closed cycle. The corrected --

BY MR. ETTINGER:

Q. That's the problem.

MS. FRANZETTI: You know what? Let him read it for the record, so we don't need to correct it otherwise.

THE WITNESS: The corrected text should read as noted above, although there have been several studies of existing plants with once-through cooling systems to evaluate retrofitting them to closed cycle cooling, few

have actually converted to closed cycle cooling because of the high capital cost, impact on plant performance, and the complexity of converting an operating station from once through to closed cycle cooling.

BY MR. ETTINGER:

Q. So the problem was just -- you said once through on the second line there when you meant to say closed cycle?

A. That is correct.

MS. TIPSORD: For the record, that is the first full -- or is the last full paragraph before sub D on page nine.

THE WITNESS: Yes.

BY MR. ETTINGER:

Q. Question number six. Why do you believe on page ten that adding cooling might trigger new source review?

A. We have a detailed, a 10-page detailed explanation in our report from section four, from 4-1 to 4-11 that explains that. To summarize it, it would be we believe the solid particle emissions from the cooling tower, because even though we would have very low drip, still the small water particles that the tower does emit has dissolved solids in them and those tiny drops evaporate and then that's considered particular

emission. For Joliet seven and eight and Will County three and four we did a detailed calculation which is explained in the report and determined that those plants could potentially emit through that cooling tower drip more than 25 tons per year, which would trigger new source review.

Q. I understand your explanation and we won't discuss the law. Does Midwest Gen believe that adding cooling to its Joliet plant triggered new source --

A. I don't know what Midwest Gen believes. But when you look at those towers, those are the existing cooling towers at Joliet seven and eight are only about one-third the size of what we would propose for closed cycle cooling, plus that is a once-through tower. So the water coming in is basically river water quality so the drip would be river water quality, and the closed cycle, as we explained before, we'd go to five cycles of concentration. So the dissolved solids concentration in the drip would be five times the concentration in the river or in the existing cooling tower.

Q. Seven, have you considered how putting cooling towers at upstream plants might affect the extent of need for cooling at downstream plants?

A. Well, we believe this impact would not be

significant. We didn't model -- we didn't try to model the entire river system. But as we explained before, looking at Fisk, the upstream river temperature in some years exceeded the proposed limits 55 days per year. So that if you didn't have -- if Fisk didn't add any heat to the water, then that same standard would apply to Crawford and so it wouldn't really have any real -- I mean Crawford would still have a problem.

Q. Did you look at Will County and Joliet?

A. Yes. We looked at -- in terms of inlet river temperatures, I looked at all five stations.

Q. If you put cooling on Will County, that would demonstrably lower the intake temperature at Joliet, wouldn't it?

MS. FRANZETTI: Objection, lack of foundation for that question.

MR. ETTINGER: You objected --

MS. FRANZETTI: You haven't -- you're assuming a fact out of thin area, Albert, and saying that it would. But it -- do you understand the question?

THE WITNESS: Yes.

MS. FRANZETTI: You can answer it.

THE WITNESS: Again I believe the impact

would be small. It would not -- if you were to say you put cooling towers in Will County, I believe we would still need to put cooling towers in Joliet nine and seven and eight, based on the -- to meet the proposed limits we would still need to go closed cycle to have a practical solution.

BY MR. ETTINGER:

Q. Based on your studies does the temperature of the -- rather does the heat discharge at Will County affect the intake temperature at Joliet?

A. As I mentioned earlier, we didn't do a model of the river. We just looked at each individual station. We looked at the inlet temperature and the limits and what we would need to do at each station to meet the proposed limits.

Q. You don't know how much the Will County land affects the intake temperatures at Joliet?

A. I don't have a specific number.

MS. FRANZETTI: Do you know approximately what the river mile distance is between Will County and Joliet?

THE WITNESS: I think it's seven or eight miles linear distance from Will County to Joliet.

MS. FRANZETTI: Also just for the record,

it's true that as of the end of last year, two of the Will County units in fact shut down already, correct?

THE WITNESS: That's correct.

MS. FRANZETTI: Your analysis assumes that they would be shut down, correct, in this S and L report, you knew that?

THE WITNESS: Yes.

BY MR. ETTINGER:

Q. Did you then go in when you looked at your historical data and backout what the affects would have been from shutting down those two plants?

A. No.

Q. Can the cooling towers be combined with wetlands that would serve to treat water for nitrogen?

MS. FRANZETTI: Objection to relevancy.

MS. TIPSORD: Go ahead and answer to the best of your ability.

THE WITNESS: Well, it would be possible to use a combination of cooling towers and cooling waters, small cooling towers and smaller cooling lakes, but we believe that the overall cost would be greater than just using cooling towers. And in terms of treating water for nitrogen, we didn't look at that at all, that's not my area of expertise so I have no idea what the impact

would be.

BY MR. ETTINGER:

Q. How much did it cost Midwest Generation to buy the plant?

A. I don't know.

MS. FRANZETTI: I'll just again object to relevancy. I don't think for economic reasonable issues it matters what Midwest Gen bought the plants for.

MR. ETTINGER: I won't bother to argue that since he's answered the question anyway.

BY MR. ETTINGER:

Q. If Fisk and Crawford were to close, would that affect intake temperatures at Will County?

A. I'm not aware of any plans to close Fisk and Crawford stations and we did not really try to analyze that, so my question would just have to be hypothetical because that's not looked at in our study. But as I mentioned before, based on looking at the river temperatures, putting -- converting Fisk and Crawford to a closed cycle would essentially have the same impact in the downstream units as shutting them down and we believe that would not be significant and would not change our recommendations for the downstream plants.

Q. Going back to something else you said. You

testified that the intake temperatures at all of the -- at a number of these plants would be above the proposed standard much of the year. What is your understanding of the heat inputs to the system?

MS. FRANZETTI: Albert, can you explain what you mean by heat inputs?

BY MR. ETTINGER:

Q. What are the sources of heat that are raising the temperature in the system that we're analyzing?

MS. FRANZETTI: Where -- do you want him to start at Fisk and have to go all the way down and mention all the heat inputs?

MR. ETTINGER: I asked a general question. If he can't answer a general question, we can go piece by piece, if you prefer.

MS. FRANZETTI: I'm just -- your general question is not very clear in terms of either --

MR. ETTINGER: Well, thank you, counsel. We'll break it down.

MS. FRANZETTI: The geographic scope that you're asking about or otherwise so --

MR. ETTINGER: I thought we were talking about the whole system, but, counsel, we'll break it down for you.

BY MR. ETTINGER:

Q. What do you believe are the thermal inputs affecting the intake temperature at the Fisk power plant?

A. I don't know. I just looked at the temperature at Fisk. I didn't evaluate why those temperatures were high or low or where it was coming form.

Q. You have no idea why the Fisk would be higher than what IEPA is proposing for the water quality standards?

A. That's correct, I do not know.

Q. Would that answer also be true as to Crawford?

A. Yes.

Q. And Will County?

A. Yes.

Q. And Joliet?

A. Yes.

MR. JOHNSON: And generally.

THE WITNESS: And generally.

BY MR. ETTINGER:

Q. Okay, here is the final question, is number 11. What is the current revenue being made at the five stations?

MS. FRANZETTI: The same objection in terms

of relevancy, but answer the question.

THE WITNESS: I don't know.

MR. ETTINGER: I'm done.

MS. TIPSORD: Are there any other question for Mr. Henry?

MS. DONATO: May I ask a question?

MS. TIPSORD: Absolutely, as long as they're relevant. You need to identify yourself for the record.

MS. DONATO: I'm Marla Donato. I'm here with Columbia College on behalf of the students.

Some of these things might be pretty basic, but you're using river water in order to generate the steam turbines. Is that what we're trying to cool down here in general?

THE WITNESS: We're using river water to cool the steam generators.

MS. DONATO: And the water for the steam to -- to generate the turbines is coming from where?

THE WITNESS: That's a separate isolated cycle. We're generating steam in a boiler, the steam turns the turbine, then when it exhausts the turbine we have to condense that steam and so we have a heat exchanger that uses river water to condense that steam, then that condensed steam then goes back to the boiler

and that's the closed loop cycle.

MS. DONATO: The water that's turning the turbines, where is that coming from that's generating the steam?

THE WITNESS: That is makeup water. I don't know where the source of the makeup water that these plants is, but that's extremely pure water so that just goes around in a closed loop.

MS. DONATO: Right now what's existing as far as cooling?

THE WITNESS: All of these plants use the river water for cooling.

MS. DONATO: You're saying these are proposed standards. The current existing standards are what?

MS. FRANZETTI: I don't think this witness can explain to you all the proposed standards. They're thermal standards that would apply in the receiving water.

MS. WILLIAMS: She asked current, though, she didn't ask about proposed. They're pretty simple now.

MS. FRANZETTI: The secondary contact are the thermal standards.

MS. TIPSORD: Let's just refer to the rules of the -- if you look at the Board's rules and regulations at 35 Ill App Code 301, 302, 303, they delineate exactly what those standards are and you can get those from our website. That's probably easier than us trying to explain what the secondary contact current ones are, but they are on the website and you can get them there.

MS. DONATO: And this would -- theoretically you have to cool the water down more from what it is currently?

THE WITNESS: That is correct.

MS. DONATO: Do you know what the difference is between -- about?

THE WITNESS: Well, it varies over the year and the difference is big enough that it would not be practical to try to cool that water down. What we have estimated is that we would need to put in cooling towers, basically a complete closed system where we'd only be taking water from the river for makeup, that we would use cooling towers for essentially all the cooling, we'd no longer be using the river for cooling.

MS. DONATO: Then do you have any idea of how much volume of water you would use in this closed

system from the river?

THE WITNESS: The amount of water we would have to withdraw from the river for makeup?

MS. DONATO: Uh-huh.

THE WITNESS: I think that may be in our report. It's a few percent of the total amount of water that we're using now. But understand that the water that we're using now, we're taking out of the river and putting it back in. So it's not really -- it's we're just taking it out, adding some heat, and putting it back in.

MS. DONATO: That would be the same with this closed system?

THE WITNESS: Well, the closed system, no. We would be -- the heat would be dissipated to the air from cooling towers and we would just need a small amount of water from the river to make up what is lost through evaporation.

MS. TIPSORD: Anything else for Mr. Henry? Thank you very much.

Mr. Read, you have something.

MR. READ: Thank you, Madam Hearing Officer.

My name is Matthew Read. I'm here on behalf of ExxonMobil and I'd like to make a request that

ExxonMobil be allowed to -- specifically Bob Elvert from ExxonMobil be allowed to make a public comment on the record. It's very brief, it's about two paragraphs, and it deals with how they plan to participate in this rule making. Since the record is open, we thought it would be a good opportunity.

MS. TIPSORD: Is there objection to that?

MS. WILLIAMS: Just to clarify, we can ask him questions about his comments if we have any?

MR. READ: Well, since it's a public comment, we just want it read into the record.

MS. TIPSORD: Yes, we won't swear him in.

MR. READ: And it's really not very -- we're not talking about substance here. We're talking about --

MS. FRANZETTI: I have a feeling we'll argue about this longer than it'll take him to say it.

MR. ETTINGER: No, no, I'm not going to argue. He's here, if he wants to read two paragraphs. But I think in the future we should tell people a written submission would be good enough.

MS. TIPSORD: All right. With that we'll let Mr. Elvert read his couple of paragraphs.

MR. ELVERT: Thank you.

Good afternoon. My name is Bob Elvert, the state regulatory advisor for the midwest region for ExxonMobil Corporation. ExxonMobil has been an active participant in this rulemaking as evidenced from my testimony at an earlier hearing during the --

MS. TIPSORD: Mr. Elvert, slow down just a little bit.

MR. ELVERT: I'm sorry. I've testified on the ExxonMobil security and safety concerns regarding the stretch of the Lower Des Plaines River where the Joliet refinery is located. ExxonMobil intends to continue it's participation in this rulemaking. Although we are not offering testimony in Subdocket C, ExxonMobil will have testimony during Subdocket D when the Board hears testimony on the proposed water quality standards. At this time ExxonMobil has identified several issues with the proposed standards which I or another representative of ExxonMobil will more fully explain during the Subdocket D proceeding. ExxonMobil also intends to present testimony at that time of the cost of compliance with the proposed standards. I appreciate this opportunity to update the Board on ExxonMobil's plans to present testimony in Subdocket D rather than Subdocket C. ExxonMobil rests respectfully

and reserves the right to do so. Thank you.

MR. ETTINGER: I actually like the testimony or statement because that brings us to our next topic which is how we're going to deal with the relationship of C and D.

MS. TIPSORD: Do we need to have this on the record, do you think, or can we do it off the record?

MS. WILLIAMS: I would like to say one thing though, then, on the record before we go off. I don't have a problem with Mr. Elvert's statement either, but I do think it's sort of unrealistic to distinguish between testimony and public comments in the same transcript -- -

MS. TIPSORD: We do it all the time. It's not unusual for the Board to take public comments at a hearing for a public comment.

MS. WILLIAMS: Okay, that's fine. Thank you.

MS. FRANZETTI: I was just looking to spare MS. TIPSORD reporter. I don't mind if we have it on the record. I guess I would just quickly say, Albert, that the reason we presented it, I can't speak for anybody else, but the reason that we presented Mr. Henry at this time was once the two dockets got bifurcated, I do think

there is an economic reasonableness issue that is raised by the Illinois Environmental Protection Act with respect to any proposed rule, that it is to be economically reasonable, so the use designation rule should pass that test. We wanted to get in our economic testimony to be able to refer to in that guise. With respect to Subdocket D, we would not repeat this testimony, although we would ask that it be also considered in Subdocket D. Now, might we add to this for Subdocket D purposes? Yes, but not duplicate.

I don't know if that helps.

MR. ETTINGER: It sounds like we more or less agree. The problem is and I don't necessarily agree with your analysis of when cost is relevant or not --

MS. FRANZETTI: I understand.

MR. ETTINGER: I think we all agree that arguably testimony could have gone in under C or D. I think what we just heard from the representative of ExxonMobil and some of us else have, is we intend to offer economic testimony or other testimony that we thought was relevant more to D than to C and I think there was just a concern that we just heard and that we have similarly, that we don't want to be held later to

have been somehow precluded because we didn't offer it in C. Also, you know, hypothetically you could adopt the proposed use designations that IEPA has proposed and then come up with criteria that didn't cost you as much to meet, as what you've just testified. So we're going to -- all I wanted to say is we haven't objected to the people who have come in testifying now, even though I think personally it's more properly D, I don't care, we just did it, it was fine. I just want to make sure that nobody's precluded later from offering economic testimony on the reasonableness of this because, you know, they didn't get it in on C because they thought it should be in on D.

MS. TIPSORD: And I would just like to say for the record, and this is as the hearing officer, I would have to have a pretty strong argument to keep something like that out in Docket D, and partly because we have our ROA-9 and in ROA-9 we had a whole lot of hearings before we went A, B, C, and D, and we already have had the instance with Dockets A and B where for example the district is filing cheers in both B and A, and we're already seeing that there is, even though we've split them out, there is overlap and I think that that's true, is going to be even more true as we go

through with C and D. So I would say that as long as it's relevant and not overly repetitious, that I would be willing to take the --

MR. ETTINGER: I'm not even arguing that our current witness couldn't come back in D if there's something he wants to clarify, in view of what has happened or revised criteria. I just wanted to make -- I was more concerned about being precluded than duplicative.

I think Fred has something to say, just from the way he's nodding, but also I have another issue to raise which has to do with the Water Reclamation District which is I don't think we've seen their proposal yet on dissolved oxygen, zinc, and whatever else it was, cyanide, as regulatory language.

MR. ANDES: I think that if you read the exhibits, the attachments to Ms. Wozniak's testimony, there are detailed proposals presented there.

MR. ETTINGER: I read -- I saw -- I mean there was something that I could draft, the detailed proposal, but I didn't see an actual regulatory proposal. Do you have something like that?

MR. ANDES: I don't believe that we provided actual regulatory language there. I think we provided

the basis for a regulatory language and it would be fairly straightforward from the draft, but we didn't feel that was a necessity point.

MR. ETTINGER: Well, here's my point. They did in fact foreshadow that they were going to make some proposal like that. Frankly, we did not expect the sort of drastic proposal that they offered. We did not think about certainly in our pre-filed testimony, we were not trying to respond to their proposal since we haven't seen it yet. So at some point further down the road, and again I'm not faulting what was done, we're all sort of stumbling through, fitting things into these boxes. I'm just saying, though, we need time to offer our own pre-filed testimony and our own analysis of their specific proposal that we haven't really seen until six weeks ago or whenever it was.

MR. ANDES: That's fine. I assumed there would be that opportunity at some point.

MR. ETTINGER: I was concerned that there would not be.

MS. TIPSORD: Is there anything else?

All right. We'll see you all at 9:00 o'clock tomorrow morning.

(Hearing adjourned at 12:40 o'clock p.m.)

STATE OF ILLINOIS)
)SS.
COUNTY OF C O O K)

DAVID J. DEMSKI, being first duly sworn on oath says that he is a court reporter doing business in the City of Chicago; that he reported in shorthand the proceedings given at the taking of said hearing on the 9th day of March, 2007, and that the foregoing is a true and correct transcript of his shorthand notes so taken as aforesaid, and contains all the proceedings given at said hearing.

DAVID J. DEMSKI - CSR# 084-004386

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